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ABSTRACT

This document contains 142 papers on PT3 (Preparing Tomorrow's Teachers to use Technology) from the SITE (Society for Information Technology & Teacher Education) 2002 conference. Topics covered include: a technology in urban education summit; student professional development; meeting NCATE (National Council of Teachers of English) standards; faculty use of WebCT; preparing teachers for the digital age; technology in K-8 multicultural classrooms; using immersive 360 degree images; consortium building; student evaluation; technology fellows; incentives that facilitate institutional change; impact of a temporary grant; a consortium for outstanding achievement in teaching with technology; changes implemented after technology professional development sessions; Web-based modules for teaching mathematics to minority students; student teaching technology sites; preservice teachers design technology-enhanced learning experiences; planning, implementing, evaluating, and reflecting on software usage; NETS (National Education Technology Standards) as a framework for change; using technology to help English learners succeed; integrated Internet-2 video content into teacher education programs; faculty development and change; technology use in the interning experience; using Intel's Teach to the Future Pre-Service Program; evaluating Web-based environments for professional development on technology integration; applying the Technology Integration Model for School Success; school-university collaboration; Michigan's Teachers' Technology Education Network; constructing scientific models during teacher preparation; the pedagogy of the 21st century; teacher candidate applications of telecommunications; team approach to integrating technology; erasing the digital divide in Arkansas schools; assessing the educational technology competency of preservice teachers; from low tech to high tech mobile computing; modeling and visualization in mathematics and science immersed in preservice teacher education; attitudinal factors in teaching middle school math/science teachers to enhance curriculum using technology; benchmarking technology readiness; redesigning courses to infuse technology; using a flex cam to cross the digital divide in rural schools; mentoring; virtual field trips; building a national PT3 online learning community; identifying the vectors of technological change in a college of education; electronic mentoring of career change; standards for digital and education

equity; assessing program alignment with technology standards; handheld technology in field-based reporting; proficiencies for Web-based course delivery; assessment of online technology modules; technology and information literacy in the English literature classroom; a history teaching institute; and an online model for student teaching. Several brief summaries of conference presentations are also included. Most papers contain references. (MES)

PT3 (SITE 2002 Section)

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Teamwork... Collaboration... Learning... Integrating... Mentoring— these words permeate the project papers presented in the following pages and form the basis of the common language shared by all PT3 grant participants; they have been goals and many have become accomplishments over the past year. They form the vocabulary of a common endeavor of which we should be proud. 142 papers covering several different aspects of PT3 grants from across the country will be presented at SITE 2002. While the foci of these papers are broad and diverse, the common endeavor, the infusion of technology into pre-service teacher education, ties them together in a way that facilitates dialogue. And yet, effective dialogue requires not only a common vocabulary but also a time and a place, just the sort of time and place provided at SITE 2002.

SITE 2002 provides us with the invaluable opportunity to share our experiences in achieving these goals and allows us the opportunity to reflect. In all good design, a time for reflection and evaluation is provided. Whether at the end of a project or as an ongoing part of it, reflection allows participants to both look back and attempt to see forward. As we all discover, however, the reflective process can be difficult and time-consuming— it is sometimes simply easier to continue forward without looking back. SITE 2002 offers the time and opportunity required for reflection. Whether nearing the end of a grant cycle or only at the beginning, we are all at a point where reflection and evaluation are advisable and necessary.

As groups with a shared vision for the future of pre-service education, we can use this time to reach out to our fellow grantees and provide them with the benefits of our experiences. Shared knowledge regarding what has worked and what has not may keep others from treading treacherous paths or guide them toward success. Along with sharing our advice and successes, we can also share our perspectives on working as teams to create change in a changing world.

This conference also provides the opportunity for communication between different PT3 groups as they share the results of the past year's work and their plans for the sustainability (sustenance) of their work.

While we reflect on accomplishments, we need to look realistically at what remains to be done. Sustainability of the progress that has been made and the changes that have been engendered by these grants can also become a focus of discussions at the conference.

Above all, see this conference as an opportunity, to share, reflect, and renew. Look to the progress that has been made in the past year and share the pride of every presenter in their accomplishments.

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PT3 SECTION

Sharing Expertise: The Technology in Urban Education Summit

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Abstract The Modeling Instruction with Modern Information and Communications technologies (MIMIC) Project housed in the Cleveland State University (CSU) College of Education sponsored a Technology in Urban Education Summit in Spring 2001. Serving as a dissemination component of a PT3 Implementation grant, this event explored current, relevant educational technology and possibilities for its integration in urban K-16 classrooms. This paper provides an overview of the Summit and presents practical recommendations based on data collected from the Summit participants.

Overview

A Technology in Urban Education Summit (Techs in the City) was held at Cleveland State University (CSU) as a dissemination component of the MIMIC Project which supports educational technology mentoring for higher education faculty by technology-proficient K-12 classroom teachers. The Summit brought together local, state, and national educators who share a common interest in educational technology. Faculty representing nine urban universities, and eight Ohio Colleges of Education joined with MIMIC participants and K-12 classroom teachers from urban districts to share perspectives on teaching with technology.

Techs in the City consisted of a day of presentations and conversations culminating with an in-depth panel discussion focused on timely issues surrounding the implementation of educational technology in urban K-12 schools. A marketplace of interactive presentations highlighted the ongoing educational technology activities of participants from the CSU College of Education and MIMIC partners Baldwin-Wallace College, Notre Dame College of Ohio, Ursuline College, and John Carroll University. Many of the Summit presentations provided insights into how faculty/mentor teams work to examine pre-service education curricular goals and implement technology that is appropriate and specific to achieving those goals. Additional presentation topics included technology integration in specific content areas, digital video, technology use in K-3 settings, program evaluation, and professional development in educational technology.

Eleven Round Table discussions were conducted midway through the day. The Round Tables provided participants with opportunities to enter into discussions about specific topics of interest such as educational technology publication, classroom videotaping, and technology integration in K-12 urban schools. Each discussion was facilitated by an expert on the topic. In addition, informal activities and breaks were scheduled throughout the day to encourage continued dialogue among participants. Urban educators with expertise and rich backgrounds in teaching, research, and administration presented a panel discussion, which capped the Summit proceedings. A video of Summit highlights was shown to close the day's events.

Participant Feedback

A survey form was distributed as attendees exited the Summit. The survey consisted of 25 Likert scale response items and 10 open ended questions. Thirty-two of the 65 attendees, 49 percent of the participants,

completed the survey. An online follow-up survey was conducted approximately two months after the Summit. Seventy four percent of the participants completed and returned the follow-up survey.

On the initial survey, three questions were posed for each of the four types of sessions; morning interactive, Round Table discussions, afternoon interactive and the Panel discussion. The first question related to level of interest generated by the Summit, a second addressed each session's connection to the Summit theme, and the third dealt with the perceived usefulness of the session. The scale for response was Strongly Disagree, Disagree, Agree/Disagree, Agree, and Strongly Agree. Ninety three percent of the respondents "agreed" or "strongly agreed" that the interactive sessions and Round Tables were interesting, related to the Summit, and were useful. Seventy five percent of the respondents "agreed" or "strongly agreed" that the Panel presentation had the same characteristics but six respondents either "strongly disagreed" or "disagreed" with the statements in regard to the Panel discussion.

Five Likert scale questions were posed on overall Summit satisfaction. The same response scale was employed. One hundred percent of the respondents either "agreed" or "strongly agreed" that the Summit was interesting, the companion video was enjoyable, and that they looked forward to meeting next year. Ninety three percent of the respondents either "agreed" or "strongly agreed" that they would be able to use the ideas presented at the Summit in their work.

The responses to the follow-up survey were quite consistent with the participants' initial feelings about their experiences. Eighty three percent of those responding indicated they "agreed" or "strongly agreed" that they have used information attained at the Summit. Fifty three percent "agreed" or "strongly agreed" that they have tried new technology as a result of the Summit.

Open-ended questions were presented regarding educational technology ideas that participants could use on their own, Summit strengths and needed improvements, and suggestions for next year's Summit. Overall, the open-ended comments were very positive. Contacts and collaborations were key aspects of participant satisfaction. In particular, the opportunity to engage in one-on-one conversations was significant to participants. Increased awareness of Internet materials appeared to have influenced some participants to examine the potential of web-based instruction, and exposure to software and hardware broadened participants' use of new technologies. Two areas of discontent were the small size of some of the presentation rooms and the short duration of the interactive sessions. Based on the number of open-ended responses, the presentations were enjoyed the most by the participants. However, the participants appreciated the Round Tables and opportunities for informal interactions, which served as mechanisms for extending the information presented in the sessions. Comments on the positive nature of the networking appeared in numerous responses.

Additional comments suggest that there was a mixed reaction to the Panel discussion. While some participants found the discussion pertinent, many others found the format limiting since audience participation in the discussion was minimal. Several suggestions were made for future Summits including the addition of "how-to" sessions, cutting edge technology demonstrations, more "hands-on" activities, and sharing exchanges.

Lessons Learned

The goals of the Summit were twofold. First, the Summit was designed to provide MIMIC Project participants with an informal but structured opportunity to disseminate information regarding their Project activities. Second, the Summit was designed to offer attendees new perspectives on integrating educational technology into urban pre-service education courses. Survey responses indicate that dissemination efforts were well received. Achievement of the second goal was supported by responses from the participant follow-up survey. Techs in the City met the needs of the intended audience. As such, a second Summit is scheduled for the spring of 2002. Well-received events such as the Round Table discussions, interactive presentations and the "highlight" video will be retained. The addition of a Reception/Poster session event will accommodate shorter, more intimate presentations and open up time for lengthier "hands on" interactive sessions in larger venues. Other suggested changes include a keynote address, cutting edge technology demonstrations and professional development sessions. Updates on the 2002 Summit are available at http://mimic.ed.csuohio.edu/summit.html

Providing for Student Professional Development as part of the Teaching, Learning and Technology Project

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Abstract: Northern Kentucky University's College of Education faculty want to ensure that their teacher education students are technology proficient. Students must demonstrate mastery of technology standards through their course assignments and professional portfolios. Students can only demonstrate technology proficiency if they experience effective and appropriate instructional applications of technology. Curricular review and the implementation of the Preservice Technology Leadership Program are some of the initiatives utilized by NKU to provide for professional development of teacher education students to be technology proficient.

Introduction

In 1998, the College of Education at Northern Kentucky University (NKU) adopted the ISTE Recommended Foundations for Teachers and a five-year *Technology Plan for the College of Education*. In May 1999, the Education Professional Standards Board of Kentucky implemented a new technology standard for beginning and experienced teachers. The statewide technology standard is based on the ISTE technology standards. NKU's College of Education recently adopted the National Education Technology Standards (NETS) for teachers to replace the 1998 ISTE standards. Adoption of technology standards, state mandates and four broad goals of a technology plan set the College on a course to infuse technology into the teacher education program.

The TLT Project

NKU received funding from the United States Department of Education (U S DOE) for a one-year capacity building grant in 1999 and a three-year implementation grant in 2000. These grants allow NKU to begin a full implementation of the five-year technology plan.

The goals for NKU's Teaching, Learning and Technology (TLT) Project are based upon three of the four goals outlined in the *Technology Plan for the School of Education*. The goals for this three-year project build upon the successful integration of technology into the teacher preparation curriculum by providing (1) *Technology-rich Environments* for students and faculty, both on-campus and in field placements; (2) *Faculty Professional Development* for NKU faculty; and (3) *Student Professional Development* that ensures students seeking initial teacher certification have the necessary skills and resources to use technology in their teaching and learning.

The third goal of the TLT Project includes the need to address professional development for students. Within the grant project several initiatives are in place to ensure that preservice teachers are trained on effective instructional applications of technology. Curricular review and reform is necessary to ensure that all preservice teachers will be trained and evaluated according to national and state technology standards. A new initiative, the Preservice Technology Leadership Program (PTLP) provides an opportunity for some preservice teachers to develop leadership skills and to collaborate with teachers from partner districts.

Curricular Review

NKU uses a continuous review and program evaluation model for curricular matters. Faculty who teach one or more courses in the teacher education program are often asked to identify which standards, including technology,

are being assessed within the courses they teach. Program folios include matrices that identify each course and type of assessment for each standard. During the 1999-2000 academic year, matrices related to the technology standards were completed.

As part of the TLT Project, a maximum of five teacher education faculty members receive a one-course (3 semester hours) of reassigned time for the purpose of reviewing targeted teacher education programs in regards to the national and state technology standards. Faculty who participated in this curricular review during the 2000-2001 academic year noted discrepancies in the technology matrices. This group developed a technology utilization survey and began conducting interviews with elementary and special education faculty. During year two of the TLT project, the technology utilization survey is being administered to middle grades and secondary faculty. By the end of the TLT grant project, all teacher education programs that lead to initial certification will be analyzed and reviewed for levels of technology implementation and evaluation. This review will allow NKU to identify strengths and weaknesses within the teacher education program.

Preservice Technology Leadership Program

Another initiative within the TLT project is the Preservice Technology Leadership Program (PTLP). This program recruits a select group of preservice students in their first semester of professional coursework and pairs them with mentor teachers from partner districts. The students and teachers participate in 24 hours of training each year. The training sessions focus on learning how to use various hardware and software components. Outside of the formal training times, the mentor teachers and the preservice students collaborate on the instructional applications of the technology in which they have been trained. Collaboration includes participation in additional training from the partner districts and development of instructional activities. Mentor teachers and students are encouraged to try out the technology-rich activities and evaluate their use within a typical classroom environment. The mentor teachers and students provide additional professional development to the partner districts either through in-services/workshops at the district or technology seminars for the consortium. A few mentors and their students also present at the statewide technology conference.

Concluding Remarks

The TLT curricular review process has been instrumental in identifying strengths and weaknesses in the teacher education programs. A few of the curricular revisions made to the teacher education program have been based upon the data collected from the technology utilization survey.

PTLP has provided another means of collaboration between the College of Education and partner districts. Participants gain knowledge and skills on the use of technology and have the opportunity to share their experiences through leadership opportunities on campus and in the schools.

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A Framework for Integrating Technology into Teacher Preparation Programs

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The lack of highly qualified teachers for urban schools continues to be a well acknowledged problem nationwide. The educational needs of children and youth, and particularly for those who attend the nation's urban schools, can best be met by assuring that each student, no matter what school he or she attends, has a highly qualified, competent, and caring teacher (National Commission on Teaching and America's Future, 1996). Faculty at the University of Wisconsin-Milwaukee (UWM) define highly qualified teachers as those who (1) are deeply knowledgeable in the content areas they are to teach, (2) possess and demonstrate a high degree of pedagogical content knowledge, (3) engage in culturally relevant pedagogy to foster high levels of achievement for all learners and to bridge the discrepancy between primarily majority teachers and primarily minority students, and (4) embed technology across all aspects of their teaching as a central means of creating active, engaging, and challenging learning communities that enable their students to meet high standards of achievement. Teachers who possess these four qualities have the potential to close the perennial gap in achievement between students in urban schools--who typically are members of minority, and often lower socioeconomic, groups--and their more advantaged peers.

But if teachers in urban schools are to use technology to close the achievement gap, they must draw on technology to *transform* traditional teaching--teaching that to date has clearly left students in urban school systems like the Milwaukee Public Schools (MPS) the least well served. Technology holds unique potential for assisting teachers in moving away from traditional, teacher-centered instruction to highly engaging, challenging, student-centered learning environments. To reach this level of technology use, however, new and experienced teachers alike will require sustained professional development to acquire a vision of what is possible through the integration of technology-rich educational approaches--opportunities that were not in place prior to the receipt of a PT3 Implementation grant.

It is our belief that to be skilled in appropriate technology use, students must learn about technology through both explicit instruction via technology courses and through more integrated means within content area courses. As part of the work to integrate technology into our program, a framework for technology was developed. The framework was developed to help students consider their roles regarding technology (e.g., promoter of ethical practice, troubleshooter), how technology could be used to help them (e.g., teacher's assistant, teacher's tool) and how it could be used to promote learning (e.g., communicating or sharing information via various technologies) in their students. Using the ISTE standards and Collaborative Teacher Education Program for Urban Communities Core Values, the framework was constructed. The framework drove the revision of two required technology courses and stimulated the integration of technology projects in a number of content area courses.

This presentation will share information about the Collaborative program and the technology framework, as well as explain how coursework has shifted in both content and delivery. Examples of student and faculty projects will be shown.

Meeting NCATE Standards for Technology Integration: Survey Results of Technology Integration in an Elementary Education MAT Program

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Abstract: This article is a report on findings of a survey that was given as a pre- and post-test of an introductory technology in education course. Introduction to Technology in Education was integrated into two other courses. In general, students perceptions of their ability to operate a computer, use computer operating systems, increase their knowledge of computers and technology, evaluate software, use technology as a tool for instruction, using technology as a teaching tool, developing a technology plan, and disseminating their technology expertise increased.

In its effort to reform teacher preparation, NCATE has moved to ensure that teacher education candidates are prepared to use technology in teaching and learning. Expecting technology to be "central to teacher preparation in 2000 and beyond" (Wise, 1997-2001, p. 2), NCATE anticipates that technology will "be integrated throughout the curriculum, instruction, field experiences, clinical practice, assessments, and evaluations of the school" (Bradley, 2000, p. 2). As SCDEs develop curriculum and discuss instructional strategies to meet these standards, they turn to recent research and model programs for guidance.

Survey research conducted in 1998 by the International Society for Technology in Education (ISTE, 1999) initially suggested that integration of technology experiences in other coursework was more effective than a separate stand-alone technology course in helping preservice teachers to learn to use technology in education. However, a follow-up study of high-scoring institutions (as identified in the 1998 study) found that "technology courses within the teacher training program were rated as essential...followed by training integrated into other education coursework and informal individual learning (Bielefeldt, 2001, p. 9). The outcomes of these two studies reflect the various approaches being tried by SCDSs: stand-alone courses emphasizing tool use or basic computer applications, integration of technology across the liberal arts and teacher education programs, or a well-coordinated combination of both. Deciding on the best approach was identified as an obstacle to infusing technology into preservice teacher education in an ERIC Digest written in 1995 (Ismat, A., 1995).

The National-Louis Preparing Tomorrow's Teachers to Use Technology grant, *Transforming Learning and Teacher Preparation through Technology-Rich Cohorts*, was designed to train elementary and secondary teachers for partner school districts participating in the grants using a program that differed from the traditional program by adding a strong element of technology training and providing students with Gateway laptop computers. This MAT program reduced the number of credit hours for Foundations courses and replaced those hours with an Introduction to Technology in Education course.

Preservice teachers involved at the beginning of this PT3 training program took three classes during their first semester, an Introduction to Special Education class, a Practicum I class and the technology class. The classes met one night per week with technology instruction occurring in an elementary school equipped with a Macintosh computer lab. During this one night per week, hours were allotted for the three-hour special education class and the three-hour practicum class, but the technology class was integrated entirely within the class time of the other two courses. The instructors of the classes met together and correlated their respective syllabi. As the other two classes covered topics that permitted the integration of the goals and objectives of the technology class, the technology instructor taught technology skills within that class. In this way, the two-hour Technology in Education course was entirely embedded within the other two courses.

To measure the success of this program, students completed a survey at the beginning and end of the semester of the program. This instrument was developed from one used by Anderson and Petch-Hogan (2001) and measured such areas as students' technology skills, their knowledge of the use of computers, their ability to evaluate software, their use of technology to facilitate instruction, their ability to use technology as a teacher tool, their ability to develop a technology plan, and their ability to disseminate their technology knowledge. Using a t-test, the pretest and posttest forms of the survey were analyzed to determine gains in these areas.

Results indicated that students perceived themselves as improving in several areas measuring the operation of a computer and peripherals. They learned to install software, explain the best operating conditions for computers, perform simple maintenance on their computers, and operate CD-ROMs. Areas that were not significant included operating computers, operating projection devices, hooking up external devices, explaining safety features, maintaining printers, scanners, and digital cameras. Mean scores for computer operation, hooking up external devices, and maintaining printers were high on the pretest, indicating that students felt they knew how to perform these areas before the semester

Results measuring student perceptions of their increased knowledge of computer operating systems indicated that students felt that they significantly increased in operating and navigating a Windows system, finding files in a Macintosh computer, making an alias in a Macintosh computer, changing settings in a Windows computer, making a shortcut in a Windows computer, and configuring peripherals in a Windows computer. Nonsignificant areas were initializing disks, operating a Macintosh system, beginning a program in both a Macintosh and a Windows computer, deleting programs in both a Macintosh and Windows computer, changing the settings on a Macintosh computer and finding files on a Windows machine. High mean scores on the first surveys for initializing disks, beginning and deleting software on a Windows computer, and finding a file on a Windows machine would seem to indicate that students already felt competent in these areas before the program began.

Results of student perceptions of their knowledge of the use of computers and related technology indicate that students felt that they gained in all areas: defining concepts related to technology, identifying major issues associated with the use of technology, identifying ways that computers can be infused into the curriculum, taking steps to keep knowledge up-to-date, and identifying sources of technology information. Using the integrated format for this course in educational technology seems to have made students feel that they improved in their knowledge of the use of computer technology.

Results for evaluation of software were also generally significant. Students felt that they increased in their ability to identify the purpose of a software program,. match student characteristics to software, identify characteristics of software for instruction, evaluate the content of software, match the difficulty of the software with the learner, evaluate documentation, and determine teacher options. Setting up software options for use was nonsignificant.

Results on the surveys measuring the use of technology to facilitate instruction reported a significant increase in all the subskills that measure this area. Students reported a significant increase in their ability to use technology for instructional practice; set up the classroom for technology instruction; use tutorial programs, drill and practice programs, problem solving programs, tool software for both students and teachers, and assistive technology; evaluate the effectiveness of applications; use the Internet for research; use multimedia, and create Web pages. The only area they failed to demonstrate a significant increase was in use of the Internet for online learning activities.

Results of students' perceptions on how technology can be used as a teacher tool were also largely significant. Students reported an increase in their ability to use a word processor to develop learning tools; search the Internet for lesson plans and information to aid teaching; use listservs, bulletin boards, use IEP generators; use word processors to create IEPs; and use portfolio software. There was nonsignificant gain in using utility programs, using databases or spreadsheets, using email, conducting regular backups of data, and transferring files between computers. Initial mean scores for utilities and using email were high, so students felt they already knew how to do these. The remaining areas were skills for which the students reported little gain.

Results of students' perceptions of improvement in their ability to develop a technology plan were all significant, indicating that students felt they were better prepared to create a technology plan. These areas included identifying goals for using technology in education, identifying how technology could be implemented in the curriculum, planning appropriate classroom changes, ensuring equitable access, creating guidelines for technology use, developing a budget, determining funding, and writing grants to obtain technology.

Finally, survey results measured students' perceptions in their ability to disseminate their technology expertise. The skills measuring this area were all significant with the exception of one, making presentations about technology. They did feel that they made significant gains in their ability to maintain a file of information on technology, provide consultation to colleagues and parents, and prepare written reports on technology.

To summarize the results of the survey on integrating technology in education students seem to indicate that while their hands-on technology skills did not increase in all areas, they felt that they increased their knowledge of effective planning and integration of technology into the classroom in most areas. Like the findings of the initial study by ISTE, the students gained in these areas when they were provided technology instruction in an integrated fashion.

Future research should explore other methods for training teachers to use technology. Since the Beilfeldt findings indicated that strong technology-using teacher education institutions provide a class for skills, this should be a focus of future research. Since these students did not report significant gains in all the computer operation skills on the survey, the Technology in Education class might be offered as a separate class, allowing for more time to make students comfortable with their laptops. These findings could be compared with the integrated method used in this study. This research could help identify which method is most effective at training teachers to use technology.

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Faculty Use of WebCT: Impact of P3T3 Faculty Development Initiatives

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Abstract: A study conducted within the School of Education, Purdue University, explored how a PT3 implementation grant project helped the faculty integrate the use of WebCT in their teaching. Data for this study were collected using both quantitative and qualitative approaches. An online survey was conducted. In-depth interviews were conducted with 3 faculty members who had attended WebCT workshops and were using WebCT in their courses. The results indicated that the overall rating of support services to the faculty was high. However, the faculty suggested changing: 1) the structure of the workshops to facilitate learning of WebCT, and 2) the quality and timing of the assistance that the P3T3 staff provides.

Introduction

The implementation of educational technology has been closely linked to the evolution of faculty development (Shapiro & Cartwright, 1998). Previous research (Dusick, 1998; Matthew, Parker & Wilkinson, 1998; Quick, 1999) has indicated that training and support are two significant factors in helping faculty to effectively integrate technology into the classroom. A major goal of P3T3: Purdue Program for Preparing Tomorrow's Teachers to use Technology, a PT3 implementation grant project, is to prepare teacher education faculty to teach pre-service teachers in technology-rich environments, modeling approaches that future teachers should use themselves. To achieve this goal, P3T3 provides activities and extended support for faculty members. These include: 1) workshops on various technology topics, 2) help sessions, and 3) one-on-one faculty assistance on technology integration. For more information about P3T3, please visit our website at: http://p3t3.soe.purdue.edu.

WebCT is a web-based course development and management tool that allows faculty to construct and manage online courses, put materials online to supplement existing courses, create online communication environments, and keep track of students' performance electronically. It is the "standard" platform for web-based courses and course support at Purdue University. To help faculty master the tool, P3T3 offers three workshops that provide step-by-step guidance for course design using functions available in WebCT. In addition, the P3T3 staff provides assistance for those who have difficulty when using it.

Study on the P3T3 Project WebCT

This study collected both quantitative and qualitative data. An online survey was conducted to obtain general information about faculty use of WebCT. Twenty-two faculty members from the School of Education participated in the survey. Results showed that 77% of the participants had attended P3T3 workshops on WebCT. All participants incorporated WebCT into their teaching. Most (59%) used WebCT for basic content presentation such as putting course notes, syllabi, and assignments online. Many (41%) posted and organized students' grades and used the quizzes/survey feature. WebCT e-mail (71%) and discussion forums (82%) were among the most popular features. Few faculty members had experimented with the WebCT live chat feature. Among those who attended the workshops, 25% continued to seek help from the P3T3 drop-in help sessions, and 63% had requested one-on-one assistance. Besides the help from P3T3 staff, several faculty members had sought assistance from elsewhere, such as personal help from friends and peers, and help from various centers around the university. Overall, participants rated the services from P3T3 high: 50% great, 25% good, 6% ok, and 19% no opinion.

In-depth interviews were conducted with three faculty members who had attended WebCT workshops and were using WebCT to get more details regarding P3T3 project impact on faculty use of WebCT. In general, faculty members liked WebCT because it helped them better organize course materials for students. All three faculty members mentioned that, because of the features available in WebCT, they could conveniently make all course materials available in one place. Although all three liked WebCT, they thought the interface was not intuitive. Two interviewees found the P3T3 workshops very helpful in getting started with WebCT. However, one felt that they went by too quickly; he recommended they be restructured to accommodate less experienced users. Two faculty members had attended a P3T3 help session as well as requested one-on-one help available during the semester. One commented that the help sessions and the one-on-one assistance were very helpful. He added that he learned more from the personal help sessions than from the workshops. Another faculty member who had also requested help from the P3T3 staff commented that it was somewhat inconvenient to go for help to get answers to minor questions. Since the P3T3 project is not dedicated to WebCT support, the staff does not always know the answers to the questions. Therefore, this faculty member found it was quicker to go to the campus support group that dealt exclusively with WebCT. The one faculty who had never requested help from P3T3 explained that he didn't know much about the assistance available from P3T3 and had received support through the campus center instead.

WebCT is one tool that the P3T3 team supports. This study uncovered both positives and negatives. Overall, P3T3 faculty services are rated highly. However, there are concerns to address. The two major ones are: 1) structuring the WebCT workshops to facilitate faculty learning of the program and 2) providing quality and timely assistance. In brief, the workshops should be more hands-on and learner-centered with mastery of one topic before moving on to the next. Staff assistance should be promptly supplied by knowledgeable personnel.

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Results after two years of a Preparing Teachers for the Digital Age (PT3) Grant on a State University Teacher Preparation Program.

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Introduction Three Pennsylvania state universities (Indiana, Clarion and Edinboro) successfully obtained a 1.73 million PT3 grant. We developed a plan to infuse technology into teacher education programs. We will present the first and second year results of this project for the fall and spring semesters for Indiana University of Pennsylvania faculty, students and course syllabi.

Sample The sample sizes are: 1999 Fall - 20 faculty, 571 students, and 13 course syllabi; 2000 Fall - 9 faculty, 566 students, and 10 course syllabi; 2000 Spring - 29 faculty, 837 students, and 20 course syllabi; and 2001 Spring - 25 faculty, 653 students, and 25 course syllabi.

Areas to be Assessed The areas of activity by pre-service students and faculty to be assessed using surveys include knowledge, attitudes, application, and integration. Knowledge represents what one knows and can do with respect to the use of technology in the classroom. Attitudes indicates how one feels about the use of technology in the college classroom. Application involves the ability to demonstrate the use of technology both in the college classrooms. Finally, integration requires the use various technologies alone and together in achieving the goals of the lesson plan for the college. We also collected a syllabus from most courses. Specific questions included: 1. Operating Systems Management (e.g. Windows, Macs), 2. Word Processing (e.g. Microsoft Word, Word Perfect, Claris), 3. Spread Sheets (e.g. Microsoft Excel), 4. Web Browsers (e.g. Internet Explorer, Netscape) 5. E-mail (e.g. Microsoft Outlook, Netscape, Eudora), 6. E-mail Distribution Lists (e.g. Microsoft Outlook, Eudora), 7. Presentation Software (e.g. PowerPoint, QuickTake), 8. Databases (e.g. Microsoft Access, Clasisworks), 9. Multi-Media Packages (e.g. CD Rom programs), 10. Video Conferencing, 11. Moderated Chat Rooms, 12. Internet in Teaching (e.g. Web CT, Course Info, Blackboard), 13. Digital Camera, 14. Laser Disc Player, 15. Scanner, 16. WWW/Internet Resources, 17. Computer Aided Graphics, 18. Ethical and Legal Issues (e.g. Copyright, Privacy) [2000 Fall and 2001 Spring only], and 19. Social and Human Issues (e.g. Empower Diverse Learners) [2000 Fall and 2001 Spring only].

Demographic Data Collection Demographic data were collected from pre-service teachers and faculty who teach relevant education courses. This included age, sex, year in school, number of credits, overall grade point average, major courses grade point average, socio-economic background, resident status, major, data available at admission to college, and other relevant information.

Instruments We developed Faculty, Student, and Syllabus instruments to assess the nineteen areas. They will be included for review.

Data Collection Baseline survey data for faculty, students, and course syllabi were collected during the initial year of the project (1999 Fall and 2000 Spring). Follow-up data were collected from each cohort during the second year of the project (2000 Fall and 2001 Spring).

Goals, Objectives, and Evaluation Goal Overview: To infuse instructional technology more deeply into the teacher education curriculum in both education core courses and selected majors. Students will be taught technology and it will be modeled for them by faculty teaching in the college of education core curriculum. To evaluate this goal we analyzed survey data for each years' cohorts and over time, i.e. baseline data for the year one cohorts and follow-up data for year two for the same yearly cohorts.

Goal - Objective 1: Train faculty to effectively and appropriately use and teach the key competency skills. This objective was evaluated by basic record keeping of attendance by faculty at workshops.

Goal - Objective 2: Have university faculty model how to teach effectively with technology in education core courses and elementary education/subject area courses. The collection, collation, and analysis of faculty surveys and student surveys for the same courses over time allowed us to evaluate this objective.

Goal - Objective 3: Create assignments within education core and subject area courses based upon the appropriate use of the technology areas. Pre-service teacher and faculty survey sub-scale data were used for this objective.

Goal - Objective 4: Revise course syllabi to reflect and recognize the integration of technology into the curriculum. Analysis of syllabi were used for this objective.

Results A brief summary of results by Objective will be presented.

Objective 1: The number of faculty attending various types of workshops will be presented for each year.

Objective 2: 1999 Fall Baseline Results - A comparison among **faculty and students** suggests that faculty and students are not in agreement with respect to how often technology is demonstrated in courses. For sixteen (16) areas the faculty ratings were higher than the student ratings and in one (1) areas the student ratings were higher. 2000 Fall Follow Up Results - 2000 Fall data when compared to 1999 Fall show that for **faculty,** meaningful decreases (effect sizes of .30 or larger in absolute size) occurred in all areas, whereas for **students,** no meaningful changes occurred. 2000 Spring Baseline Results - A comparison among **faculty and students** suggests that faculty and students are not in agreement with respect to how often technology is demonstrated in courses. For sixteen (16) areas the faculty ratings were higher than the student ratings and in one (1) areas the student ratings were higher. 2001 Spring Follow Up Results - 2000 Spring data when compared to 2001 Spring show that for **faculty,** meaningful increases (effect sizes of .30 or larger in absolute size) occurred in " 6. E-mail Distribution Lists (e.g. Microsoft Outlook, Eudora)" Effect Size (ES) = .31; "11. Moderated Chat Rooms" ES = .85; "12. Internet in Teaching (e.g. Web CT, Course Info, Blackboard)" ES = .43; and "15. Scanner" ES = .34, whereas, meaningful decreases occurred in "10. Video Conferencing" ES = -.39 and "14. Laser Disc Player" ES = -.30. For **students,** meaningful increases occurred in " 4. Web Browsers (e.g. Internet Explorer, Netscape)" ES = .47, " 5. E-mail (e.g. Microsoft Outlook, Netscape, Eudora)" ES = .39, " 7. Presentation Software (e.g. PowerPoint, QuickTake)" ES = .36, and "16. WWW/Internet Resources" ES = .39.

Objective 3: 1999 Fall Baseline Results - A comparison among **faculty and students** suggests that faculty and students are not in agreement with respect to how often assignments based upon appropriate use technology are created in courses. 2000 Fall Follow up Results - 2000 Fall data when compared to 1999 Fall show that for **faculty,** meaningful decreases (effect sizes of .30 or larger in absolute size) occurred in all areas, whereas for **students,** one meaningful increase occurred in " 1. Operating Systems Management (e.g. Windows, Macs)" ES = .30. 2000 Baseline Results - A comparison among **faculty and students** suggests that faculty and students are not in agreement with respect to how often assignments based upon appropriate use technology are created in courses. For sixteen (16) areas the faculty ratings were higher than the student ratings and in one (1) areas the student ratings were higher. 2001 Spring Follow up Results - 2001 Spring data when compared to 2000 Spring show that for **faculty,** meaningful increases (effect sizes of .30 or larger in absolute size) occurred in" 6. E-mail Distribution Lists (e.g. Microsoft Outlook, Eudora)" ES = .48, "11. Moderated Chat Rooms" ES = .85, and "17. Computer Aided Graphics" ES = .35, whereas, meaningful decreases occurred in " 2. Word Processing (e.g. Microsoft Word, Word Perfect, Claris)" ES = -.40, " 8. Databases (e.g. Microsoft Access, Clasisworks)" ES = -.54, and "14. Laser Disc Player" ES = -.30. For **students,** meaningful increase occurred in " 2. Word Processing (e.g. Microsoft Word, Word Perfect, Claris)" ES = .32, " 4. Web Browsers (e.g. Internet Explorer, Netscape)" ES = .45, " 5. E-mail (e.g. Microsoft Outlook, Netscape, Eudora)" ES = .33, " 7. Presentation Software (e.g. PowerPoint, QuickTake)" ES = .35, and "16. WWW/Internet Resources" ES = .46.

Objective 4 - 1999 Fall Baseline Results - A comparison among **faculty, students, and the syllabus** suggests that faculty and students are not in agreement with respect to what is in course syllabi. 2000 Fall Follow up Results - 2000 Fall data when compared to 1999 Fall show that for **faculty,** meaningful increases (effect sizes of .30 or larger in absolute size) occurred in " 4. Web Browsers (e.g. Internet Explorer, Netscape)" ES = .40 with all other showing decreases except for " 1. Operating Systems Management (e.g. Windows, Macs)". For **students** meaningful increases occurred in " 1. Operating Systems Management (e.g. Windows, Macs)" ES = .36, " 2. Word Processing (e.g. Microsoft Word, Word Perfect, Claris)" ES = .36, " 4. Web Browsers (e.g. Internet Explorer, Netscape)" ES = .39, and "16. WWW/Internet Resources" ES = .37. 2000 Spring Baseline Results - A comparison among **faculty, students, and the syllabus** suggests that faculty and students are not in agreement with respect to what is in course syllabi. For fourteen (14) areas the faculty percentage was equal to or higher than the student percentage and in three (3) areas the student percentage was higher. For fourteen (14) areas the syllabus ratings were equal to or lower than the faculty or student ratings. 2001 Spring Follow up Results - 2001 Spring data when compared to 2000 Spring show that in the **syllabus,** meaningful increases (effect sizes of .30 or larger in absolute size) occurred in " 1. Operating Systems Management (e.g. Windows, Macs)" ES = .49, " 2. Word Processing (e.g. Microsoft Word, Word Perfect, Claris)" ES = 1.60, " 4. Web Browsers (e.g. Internet Explorer, Netscape)" ES = .89, " 5. E-mail (e.g. Microsoft Outlook, Netscape, Eudora)" ES = .98, " 7. Presentation Software (e.g. PowerPoint, QuickTake)" ES = .49, and "16. WWW/Internet Resources" ES = .35.

Discussion All of the above will be discussed and various theories put forward to explain why things happened this way.

Assessing of the ISTE NETS for Teachers

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Abstract: Learn about performance-based strategies for demonstrating achievement of the ISTE NETS for Teachers, including web-based basic skills assessments, performance tasks, electronic portfolios, and observation tools. Preview a new publication from ISTE that provides a Framework for Assessing the NETS-T.

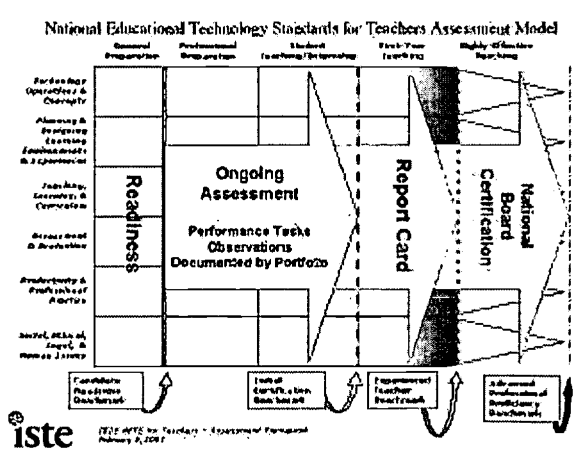
Background

This paper will cover the process that has been conducted to develop an assessment system covering the ISTE NETS for Teachers. Following that description, the Assessment Component of ISTE's 2001 PT3 Knowledge Development Catalyst Grant will be described, entitled the STATE project (Supporting Technology and Assessment in Teacher Education).

The NETS for Teachers Project held a focused Assessment Writing Meeting in Tempe, AZ in December, 2000. Through an exhaustive selection process, an elite group of educators from across the nation were selected to thoughtfully examine the issues of assessment and technology. The contributing team members included teachers, technology coordinators, administrators, teacher educations, college of education administrators, and professionals from the assessment community. Four subcommittees were formed, each of which worked on different strategies to assess the National Educational Technology Standards for Teachers. The areas of focus for each subcommittee and their tasks were:

- -General Preparation – Listed specifications for the assessments meeting the tasks described in the profile;
- -Performance Assessment Tasks and Rubrics – Developed a meta-rubric to address the Professional Preparation and Student Teaching/Internship Profiles
- -Electronic Portfolio – Outlined the process and content for development of an electronic portfolio for the Professional Preparation and Student Teaching/Internship Profiles with links to the First Year Teacher Profile, and
- -Observation and survey Tools - Identified a series of options to address the Student Teaching/Internship and First Teacher Profiles.

The outcomes of the Assessment Writing Meeting contribute to the basis of this presentation. Additional specific products and ideas from the meeting will be found in later ISTE publications. ISTE has based the NETS for Teachers Assessment Model on NCATE's Specialty Areas Studies Board (February, 2000) Principles For Performance-Based Assessment Systems in Professional Education Programs. The NETS for Teachers project used the following diagram as a framework for the Assessment System to address the attainment of these standards.



The rows going across the chart represent the six individual standards, the columns represent the four profiles identified as phases in a teacher preparation program, and the boxes in the chart represent individual standards within each profile. At least three benchmarks were identified for which assessments were considered:

- **Candidate Readiness Benchmark**: at the end of the General Preparation, or at entry into the Teacher Education Program (the "solid" line). At that point, the teacher education program needs to determine the readiness of the teacher candidate to have the technology skills to be successful in both Methods and Student Teaching.

- **Initial Certification Benchmark**: at the end of the Student Teaching/Internship and graduation from a Teacher Preparation Program (the dashed line). At that point, the program needs to determine the readiness of the graduates from a teacher education program to be successful using technology in the classroom.

- **Experienced Teacher Benchmark**: at the end of the First Year of Teaching, when Schools of Education may need to prepare a USDOE Report Card on their graduates (Higher Education Act. Title II, Section 207) (the dotted line). At that point, ISTE defines the professional proficiency with technology of all experienced teachers.

- **Advanced Professional Proficiency Benchmark**: In the future, ISTE will be working with the National Board for Professional Teaching Standards to develop an advanced certificate to recognize those highly effective teachers who integrate technology into their classrooms and who provide models for others to emulate.

PT3 Knowledge Development Catalyst Grant.

ISTE's PT3 Catalyst grant will address the first two benchmarks, because they are within the direct control of teacher education programs and consistent with PT3 funding. The last two benchmarks will be addressed at a later time. The STATE project will use both traditional hands-on workshops and distance learning strategies to deliver the training on technology-supported assessment strategies. Dr. Helen Barrett has already provided traditional, face-to-face workshops on Electronic Portfolio Development for PT3 grantees at Montana State University-Northern, Iowa State University, University of Central Florida, and National-Louis University. She has also provided distance-delivered workshops for PT3 grantees Clarion University and Indiana University of Pennsylvania, using a combination of video tape, CD-ROM, live CUSeeMe videoconferencing, and telephone conferencing.

Specifications for the assessments of the General Preparation Profile (1st Profile)

Colleges of Education are at a crossroads in determining how to assess prospective teachers' knowledge and skills in use of technology prior to admission into the core program. Universities are asking for a set of tools to select from to assist them in determining whether or not a student has sufficient technology skills and knowledge to enter into the teacher preparation program. This assessment should determine if a prospective teacher has the prerequisite skills to participate in and eventually facilitate learning activities for students that focus on the teaching and learning with technology. It is not expected that there is one solution to assessing this profile. Rather, this group examined both commercial and non-commercial options and described ideal options that currently do not exist. In addition to the quality factor, important issues the group considered were scalability, economics, and equity of student access. The specifications developed with accompanying examples and narrative should provide guidance to Colleges of Education in making a decision that fits their unique circumstances.

Through a partnership with several assessment developers, this project will partially cover the development of an on-line assessment that will be made available to SCDEs at a no cost (for students taking a "practice test") or at very nominal cost once the assessment is validated, to provide a much-needed tool to assist with determining readiness for using technology in Teacher Education programs, as well as access to a system for remediation of basic technology skills.

Performance Assessment Tasks and Rubrics to address the 2nd and 3rd Profiles

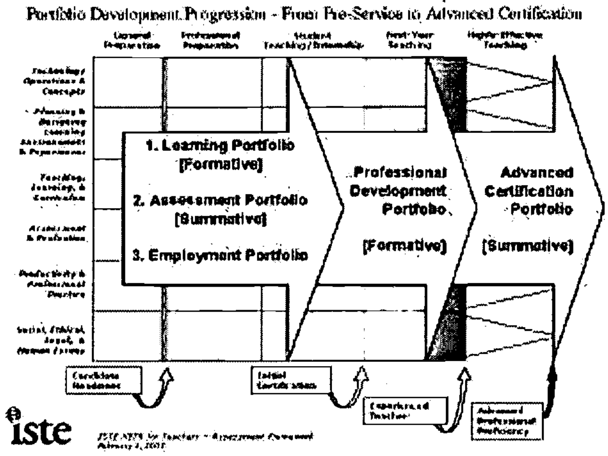
Another group in the Writing Team Meeting addressed performance assessments that may be used in an exam setting, or as part of the on-going assessment in a course and/or at the end of a program of study that may form the contents/artifacts for a portfolio or as part of an overall assessment of prospective teachers' competence in meeting the standards. The group took into account the variety of types of teacher preparation programs and the various settings in which they occur. This writing team developed a sample rubric that could be used to assess the attainment of these standards. A variety of performance assessments need to be gathered as part of this project, and will be published by ISTE in an online Clearinghouse on Electronic Portfolio and Performance Assessment.

The NETS Leadership Team has developed preliminary rubrics to assess the NETS for Teachers. These standards will be shared with the group at the conference, to get a first round of feedback on the content. There will also be an opportunity to give feedback online through the ISTE NETS website.

Electronic Portfolios and rubrics for 2nd and 3rd Profiles with links to the 4th Profile

The task of that Writing Team was to define the purpose, audience, process, and various development strategies for using technology to maintain authentic samples of a prospective teacher's work, demonstrating achievement of not only the ISTE NETS-T Standards, but also the School of Education's teaching standards and any other standards that the student is responsible for demonstrating. The purpose of the electronic portfolio is to demonstrate the prospective teacher's growth and change over time, and will provide the ideal container to organize and document the various performance assessments that demonstrate achievement of the standards. This team described development strategies using a variety of software tools; possible contents of the portfolio and suggested table of contents; strategies for assessing these portfolios; strategies for scalability, or how to manage the assessment process with large numbers of students in a Teacher Education program. Suggestions were also made on how to extend the use of the portfolio that is developed at the end of the 3rd Profile, into the first year of teaching as a tool for professional development throughout the teacher's professional career, possibly preparing for the National Board for the Professional Teaching Standards.

Portfolio Development Progression - From Pre-Service to Advanced Certification



The diagram above represents an adaptation of the Assessment Model to address the progression of the teacher candidate's electronic portfolio through the stages of the Teacher Education program into the classroom teaching experience and on to advanced certification, possibly through the National Board for Professional Teaching Standards. Students are encouraged to become a "digital packrat" from the beginning of the program. A student will create three types of portfolios. At first, the portfolio is a collection of products that the teacher candidate has produced in their coursework (formative). By the end of the Student Teaching program, the portfolio could be used for more summative assessment, to demonstrate achievement of any group of standards (i.e., NETS, INTASC). The teacher candidate can transform their portfolio into the format and content suitable to facilitate their seeking employment. Once in the teaching profession, the portfolio becomes a learning tool again, where teachers can document their work and samples of their own students' work. During the course of a teacher's career, the portfolio can be used for performance assessment, based on appropriate teaching standards. Finally, after years of classroom experience, the collection could be transformed back into a summative portfolio for National Board Certification.

The Electronic Portfolio Development team at the ISTE NETS Assessment Meeting developed a list of artifacts that could be included in an electronic portfolio to demonstrate achievement of the ISTE NETS for Teachers. In addition to artifacts that a teacher candidate may choose, the team also identified six required entries for the portfolio that demonstrate the appropriate standards. The writing team also adapted a generic "meta-rubric" to assess the electronic portfolio designed through this process.

Several major activities under the second goal of this project will be to provide training and technical assistance to SCDEs on the implementation of electronic portfolios to document the professional growth of teacher candidates, and will begin with training teacher education faculty members to create their own electronic teaching portfolios. The facilitator of this writing team, Dr. Helen Barrett, co-PI of this project, has done innovative work on electronic portfolios, and is a nationally recognized leader in this area. As Assessment Coordinator for the NETS project, she will coordinate the development and dissemination activities provided to SCDEs under this goal.

Observation and survey tools to address the 3rd and 4th Profiles:

Once prospective teachers move into their student teaching/internship experience, there is a need for classroom observation tools to assess appropriate uses of technology in the curriculum. Not only will this work assist with the assessment of prospective teachers by teacher education faculty and master/cooperating teachers, but also the instruments will potentially assist administrators as they assess the appropriate use of technology in the classroom. In addition to observational instruments, the use of survey information collected from students, parents, and other stakeholders, provides valuable data for assessing the impact of technology to support student learning. The writing team developed a series of observational assessment protocols that need to be field tested and validated before they can be made be available. This project will provide support for further refinement of the observational assessment protocols that were developed, so that they can be more widely disseminated to SCDEs. Dr, Doug Daniel, with ISTE's Assessment and Evaluation Department, will coordinate these efforts.

Preservice and Inservice Teachers Collaborating with Technology In K-8 Multicultural Classrooms: Year 2

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Abstract: While computers and other technology have become more ubiquitous in public school classrooms, teachers who have graduated from ASU west's College of Education have reported feeling a lack of confidence in their ability to use the technology to reach lesson objectives. Our research has revealed that although students were experiencing models of technology integration in their teacher education courses, they were not experiencing exemplary models of technology use with children in the classrooms in local schools where they were assigned for field experience. Through a federal grant, we have been addressing this issue. This study reports on our efforts to address lack of exemplary practica sites – although a program developed in collaboration with school district partners. Together, the mentor teacher and student intern attended workshops, learned technology applications, and designed

curricular units that incorporate the technology. Our evaluation of the Practicum Plus revealed that the program was effective in meeting the professional development goals. The preservice and inservice teacher pairs integrated technology into instructional Units of Practice (UOP) for culturally and linguistically diverse students in K-8 classrooms. Although the Practicum Plus program was found to be effective, the researchers also noted difficulties encountered in implementing the program on a broader scale.

Introduction

Preparing Tomorrow's Teachers to Use Technology (PT^3) staff, Arizona Classroom of Tomorrow Today (AZCOTT) teachers and education faculty at Arizona State University West are completing the second year of the Practicum Plus Program. The program provides technology professional development to K-8 preservice teachers and their mentor teachers. Preservice teachers are recruited from classes in the College of Education; mentor teachers are recruited from those local school districts in which preservice teachers complete their required internship experiences. The Practicum Plus Program prepares them to integrate appropriate technology into grade level curriculum. The inservice and preservice teachers experience the instructional applications of information technologies and learn to develop and implement an instructional Unit of Practice (UOP). Participants have opportunities to explore the integration of technology with multicultural and English as a second language instructional strategies so that they may provide maximized learning experiences which accommodate the rich cultural and linguistic diversity found in their classrooms.

The Practicum Plus Program, made possible through a PT^3 Grant, consists of collaborative, hands-on training in technology integration led by PT^3 staff, AZCOTT teachers and faculty in the Arizona State University West College of Education. The UOP is a framework for organizing content and embedding technology into teachers' classroom instruction. Components of the UOP bring into focus seven specific elements of instruction (i.e., Standards, Invitation, Situations, Interactions, Tasks, Tools, and Assessment) that align curriculum with developmentally appropriate standards across grade levels and content. Inclusion of State and national academic standards were a requisite part of the participants' UOPs. The *ESL Standards for Pre-K-12 Students* (TESOL, 1997) provides the framework for language activities that promote English language acquisition. The UOPs also incorporate Chisholm's (1998) six elements for technology integration in multicultural classrooms.

Diverse Populations and Technology

In 1998, 40 percent of the total school population in the United States were minorities (National Center for Education Statistics, 2000). By 2000 immigrants accounted for 8.6 million school-age children in our schools (Camarota, 2001). The number of school age children who spoke a language other than English and who had difficulty speaking English rose from 1.3 million in 1979 to to 2.4 million in 1995 (Federal Interagency Forum on Child and Family Statistics, 2000). American schools also serve children from a range of socio-economic backgrounds. In 1999, one in six children lived below the poverty line (Children's Defense Fund, 2000). Given that by 2006, half of all jobs in the United States will be in information technology or will require information technology skills (Carvin, 2000), it is imperative that this diversity of students have technology access and opportunities to use information technologies for authentic purposes involving problem solving and higher level thinking.

However, racial, ethnic and economic parameters determine children's access to technology. Households earning $50,000 to $75,000 are twice as likely to own a computer than those earning $10,000 to $14,000 (Nickell, 2001). Whereas 52 percent of White children use a computer at home, eighteen percent of Hispanic children do so (ERIC Clearinghouse on Urban Education, 2001). The proportion of rural Native American households with access to computers is nearly half that of the national average (Luening, 2000). Further, children from the poorest households and living with adults with the least schooling are least likely to have Internet access at home (Carvin, 2000, The Children's Partnership, 2000).

Though the number of computers at schools is increasing and school connectivity is rising, school access remains inequitable. Those with the largest concentration of children in poverty have a 9:1 ratio of students to computers as compared to the national school ratio of 5:1 (Cattagni & Westat, 2001). Sixty-eight percent of Hispanic children use a computer at school as compared to eighty-four percent of White students (ERIC Clearinghouse on Urban Education, 2001). Half of schools in the poorest communities report that students use the Internet (The Children's Partnership, 2001). And teachers in more affluent schools are more

likely than those in the poorest schools to assign computer-related and Internet work to their students (Rowand, 2000).

Research on English language learners (ELLs) suggests that integration of technology can augment positive self-concepts, promote English and native language proficiency, enhance motivation, stimulate positive attitudes towards learning, improve academic achievement, and foster higher level thinking skills (Diaz, 1984; Knox & Anderson-Inman, 2001; Meskill, Mossop & Bates, 1998; Soska, 1994.) Technology, in conjunction with the teachers' goals, purposes and epistemologies, allows students to take control of their own meaning-making and creates socially-mediated literacy activities that foster the development of language and thinking (Meskill, Mossop & Bates, 1998). When ELL students use technology in small groups, their verbal interactions enhance interpersonal and communication skills (Steinberg, 1992). Technology provides opportunities for cooperative learning which not only increase instructional effectiveness and efficiency, but also promote positive social interactions (Johnson, Johnson, & Stanne, 1986; Schlechter, 1990)

Technology-based activities can transform the classroom into a rich learning environment and prepare minority children for the technological world. While information technology has a potentially positive effect on ELLs, its presence in our schools is not sufficient. Teachers are central to the creation of a computer-supported learning environment that is learner-centered and motivating. Effective use of technology requires new teaching models where technology becomes an integral component. ELLs, often among the disenfranchised and the computer-destitute, need teachers who can effectively integrate information technologies and the Internet into the learning process. Withouot such teachers these children's exposure to technology remains limited and inequitable.

The Study

The investigators looked for answers to the following research questions. Question 1) How effective was the Practicum Plus program in preparing mentor teachers and their university practicum students to create a curriculum unit of practice in their K-8 classrooms? Question 2) How did mentor teachers and practicum students use the cohort listserve to support the community of learners? Question 3) To what extent have faculty participating in the Plus program learned to use and integrate technology in their subject area curricula and model the use of technology in their classes?

Method

Subjects

Participants (*43*) consisted of two groups, 19 university students who were in the semester prior to student teaching (12) or completing their professional education preparation program as student teachers (7); and 24 inservice teachers, 19 of which were supervising the participating interns/student teachers and 5 working on their own. The majority of students were in Elementary Education programs including Elementary, Bilingual, ESL, and Early Childhood Education.

Summer/Fall 2001

Emphasis of Course Section	Total Number of K-12 Teacher Participants
Elementary	31
ESL	7
Bilingual	5

As a result of suggestions from year one, recruitment for PLUS courses in year two included advertising earlier in the semester, presenting in student courses and at school faculty meetings, and early notification of PLUS course dates and locations.

Technology Questionnaire

A 42-item, Likert-scale questionnaire, which assessed teachers' beliefs and self-reported skill levels related to technology use and technology integration, was administered pre and post. (For a full description of

the questionnaire see Zambo, Buss, & Wetzel; 2001) The pretest was administered the first day of the workshops in the summer of 2001. The posttest was administered on the last day of the workshops in November/December of 2001.

Questionnaire items were developed to provide coherent sets, which formed subscales that could be more readily analyzed. Subscales completed by both inservice and preservice teachers were: 1) general confidence in using technology; 2) confidence in computer setup and general operation; 3) confidence in using non-computer equipment; 4) confidence with software selection and use; 5) confidence in addressing students with special needs; 6) confidence in developing lessons with technology; 7) beliefs about appropriate use of computers; 8) beliefs that computers are integral to classroom instruction; 9) beliefs about the cost effectiveness of computer integration; 10) knowledge about the technology standards; and 11) knowledge and beliefs about UOP.

Cronbach's alpha for the total test was .92. Individual subscale alphas ranged from .90 to .49 with a median of .79. The test overall was reliable. Mean pretest subscale scores for all subject combined ranged from 2.76 to 4.70 on a scale from 1 to 6 with 6 being the most positive. Mean posttest scores were generally higher and ranged from 3.46 to 5.28.

Repeat measures analysis revealed scores on 8 of the 11 subscales (1-6, 10-11) increased significantly ($p < .01$) from initial testing, prior to the workshop, to testing at the end of the semester. All eight subscales with significant gains were those related to confidence in, or knowledge of, various factors. This is a strong indication that the workshops were effective in increasing teachers' confidence and skills in those targeted areas.

The subscales that did NOT show significant increases were those related to beliefs (numbers 7, 8, & 9 from above). This is an indication that the students and teacher who participated in the workshops came with a predisposition in favor of educational technology. The workshops did not increase these factors that were already at high levels at the time of the pretest.

One-way Anova detected between-subjects differences for group (preservice teachers vs. inservice teachers) on one pretest subscale and on one different posttest subscale. On the pretest, preservice teachers scored higher than inservice teachers on the belief that computers were integral to instruction with means of 5.11 and 4.38, respectively [$F(1, 42) = 8.53, p < .006$]. This difference had dissipated and was not significant by the time of the posttest with means of 5.04 and 4.72 for preservice and inservice teachers.

On the posttest, preservice teachers were more confident in developing technology lessons than were inservice teachers with means of 5.12 and 4.50 respectively [$F(1, 42) = 5.86, p < .020$]. This difference was not significant on the pretest with means of 3.76 and 3.71 respectively. Although the confidence had increased for both groups, the increase was larger of the preservice teachers. This may be attributed to the fact that the majority of preservice teachers were also taking methods courses during the Fall semester, concurrent with workshop activities. Lesson planning is a major component of methods courses and most likely confounded the effects of the workshop.

Discussion Board

The five cohorts of the PLUS program participated in on-line discussions through an electronic course using Blackboard. The purpose of the discussion board was threefold:

- To provide the participants with skills of electronic communication,
- To encourage collegial sharing, and
- To create a community of learners who could interact beyond the time and place of the actual workshops.

Participants consistently used the discussion board to share teaching ideas and resources, for reflection and discussion of activities that occurred during the PLUS course time, to stay abreast of current events that had impact on their classrooms, to share information about websites, information about how to accomplish assignments, and to support each other on how to implement new information and technology applications into their classrooms.

Unit Of Practice

A rubric was used to evaluate and identify proficiency levels for each category of the UOP: Standards, Invitation, Situations, Interactions, Tasks, Tools, and Assessment. Each was evaluated on a scale of Accomplished, Developing, or Emerging (http://www/asu/pt[3]).

Results from analysis of the Unit of Practice generally agreed with the results from year 1. Participant's strengths were in the Invitations, Tasks, Interactions, and Situations components. Additionally there was an increase in percentage of participants achieving the *Accomplished* level in the standards components including the TESOL standards for English acquisition by bilingual and ESL teams.

Faculty Technology Use

During the past two years 13 tenured and tenure track ASUW faculty participated in the PLUS program. The faculty were surveyed to determine the extent to which they have modeled the use of technology in their classes with an open-ended survey item: Write a brief description of how you are using technology in your teaching to help our university preservice teachers incorporate technology in their work. Data was categorized and tabulated in these categories: technology for course structure, use of web resources, and student assignments using technology.

70% of the faculty reported using technology in their teaching. Uses clustered around five areas: faculty using technology to present information to the class such as semantic nets using Inspiration, PowerPoint or HyperStudio (67%); threaded student on-line discussions (44%); Blackboard assignments and discussion areas (22%); incorporation of web resources for readings, simulations and links to National Educational Technology Standards for Students and Teachers (http://cnets.iste.org) and State academic standards (22%); structured lessons requiring students to use technology in and out of class for graphing of data, multimedial book construction, digital portfolio, etc. (56%).

Discussion

In this model of teacher preparation, the preservice and inservice teachers participate in technology integration workshops together during the summer. In the semester following the training, the preservice student helps to implement the technology-rich unit created in the workshop. The researchers found that the mentor teachers and the preservice students appreciated the opportunity to work together prior to the practicum experience. In addition to the trust established between the pair, they also increased their knowledge of hardware and software and confidence in their ability to design and implement technology in the curriculum.

In comparison to the previous year, the units of practice created during the training were better designed and more complete. Further they included the TESOL standards which helped to meet the needs of second language learners in our urban schools.

Finally, the faculty who participated in the training also adapted many of the technology rich activities for their courses. Faculty use of technology was not the primary purpose of the Plus program, but the benefits for faculty were evident. For example, many of the faculty used the Unit of Practice format for lesson planning in their courses. Thus, students in their courses incorporated technology in each of the assignments involving lesson planning.

Although this model of professional development was found to be effective, the researchers noted that the implementation of the Plus program was difficult. For example, it was not easy to locate the mentor teacher to match with the student in the early summer, months before the practicum semester. Typically, the field placement office finalizes the matches just before the semester begins. Consequently, we recommend that universities contemplating the adoption of similar professional development models, consider this difficulty. If the problems involved with creating the mentor and student teacher pairs can be resolved, then this program model is promising.

Despite the extended efforts to advertise and recruit participants for the PLUS course, year two enrollment numbers were lower than year one. Several factors seemed to affect enrollment:

- ☆ Repeat participation by mentor teachers was low without financial or graduate credit incentives for teachers attending the course a second year while working with a new preservice teacher.
- ☆ Unstable school district environments, resulting from negotiations of teacher contracts and salary issues, hindered the mentor teachers' enthusiasm to participate in the program.
- ☆ Changes in district or school administration, teacher requested school changes, and new school openings hindered mentor teacher recruitment and placement with preservice teacher because location and/or grade level of teacher was uncertain.
- ☆ Students experienced conflicts with the PLUS course schedule and required program courses that they needed to complete during summer session.
- ☆ Mentor teachers who were required to attend district training or teach district summer school were also not able to attend due to scheduling conflicts.
- ☆ The preservice /mentor teacher pair was not established until after the PLUS courses had begun. Mentor and/or preservice teachers who might have attended, did not because they were uncertain if their counter part would be interested, or in the case of the mentor teacher, if they would actually receive a preservice teacher.

Year 2 results compared very favorably to year 1 in most aspects. It is apparent from the results, there was an overall increase in UOP development as regards the inclusion of appropriate standards and in technology integration and applications by all participants. Preservice teachers and mentor teachers used the discussion board effectively as a communication tool. Additionally, University faculty reported greater emphasis on inclusion of technology in their own teaching, providing further modeling of technology in classrooms. The only aspect of the workshops that did not compare favorably to year 1 was in recruitment of participants. This issue has been evaluated and is being addressed for year 3 planning. Plans include relocating the workshops sites to a central location at the ASUW campus, and offering a more flexible schedule in order to accommodate schedules of preservice and mentor teacher routines and responsibilities.

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Using Immersive 360 Degree Images to Enhance Active Involvement and Comprehension in the Learning Process

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Abstract: The purpose of this paper is to introduce three types of panoramic or 360° by 360° immersive images as a powerful, active learning tool to enhance understanding in a wide array of curriculum initiatives. The underlying principles of learner control and active engagement, plus the power of contextual cues immersed in an entire scene will be demonstrated. Participants will experience the learning potential of this technology by visiting and exploring an entire context through this medium. The process of creating and using these images for use in the classroom and web-based learning activities is described. Curriculum can be augmented by re-purposing available immersive images integrated into lessons. Examples showing the use of these images in standards-aligned science and social studies integrated thematic lessons will be presented.

Introduction

Computer technology offers the capability of presenting text in combination with photos, illustrations, charts, graphs, audio, video and animated representations to enrich comprehension. In addition to still and animated images, now 360-degree panoramic images can be presented on CD-ROM or the web. In a 360-degree format, students can explore an entire virtual environment as if they were at the actual site. The term for these images is *immersive*. Learners are in control and can move about at will within rooms, around historical monuments and landmarks using the mouse or other mouse emulators such as a tablet or track ball. The 360-degree panoramic images provide learners with rich contextual and relational cues. They can see and explore such wonders as the Great Wall of China or take a virtual trip to the Grand Canyon and study striations in the rock formations, or they can freely roam the virtual White House.

Teachers want their students to be able to experience these environments in a meaningful, constructive way, to gather and evaluate relevant information. Immersive images offer this opportunity. Teachers report that students become more interested in academic content after a real or virtual field trip that brings the subject matter to life and gives them a lifelike experience. Since most students have limited opportunity to visit important sites relevant to their lessons, immersive images fill an important need.

Originally, the term *virtual reality* (VR) was used to describe computer presentation of digital still images in a 360° panorama format. Typical virtual reality software allows users to develop their own virtual environments by "stitching together" a number of flat images in such a way that the computer can present them as a seamless 360 degree panoramic scenes or environments. These images are an improvement over "flat" digital still photographs. They provide more information in one image; thus the learner can focus on particular selected areas to explore.

A second type of immersive technology, called 360 One™, from Kaidan and EyeSee360 Inc (www.Kaidan.com), makes creating the 360° panoramic image easier. Only a single camera shot is required so there is no stitching together of flat images. Using a special parabolic lens attachment, digital camera and software, this optical system captures a complete 360° panoramic image. The resulting image is a complete 360° horizontal panorama with a 100° vertical field-of-view (50° above and 50° below the horizon). 360° panoramas with 100° vertical field-of-view is sufficient to see all of a scene except the floor and ceiling.

A third approach, even more comprehensive than the 360° by 100° panorama, is the spherical 360° by 360° immersive image. In this virtual environment, students can have a realistic visit that immerses them in the photographed scene and allows them to move about in the entire space. They can navigate in any direction, up-down, left-right, close and distant, along either the vertical or the horizontal plane and anywhere in between. Therefore, on a virtual visit to the Capitol Rotunda students can see the ceiling, the floor, the architecture and all of the paintings on the walls. Although the images are mere stills, students move around freely inside visual space that seems identical to video. They are fully immersed in the environment.

Development and Use of 360° by 360° Images

For educators, 360° by 360° technology offers maximum field of view within a single immersive image. Many learning environments have important information above and below the typical horizon. Now the full scene can be documented and presented. These spatial arenas are easy to use and navigate. Using such images requires active involvement by the student in order to explore, find, and zoom into the important visual content. Because they are made up of two standard JPEG images, immersive images are low memory (50 to 400 kilobytes) and faster to serve from the Web or use in presentations. These 360° by 360° immersive images are relatively easy to create and have been photographed and assembled by educators for the classroom as well as professional photographers for commercial uses.

Several types of virtual reality software support the development of 360° by 360° still images, usually by overlapping flat stills seaming them together. A newer technology has been developed by Internet Pictures (www.ipix.com) which allows the user to create 360° by 360° still images by combining two 180° digital still photographs. They can be used alone or in combination with other digital media such as audio or video. With the same amount of training required to use the other virtual reality development programs, teachers and students can develop this type of content. They take the two 180° digital still photographs and seam them together to create the 360° by 360° immersive sphere using iPIX software.

Creating the 360° by 360° image involves first taking two 180° photographs of the exact halves of the scene that will become the immersive image. A 180° fisheye lens on a digital camera is used to capture each hemisphere. A tripod with a special rotator cuff is used to control the exact angle of rotation of the camera to facilitate photographing the two halves precisely. The user simply takes the first 180° image then rotates the camera exactly 180° around to capture the other half of the scene. Nikon has developed a 185° fisheye lens that allows the user a little (ten degree) overlap at the seams so that when the halves are assembled in the computer, adjustments can be made for the best fit at the seams. The second part of the process is downloading the two 180° images to the computer to bring the images together. At this point any imperfections need to be removed with image editing software such as PhotoShop, Photo Elements or Paintbrush. The final step consists of bringing the two hemispheres together in a 360° by 360° spherical immersive scene. iPIX Wizard software is used to align the edges of the two halves, seam them together and remove or compensate for the minor distortion that occurs in this type of spherical image. QuickTime VR and an iPIX plug-in support the showing of these images on Macintosh and PC Platforms. The resulting immersive image can be viewed in any direction by moving a cursor inside the image or using the navigation bar.

Curriculum Applications

When immersive images are used as part of a curriculum they generate interest and provide a simulated experience of "actual reality." Students are actively engaged researchers. We use teacher generated and professionally developed 360° immersive images. We assemble the lesson components, including text, images and links within a web page, or embedded in a slide show program such as *PowerPoint*. An inquiry-based approach to learning sets the context and provides the initiative. The lesson begins by asking a good guiding question such as: "What are threats to independence?" As part of the lesson, students travel to distant or inaccessible places and explore the situation as a 360° virtual scene. They achieve a new awareness for the actual events, the locations, the times, and how they fit together. Simultaneously, they gather relevant information for the development of their projects. Curriculum examples showing the use of these images in standards-aligned science and social studies lessons will be presented and disseminated on our web site at www.sfsu.edu/~teachers.

Preparing Teachers to use Modeling and Visualization in Science and Mathematics

Lisa Bievenue, NCSA, University of Illinois, US
Sharon Derry, University of Wisconsin - Madison, US
Marcia Linn, University of California - Berkeley, US
Mary Ellen Verona, Maryland Virtual High School, US

This panel will report on the Workshop to Integrate Computer-based Modeling and Scientific Visualization into K-12 Teacher Education Programs (October, 2000). The National Science Foundation and the Department of Education's Preparing Tomorrow's Teachers to Use Technology (PT3) program co-funded this national meeting of educational researchers, teacher educators, teachers, and scientists to research and develop sustainable strategies to integrate computational modeling and scientific visualization within science and math teacher preparation programs nationwide.

Relation to National Technology and Science Education Standards

Modeling and visualization tools support several areas of the NETS technology standards, especially the sections on technology research tools and technology problem-solving and decision-making tools. Students can use the tools presented in this workshop to process data and report results, and to solve problems and make informed decisions. These tools also support the science curriculum standards, including using technology for scientific inquiry, especially analyzing alternative explanations and models. The AAAS Benchmark science standards also indicate the need for computer-based modeling. The benchmark common themes emphasize connections between seemingly disparate science content. In using and creating computer models, student attention can be focused on similar structures and behavior. For example, a predator prey interaction model and a physical spring model share the oscillation structure. Disruption and resumption of equilibrium can be found in both biological and earth systems. Assimilating an understanding of such structure and behavior leads to acquisition of the schemas of science content which have been shown to distinguish experts from novices. (Chandler, P. & Sweller, J. 1991. Cognitive load theory and the format of instruction, Cognition and Instruction, 8, 293-332.)

Outline of Panel

The Panelists will report on the following goals of the workshop:

- defining the needs and uses of computer-based modeling, scientific visualization tools, and computational methods in science education, and identifying the major barriers to their integration into classroom practice;
- examining and developing strategies for overcoming known barriers to transfer of advanced technology into school environments, including schools of education;
- identifying promising methods of integration into teacher education programs, especially addressing pedagogic models (scaffolding, student inquiry, assessment), professional development opportunities for faculty and strategies for providing faculty with time necessary to restructure courses;
- identifying how national partners can begin to build an infrastructure of technology and knowledge transfer to support those methods of integration; and
- establishing collaborative research relationships among teacher educators, K-12 teachers, scientists, learning scientists, and computational scientists to learn how these tools and methods can best be integrated into teacher education programs.

Qualifications of Presenters

The panelists are co-chairs of the Workshop to Integrate Computer-based Modeling and Scientific Visualization into K-12 Teacher Education Programs.

Lisa Bievenue is the K-12 lead for the EOT-PACI (Education, Outreach, and Training Partnership for Advanced Computational Infrastructure) and Education Program Coordinator at NCSA (National Center

for Supercomputing Applications). Her current research interests include systemic professional development programs to support the use of technology in the classroom, the development of technology tools to support constructivist learning, and web-based courses to support engaged and inquiry-based learning.

Sharon Derry is Professor of Educational Psychology at the University of Wisconsin-Madison. She graduated from the University of Illinois at Urbana-Champaign in 1982, receiving her PhD in Educational Psychology with specialties in both cognition and instruction and quantitative/evaluative methods. Derry is a team leader within the National Institute for Science Education and manages several curriculum and instructional technology projects that focus on individual and collaborative problem solving, critical thinking, literacy, and basic mathematics.

Marcia Linn is Professor of Education at UC Berkeley, Director of the campus-wide Instructional Technology Program, and a member of the AAAS Board. She co-directs the Visualization and Modeling theme team, leads the CILT postdoctoral program, and coordinates the involvement of Berkeley's Program in Education in Mathematics, Science, and Technology in the R&D and research training components of CILT. Her research interests include gender and science, the development of scientific understanding through a "scaffolded knowledge integration" framework for instruction and assessment, and innovative applications of Internet resources to improve science learning (KIE and WISE).

Mary Ellen Verona has been the project director of the Maryland Virtual High School (MVHS) since 1994, and is currently Principal Investigator of the MVHS CoreModels Project, funded by the NSF REPP program. She has taught science, mathematics and computer science on the k12 level for over fifteen years, most recently at the Montgomery Blair Mathematics, Science, and Computer Science Magnet Program. Currently ABD in the climate dynamics strand of the Computational Science and Informatics program at George Mason University, she has a bachelors degree in physics and masters degrees in computer science and mathematics education.

Consortium Building: The Northern Arizona University Teaching And Learning With Technology PT3 Project

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Abstract

Northern Arizona University's (NAU) PT3 Grant is a consortium of individuals from very unique organizations that provide specific expertise to handle the collaboration among all state colleges and universities, Arizona K-12 schools (AZ-K-12 Center), the Governor's Office, and the Arizona Department of Education. Building a consortium of this nature is, although extremely complex and challenging, tremendously important and rewarding in fulfilling the goals of the grant – especially in light of possible changing federal educational funding policies. Building and maintaining good working consortia is essential in the success of any project, but especially for PT3 projects. This paper describes the organizational structure and provides examples of how each party plays a pivotal role in the success of this PT3 endeavor.

PT3 Design

The NAU PT3 project is designed to support: a) the training of its education college faculty to model and teach the use of technology; b) the redesign of its teacher preparation curriculum to include technology integration; c) the redesign of its distance learning teacher preparation program for pre-service teachers in 34 remote sites to include on-site mentoring for integration of technology; d) the development of a culturally sensitive mentoring model for use with Arizona's minority students and teachers; and e) the development of a Technology Integration Best Practices Clearinghouse including electronic, print, video, and audio resources available to schools and colleges statewide. To do so, each component is led by a Principal Investigator with specialties in their specific area – Dr. P. Horn, director of The AZ-K12 Center provides organizational leadership, Dr. S. Markel, Associate Professor of Instructional Leadership provides leadership in the redesign of education methods curriculum, Dr. A. Batchelder, Associate Professor of Instructional Leadership will coordinate the design and implementation of a school-based technology integration mentoring model piloted with pre-service teachers on the Navajo Reservation, and Dr. J. M. Blocher, Assistant Professor of Educational Technology provides leadership for technology integration and faculty support throughout the project.

Roles

Although this PT3 project, like many others, is designed to provide faculty and cooperating teacher workshops, the primary focus for the NAU PT3 project is to provide support for and collaboration between education methods faculty in the redesign of the teacher preparation curriculum to include technology integration and thereby model and teach the use of technology. Faculty are supported in a variety of ways. Most importantly they are supported with the help of a technology liaison. The role of the technology liaison is to coordinate and communicate pedagogical needs of the individual faculty to the project instructional designer who will help in the re-design, development and implementation of technology-supported curriculum. Furthermore, the technology liaison will work closely with the faculty and the instructional designer in making suggestions and the development of online media and instructional systems that will support both campus-based and distance delivered courses. Together the technology

liaison and instructional designer form a knowledgeable team that design and develop pedagogically sound technology integration solutions.

Probably the most unique organization and role is that of the AZ-K-12 Center because of its distinctive mission to improve the quality of K-12 teaching and learning in Arizona classrooms. On its inception, Governor Jane Dee Hull called for the creation of the Center and through the state of Arizona committed $2 Million to support training and re-tooling of teacher skills based on best practices. As part of their mission, the AZ-K12 Center provides a clearinghouse that fosters communication and shares knowledge and information throughout the state. However, one of the most unique roles the Center plays is to build consortia between state governing and funding entities and other Arizona universities in their efforts of preparing future teachers. In this pivotal role, Dr. Horn acts as a liaison between a variety of state decision makers. For example, Dr. Horn meets regularly with the state's law makers, including the Arizona State Superintendent of Schools, and has other collaborative projects with universities and colleges such as: Northern Arizona University, Arizona State University, Arizona State University West, Grand Canyon College, Central Arizona College, to mention a few.

Northern Arizona University also has a unique role in that its mission is to provide educational opportunities to rural and underserved populations within the state. For example, many of the students are located in vastly remote areas, and access to course work is often delivered to remote sites via Instructional TV courses, Web-based courses or even site based. This presents challenges for cooperating teachers trying to integrate technology where support and training can often be limited. To address these issues, an alliance has been established between Educational Technology and the Instructional Leadership to provide technology training and support along with mentor training and support for the cooperating teachers. Through both on-campus workshops and site-based visits, cooperating teachers receive mentor *and* technology training to be supported in their expansion of modeling technology integration for their student teachers. For example, Dr. Markel provides expertise and leadership with the methods faculty. Dr. Batchelder provides expertise and will provide training on building good mentors. Dr. Blocher provides expertise and leadership in the area of Educational Technology, support for faculty, and supervision for the additional technology support personnel – the technology liaison and instructional designer. All members are working closely together to design training and support materials for both the campus-based methods faculty and cooperating teachers of our students. With these two foci, the students of our pre-service teacher preparation program are provided good models of technology integration while taking course work as well as while they student teach.

Evaluation: Challenges in Measuring a Moving Target

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Abstract: Learning Through CyberApprenticeship (LTCA) is a PT3 *implementation* grant conceptualized as a forum for connecting preservice teachers with veterans in the field. Federal funds allowed for establishment of a system through which preservice teachers could work directly with technologically skilled teachers (TMTs) to create projects for immediate classroom use. But more interesting evaluatively is the metamorphosis of the course preservice teachers must complete to earn their Level 1 (preliminary) credential. Through comprehensive and well-structured evaluation – and our own willingness to change course as circumstances dictate – we have been able to capture students' pedagogical growth (rather than their "skill" with isolated features and functions), camaraderie among the instructional team, and attitudinal changes that portend how teachers may use technology to meet the many mandates for which they're increasingly held accountable.

Learning Through CyberApprenticeship (or LTCA) was conceptualized as a forum for connecting preservice teachers with veterans in the field. Federal funds allowed for establishment of a system through which preservice teachers could work directly with technologically skilled teachers (TMTs) in the field to create proje cts for immediate classroom use. The process itself is relative straightforward. Project ideas are generated at the start of each semester, during one or more colloquia to which TMTs and education faculty (methods instructors as well as disciplinary specialists) are invited. All projects adhere to multiple criteria sets, ensuring that student experiences are relatively equivalent and that grading or scoring is as equitable as possible.

Projects are showcased at the close of each semester and may include activities, lessons, or larger units. Exemplary projects become part of a online library (see, for example: http://edweb.sdsu.edu/ltca/spg01projects.htm) for electronic distribution … "tracked" via a sophisticated management system.

In point of fact, however, much of our effort has gone into ongoing revision of the one-semester course preservice teachers must complete prior to their earning a preliminary (or Level 1) California teaching credential (http://edweb.sdsu.edu/Courses/EDTEC470/). The State's position is that teachers must come to the classroom with basic technology proficiencies/competence.

EdTec 470 is taught by several instructors (both adjunct and tenured or tenure-track) and in several configurations. It's structured to be responsive to changes in State requirements … and to be flexibly presented. [In other words, modules do not have to be taught in a prescribed order; they're designed to stand alone.]

Our SITE 2001 session focused on the overarching "gaps" the project aims to remedy, and they're important to note once again:

- Placement and modeling
- Integration
- More ideas than time
- Breadth of experience
- Authenticity
- Practicing what we preach

These gaps clearly inform the project's several overarching outcomes:

- Design/use of an apprenticeship model
- Design of a management system
- Establishment of an online library of exemplary teaching materials
- Twice-yearly colloquia to open lines of communication
- Twice-year showcases to highlight accomplishments
- Refinement of a curricular system

But as the project reaches maturity, it's critical to share our lessons learned – many of them with broad applicability to other technology infusion efforts planned or in place.

The first centers on evaluation, and the many benefits of a comprehensive framework to guide ongoing data gathering and analysis. Our efforts are multifaceted and increasingly attend far more to pedagogical growth (and camaraderie among the instructional team) than to students' "skills" or "abilities" with isolated features and functions. Among our core data collection strategies are:

- Pre/post student surveys (deployed online; see, http://www.zoomerang.com/recipient/survey-intro.zgi?ID=5D8XYMQTQC6L&store=1)
- Limited class observation
- Review of extant data (websites, email/listserv exchanges)
- An instructor survey (see, http://www.zoomerang.com/recipient/survey.zgi?ID=V0T4EA1Q5X4G&store=1)
- Attendance at major project events

Our evaluation design (a hybrid undergirded by Stufflebeam's four-dimensional CIPP framework but supplemented by elements of the Concerns Based Adoption Model) attends to specific project goals as well as to the several GPRA indicators with which the project aligns. Our techniques are innovative – and an extension of evaluation efforts with which we've been associated in the past (Innovation Challenge Grants, Literacy Challenge Grants, Digital High School Initiative).

The second focuses on the challenges (posed as reflective questions) we ... and likely all PT3 evaluators ... face:

- Who does the project really serve?
- Who are our core stakeholders? Who are our core constituents?
- What are we trying to accomplish?
- Are we simply replacing "old" ways with "new" ones? Are we modeling the benefits of adaptability and flexibility?
- Are we focused on skills or competence? To what extent are we interested in pedagogical impact?
- What are the complexities of measuring long- v. short-term change?

Specific challenges facing evaluators include the following:

Challenges related to the proposals themselves. Program goals and outcomes that "wowed" reviewers just a short while ago were (perhaps) overly focused on isolated skills and proficiencies. But as evaluators, we feel considerable pressure to continue/follow through with our original designs – many of them structured to measure growth or change in such areas as: the *ability to identify and select* hardware features and software functions or the *amount* or *proportion* of time students spend using technology. The zeal to be faithful to evaluative tasks comes with a price, the most serious of which is missed opportunities to critically examine the real (and often subtle) innovations that spell real project success.

Terminology challenges. As evaluators with short- and long-term deliverables, we're constantly wrestling with definitional AND interpretive differences with such 'basic' words as pedagogy, competence, and technology.

Challenges that derive from orientation. Are evaluators thinking strategically when assessing the pedagogical implications (strengths, weaknesses, and impacts) of their projects, or is the view tactical only? *Do we really have a clear picture of educational reform?*

As important, are we as evaluators too process (rather than policy) oriented? *Do we really understand our mission?* Are evaluators overly willing to fall back on traditional evaluation "models" (frameworks, approaches, orientations) and study designs?

Implementation Strategies for PT3 Grant

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We are pleased to submit a proposal to SITE because of our continued commitment to the improvement of technology integration in teaching and learning, a goal of our PT3 Implementation Grant. We look forward to sharing the research and applications our grant has provided regarding graduate teacher education. In the 28 months that we have been working on this grant much has been learned and many assumptions have been challenged. This abstract describes our grant and the discourse we wish to generate around various activities and involved in overseeing the grant implementation process.

In the summer of 2000, National-Louis University was awarded a Preparing Tomorrow's Teachers to Use Technology (PT3) grant. Now that this multi-year grant has been running for almost a year with over 100 students in 5 cohort groups, reflections can be made on what decisions helped make this program start (OFF) successfully.

The PT3 program at NLU revolves around three areas. The first is a modified version of the Masters of Arts in Teaching (MAT) program that integrates technology directly into the regular coursework. A Technology Integration Specialist (TIS), working with the regular teacher, models for pre-service teachers how technology is integrated into courses. The second area focuses on developing the technical skills of the NLU faculty so that they can better demonstrate effective use of technology in Education. The third area focuses on developing a learning community online that allows pre-service teachers to tap into the skills and experiences of NLU faculty.

The MAT program has been a key component of NLU's National College of Education which trains over 500 new teachers a year. This makes it the second largest private teacher's college in United States. Since 1886, the National College of Education has been a leader in the field of teacher education and with the new PT3 grant, it continues to expand on the already established program. The Master of Arts in Teaching degree will lead to certification in the state of Illinois. It is designed for individuals with undergraduate degrees in fields other than education.

The key difference in the MAT program is the integration of technology, which is the prime focus of the PT3 grant program. NLU has kept the program relatively the same except that along with the faculty advisor working and in some cases, teaching the students, there is also a TIS who assists in technology integration which is a multi-layered role. The TIS is responsible for introducing students to the basic workings of the laptop computer given to each student at the start of the coursework. By interweaving computer basics into many of the required courses, students meet the requirements of yet another course. Another role of the TIS is to work with NLU instructors in designing lessons with the instructors that take advantage of the students' developing technology skills. The third role is to suggest improvements and communicate problems to the entire PT3 staff in order to utilize and take advantage of the grant's resources.

During the handling and exposure of the laptops by the students, certain issues arise that need to be identified and solved. This can take some time, especially when all the students have different experience levels. Through our extensive surveys, we were able to keep records on how much time students spent on content and how much was spent on technical issues. Our TIS was integral in expediting solutions to problems and seeing that future ones are avoided.

Another key difference with the MAT program is an additional faculty position called the Academic Technology Facilitator. This person's role is to oversee the proper functioning of equipment, such as the web site, recurring laptop problems, and purchases. This position also requires active participation in the second area of the grant, faculty development.

When modifying the MAT program to include technology, it was important to consider the needs of the faculty. Many had shown interest in including technology into their lessons but never had the resources to do so. A major part of the grant, therefore, was to provide 16 hours of technology workshops to over 100 faculty members in a three-year period. Having completed a third of this requirement, we have made constant changes, including better web site instruction and more detailed information about Personal Digital Assistants which really spur on active interest in technology. Handheld devices are excellent triggers for getting faculty interested in technology innovations as well.

During the faculty development workshops, one of the greatest outcomes simply is the discussions that are generated. By starting out with a discussion concerning some of the basics of what technology is, other topics spring up and create seemingly endless areas for conversation. These conversations include ideas for lessons that the teachers have wanted to develop, but were unclear on the logistics of how to proceed. In many cases, people were uncertain what software or hardware to use. In other cases, not realizing the amount of time needed to implement a project was another hindrance.

Eventually, after a comfort level is achieved with all participants, other topics are introduced. The focus now turns toward concepts that affect the higher education faculty member. Topics now include copyright and what rights the faculty member has concerning online material; online tools and what advantages and disadvantages they hold; the effects of Hypermedia and how it affects teaching and learning; and finally what are the advantages of building a community online.

This final topic brings us to a third area of NLU's PT3 grant. Through exposure to online tools, like WebCT, both students and faculty have a common bond even though they may be separated by hundreds of miles. Both groups are given access to a common online area that they have received training on. This online area provides them with communication tools such as e-mail, chat rooms, and discussion areas. It is through increased exposure and as our grant progresses, that we can create a rapport between the two groups that is beneficial to all. One of the biggest lessons we have learned, is that even though this community can serve both group's needs, without the leverage of making it a requirement in a specified course, busy students find it difficult fully utilize the online community. During our presentation, we will explain our latest approach to the online community and what new lessons have been learned from its implementation.

It is our intent to examine this implementation grant through the eyes of the staff and administration who see that all implement the process successfully. Since June of 2000 this grant has offered insights into prior assumptions, newfound discoveries and successes regarding the various ideologies inherent in the grant. During the one-hour session at SITE we would like to encourage discourse around several areas, including the realities of what challenges and successes arise out of the grant, what was achieved or not that was scheduled into the plan for the grant, and what are we learning through our reflections. For example, we initially thought that placing a course on-line would offer greater ease of access to many students located in geographically dispersed areas. Initially we found it difficult to get students connected to the Internet and to have confidence in their ability to utilize the on-line resources. Likewise we discovered that the choice of WebCT challenged our university faculty in ways we hadn't anticipated. The work to get the course into an on-line format was daunting for many. Yet there have been many successes, including the completion by all students of the on-line courses offered in the program and the ease in which our faculty now use WebCT.

We feel that a discussion of PT3 projects in vital within the framework of organizations such as SITE. The invaluable resources and ideas within the participant population guide PT3 projects towards new ways of integration and success in meeting project goals. Through a shared discourse around our implementation project we hope to both inform the conference participants who attend and to learn from each other.

UNT Technology Fellows: A Case Study of Participants in the PT3 Grant Program of the Department of Education

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Abstract: This paper is a report on the findings of a case study (in-progress) of Technology Fellows at the University of North Texas. The purpose of the "Preparing Tomorrow's Teachers to use Technology" (PT3) grant program of the Department of Education is to make changes at the university level where the next generation of teachers is being trained. This study looks at how participating in the fellows program impacted individuals, school districts, and universities. Findings indicate that participating in the program has had a positive and far-reaching impact on the Technology Fellows and their schools.

Introduction

Computer technology is forever changing. According to Dyrli & Kinnaman (1995), computer technology greatly empowers teachers, affording the opportunity to make sweeping changes in education. However, technology needs to be used effectively. A popular theme in education today is planning for and integrating technology into the classroom. Teacher training is among the essential elements for technology planning (West, 1994). Access to computer technology as well as peer coaching is an important part in training for technology.

It is important for future teachers and faculty to experience technology hands-on. Training requires a focus on learning as well as a focus on technology, teaching with technology what would normally be taught without technology, as well as changing perceptions of what is important to teach (Boettcher, 1995).

The purpose of the "Preparing Tomorrow's Teachers to use Technology" (PT3) grant program is to make systemic changes at the university level where the next generation of teachers is being trained. The University of North Texas received three different PT3 grants, one of which was called Millennium II: Bridging the Digital Divide. A key component of that grant was capitalizing on the rich and rare resource available in North Texas: practicing K-12 educators who are already integrating technology into their classrooms. The Technology Integration Fellows program (a part of Millennium II) gathered 14 integration practitioners and encouraged them to pursue higher education degrees while sharing their expertise with current faculty and the next generation of teachers.

The Millennium II consortium proposed implementing seven preservice teacher initiatives in the North Texas area (see Table 1). Technology -infusion activities were designed to continue the expansion of services to meet educator preparation needs of the state and nation. The emphasis for this three-year project was "closing the digital divide," and the key areas of quantity, quality and equity were addressed in the preparation of technology competent and confident new teachers.

Increasing the quality and quantity of preservice technology integrating educators
Expanding technology -infusing methods courses and instructor modeling of technology
Providing technology enriched assignments and assessment for special education preservice teachers
Establishing technology enhanced academic content courses for preservice teachers
Establishing "fast track" credentialing for technology aides to be degreed teachers
Developing Internet-based quality resources for preservice teacher courses
Recruiting new millennium teacher educators from technology infusing classroom teachers to work as technology fellows in the project

Table 1: Major objectives of the Millennium II consortium

As the saying goes, from the New York islands to the Gulf Stream waters, the technology fellows gathered. Having studied in Indiana, Hawaii, Australia, Georgia, Illinois, and other states and countries, the Technology Fellows that came together brought unique experiences and backgrounds. Working in different states and countries with all age groups from three year olds to octogenarians, the Technology Fellows shared programs such as Flash and amazing equipment like Topocam while teaching web courses and utilizing the VTEL system. Standing on the shoulders of the giants who go before enable all to reach higher. From Dr. Dunn-Rankin and Dr. James Gallager, the master educators who helped to shape Dr. Tandra Taylor-Wood and Dr. Gerald Knezek, the link to educators who forge with other educators is powerfully affecting UNT and other universities, partner schools, and future teachers.

The Study

Technology Fellows were asked to respond to questions concerning applications and programs presented and worked with in class meetings, such as: Flash, Topocam, Creating Web Pages with HTML, Web Netiquette, Integrating the Internet using Email, Mailing Lists, Chat, Discussion Boards, Asynchronous Voice, Video Conferencing, The Classroom Performance System (response system for obtaining immediate feedback from students), Lightspan, Digital Video, & Blackboard. Their responses indicated the use of these programs and applications in their schools, the impact from their use, and possible future uses of technology as a result of being part of the Technology Fellows. Responses so far have been extremely encouraging.

PT3 has helped current faculty to integrate technology into existing courses. Modeling for a new generation of teachers has occurred in diverse departments from Art to Journalism. Each partner school implemented the grant uniquely to meet the needs in the different school districts. The Technology Fellows, working with UNT and independent school districts from San Antonio to Aubrey, integrated technology into teaching and learning. Sometimes sharing with one teacher or one student and sometimes sharing with entire staffs through training groups, the Technology Fellows utilized and implemented different technologies not for the sake of technology but to support curriculum, learning, and related tasks in increasingly efficient and meaningful ways. The strength of the PT3 grant and of the Technology Fellows is in the continuous and permanent network, stronger then wireless or wired. The human connection and experiences across geographical boundaries and varied experiences and linked to the giants who have gone before are intricately woven into tomorrow for the teachers and the learning that is yet to be.

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Carrots, Velvet Whips, and Propeller Beanies: Providing Incentives That Facilitate Institutional Change

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Abstract: The directors of PT3 projects at Washington State University, University of Idaho and Milwaukee Public Schools articulate the participation incentives each of their programs offers teachers. The group also sent a request to PT3 project directors nationwide, asking for descriptions of incentives they were offering their program participants. The various enticements and restrictions used by PT3 projects to motivate faculty of K-12 schools and institutions of higher education are presented and discussed.

Introduction

At last year's (2001) SITE conference, PT3 director Tom Carroll observed that the United States Department of Education's Preparing Tomorrow's Teachers to use Technology (PT3) program had achieved a sufficient scale to drive change: enough programs exist nationally to impact the culture of teacher education. As stated in the welcome message on the PT3 Web site, "PT3 grants support innovative programs to develop technology-proficient educators who are well prepared to meet the needs of 21st century learners." This preparation includes exposure to K-12 teachers and university faculty members who model the behaviors of making good use of innovative technologies in their own professional practice, as well as adhering to new standards of educational technology use (e.g. ISTE's *National Educational Technology Standards* for students and teachers, 2000). This type of change is often not an easy one to manage, and members of the culture of teacher education must find significant motivation to do so (Perkins, 1985 in Surrey and Land, 2000). A key issue in the success of many PT3 projects is motivating faculty to embrace and experiment with innovative technologies.

The directors of PT3 projects at Washington State University (WSU), University of Idaho (UI) and Milwaukee Public Schools (MPS) have spent part of this past year engaged in discussion about participation incentives each of their programs offers teachers and university faculty and discussed the various strategies used to motivate their constituents to experiment with and adopt innovative educational technologies. The group also sent a request to PT3 project directors nationwide, asking for descriptions of incentives they were offering their program participants. The results of such an examination reveal what technology change agents around the country are doing to promote the adoption of innovative (primarily computer-based) technologies for teaching and learning.

Motivating Change

The Department of Education's PT3 officers work to achieve a change in the culture of education nationally; PT3 grant recipients do the same locally and regionally. As all PT3 participants seek ways to make these changes, questions about what motivates teachers and university faculty to adopt innovative technologies into their professional practice become important ones to answer. As a sufficient scale to drive change is achieved, it is critical that we examine what incentives work best to bring change about.

Factors that may affect an individual's adoption of an innovative practice include: the *appeal* of the innovation based on externally placed or internally generated pressures to adopt a new practice; the *perceived value*

of the innovation based on whether a punishment or reward system is in place that offers incentives for adopting new practices; and *viability* of the innovation based the resources and/or restraints placed on adoption by the practitioner's work setting. Thus, a person may be successfully encouraged to adopt an innovation if he or she: feels the satisfaction of personal growth or a professional obligation to do so; gains increased prestige (status, promotion) by virtue of the fact that he or she is adopting new practices; or receives added resources such as money, goods, services and/or support that facilitates the adoption of an innovation.

The Milwaukee Public Schools (MPS) PT3 project offers the following incentives to facilitate the adoption of innovative technologies: Stipend based training; "Technology Thursdays for Teachers" and "Talking Teaching on Tuesdays" (in-service sessions); ISTE NETS Curriculum Materials; and access to K12 Teachers as mentors. Other incentives to participate in PT3-related activities include: paid expenses to NECC and the Wisconsin State Technology Conference for teams of IHE, K12 and pre-service teachers; Personal Digital Assistants (PDAs) for participation in training; digital cameras for submission of best practice standards-based instructional plans; door prizes for workshops and meetings; as well as invitations to participate in National Technology Advisory Board activities.

The University of Idaho (UI) PT3 project supports the adoption of innovative technologies among it's participants through: training stipends; week-long intensive workshops (in-service sessions) demonstrating integration of skills into the classroom; technical support with hardware and software; instructional support (creating/implementing ideas); Providing necessary software & hardware (on a limited basis). The state of Idaho has a mandatory performance assessment for teaching certification; a motivating factor for many UI project participants is their increased ability to demonstrate competence on the Idaho Technology Performance Assessment (ITPA).

Washington State University's (WSU) PT3 project offers incentives to facilitate the adoption of innovative technologies that include: funding for pre-service teachers and teacher-education faculty that is linked to the awardees' demonstration of knowledge of NETS•T and NETS•S; "Geek Speaks" – one-hour in-service sessions for faculty and staff; "Geek Week" – a week of workshops and discussion sessions designed to support the development of technology skills (Brown, 2001); technology assistance, hardware and software to support teaching and learning.

In June of 2001, the following message went out to the PT3 listserv, which consists of project directors and coordinators nationwide. The message included the following request:

> ... we'd like to gather as much information as we can about what incentives different PT3 projects have been offering to faculty members in order to get them to participate in PT3-related activities. A brief reply to this message, offering a few words on what kinds of participation incentives you're providing would help us out immeasurably.

Twenty-three project directors and/or coordinators responded to the message with answers that ranged from a few sentences to lengthy descriptions of what individual projects were doing to motivate their constituents. A preliminary examination of the data using a simple coding scheme (essentially generating a list of topics by reading through the messages looking for common ideas) revealed eleven incentive types: Equipment (10); Support (9); Travel Funds (5); Release Time (4); Required Training (4); Voluntary Training Sessions (4); Social Support/Community Building (3); Food (2); Event Hosting (2); Competency Requirements (2); and Promotion & Tenure Documentation (1). These eleven incentive types echoed the activities of MPS, UI and WSU.

With examples from a total of 26 major institutions involved in the process of fostering the development of technology-proficient educators, it is possible to develop a preliminary classification system of the incentives currently used to facilitate change in this area. The most significant, binary distinction among the various incentives is between positively and negatively oriented incentives. Three of the authors have referred to these as "carrots" and "whips" in a presentation to PT3 directors (Brown, Davis and Onarheim, 2001). The carrots offer an enhancement (e.g. release time, funding); the whips offer the ability to maintain one's professional status without enhancement (e.g. competency requirements, promotion and tenure documentation). As one might suspect, the number of carrots is far greater than the number of whips. The "whips" are not harsh reprimands either, they are, for lack of a better term, "institutional rewards" – a means of facilitating technological proficiency in a way that is easily documented; for this reason, we recommend referring to them as "velvet whips" because, although they are not professional enhancements in terms of receiving something extra that others may not have, they are not intended to cause pain or take anything away from one's professional resources (this point might be argued in terms of denial of promotion, but the authors suggest the term "velvet whips" regardless of this argument).

Carrots	Velvet Whips
Extra Funds	Certification Requirements
Equipment	Promotion Requirements
Technical Support	
Special Events	
Training Opportunities	
Release Time	

Table 1: Motivational Incentives Offered to Facilitate Technological Proficiency

Discussion and Recommendations

The findings and suggestions articulated here are preliminary and require a great deal more consideration before adopting them for practical (or even theoretical) purposes. However, the basic premise, based on the authors' experiences as directors of projects intended to promote the integration of innovative technologies into teaching and learning and the information provided by a significant number of other directors of similar projects, seems sound and reasonable. In order to promote change, organizations must offer incentives of some type. In the case of the PT3 projects, incentives range from outright rewards (carrots) to vague threats (velvet whips).

Mehlinger and Powers (2002) recommend nine steps for successful technology implementation. Their third step: "Provide Leadership for Technology" includes a recommendation to, "create incentives to influence the way faculty and staff use their energies" (p. 291). In creating these incentives, it is the authors' hope that the types of incentives described in this paper might serve as a guide.

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Sustainability:
How Can a Temporary Grant Have a Long-Term Impact?

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Abstract:
Most grant applications seek proposals that make a serious effort to sustain the impact of the grant beyond the funding period. How is it possible to fulfill requirements for sustainability at budget-strapped institutions of higher learning? In writing the proposal and implementing a $1.7 million PT3 grant (Preparing Tomorrow's Teachers to use Technology) from the U.S. Department of Education, three public universities in Western Pennsylvania have tried to build longevity into the grant itself. Strategies include uses of matching funds, collaboration with permanent staff, types of training and support during the grant, development of instructional materials, using incentives to promote changes in syllabi, and placing grant offices and activities within permanent organizations. In addition, several institutional factors, outside pressures for change, and serendipitous events will also prolong the influence of the grant, enabling and motivating faculty to continue to use and explore new technology in teaching after the grant.

Problem Statement and Background

Most grant RFP's seek proposals that include a serious effort to sustain the impact of the grant beyond the life of the grant and details about how this will be accomplished. To take just one example, the application for Preparing Tomorrow's Teachers to use Technology (PT3) specifically states: "The consortium should have a strong capacity to sustain the program innovation after the grant ends." (U.S. Department of Education, 2000) How is it possible to fulfill such requirements for sustainability at budget-strapped institutions of higher learning?

"Preparing Teachers for the Digital Age: Implementing a Dynamic Model of Pedagogical Change" is a project funded by a $1.7 million PT3 grant from the U.S. Department of Education. The proposal was written by the ADEPTT Consortium (Advancing the Development of Educators in Pennsylvania through Technology Training), composed of three public universities in rural areas of Western Pennsylvania – Indiana, Clarion and Edinboro Universities of Pennsylvania. Our overall goal is to infuse technology into the pre-service teachers' core curriculum and several teacher education programs. Three of the major objectives are: 1) Instructional Technology will be moved from the periphery to the core of our curriculum. 2) Future teachers will apply and integrate Instructional Technology into the teaching/learning process. 3) Additional faculty, instructional designers, and technical support staff will assist with the transition, providing professional development opportunities and support for faculty. Technology infusion at our institutions will have a significant impact, for together we graduate some 1500 future teachers per year. These universities provide excellent faculty-student ratios but have limited support staff and budgets. Both faculty and non-managerial staff are unionized.

In writing the proposal and implementing the grant, we have made an effort to sustain the impact of PT3 well beyond the life of the grant. In other words, we have tried to build longevity into the grant itself. Our strategies include the uses we made of matching funds, collaboration with permanent IT staff and university administration, the types of training and support offered during the grant, the development of instructional materials, using incentives to promote changes in syllabi, and placing grant offices and grant activities within permanent structures in our own and other institutions. In addition, several institutional factors, outside pressures for change, and serendipitous events will also prolong the influence of the grant, empowering and motivating faculty to continue to use and explore new technology in teaching after the grant-funded personnel and incentives are gone.

Strategies

Uses of Matching Funds

Matching funds can be structured to extend the impact of the grant beyond its funding period. In many cases, we have taken advantage of changes the university or College of Education was already planning. For example, one of the goals we built into the grant – to enhance our technological infrastructure to support project initiatives – is helping to achieve a measure of permanence. Since PT3 implementation grants do not fund equipment and infrastructure, we are achieving this goal through university and college match. Upgrades to labs and computers were performed as promised (at Edinboro an entirely new technology center opened); by Year Two of the grant, all three campuses had completed their wiring programs; campus networks were expanded and extended to all faculty and students, and student and/or course directories were created or expanded; training in course authoring systems began or intensified; and faculty are involved in technology planning at multiple levels of their institutions. At IUP, web sites began to be migrated from the VMS server to NT servers that are user-friendlier, and the university adopted standard web editors; the majority of faculty switched to GUI email; there has been greater desktop and lab standardization and a university-wide 3-year replacement cycle for faculty computers; a university-wide student help desk and faculty help desk have been created. Infrastructure improvements are continuing in the final year of the grant, in part propelled by grant initiatives. For example, the IUP College of Education purchased a server dedicated to housing student electronic portfolios, which have been a focus of both college and grant activities, and is converting a faculty lab to a Portfolio Studio to assist both faculty and students with electronic portfolios and other technology projects. The PT3 grant monitored institutional improvements, modifying training and support for faculty as needed, pointing out changes that made it easier to use technology in teaching, and taking advantage of the improvements to promote the goals of the grant. Improvements in infrastructure and planning mechanisms will extend the impact of the grant beyond its formal conclusion by assuring the quality of the computing resources available to faculty and input from faculty that have begun to use technology in teaching.

Grant-funded personnel have been an undeniable factor in the success of the grant. They have made it possible to expand and customize faculty training specifically for teacher preparation faculty. They have co-taught classes, modeling to faculty how technology can be taught and integrated directly in their courses, rather than in isolation. They have also taught workshops, developed instructional materials, and provided individual consultation and support.

In the area of personnel, however, the universities also committed match. University and college commitments to create or revise permanent technology support positions guarantee that, even when grant personnel are gone, the support available to faculty will still be better than it was before the grant. Both Clarion and Edinboro added instructional designers to their staff with the intention of switching them to university funding when PT3 ends. The IUP College of Education upgraded a technical support position to that of Assistant Dean of Technology, adding faculty training duties. This individual will pick up some of the work now done by grant-funded faculty and student workers. As mentioned above, the College is also redefining the mission of its small Incubator lab. Originally intended for one-on-one help and project development for College of Education faculty, the lab began to permit teacher preparation faculty from other IUP colleges to use it as well. The lab experienced declining utilization, however, as more equipment (e.g., printers, scanners) became available in individual faculty and department offices. So it will now be renamed the "Portfolio Studio" and give both faculty and students support in developing electronic portfolios. On the university level, IUP added an

academic user services coordinator. She began a university wide faculty training program modeled on workshops originally offered by the ADEPTT grant, which concluded in 2001, and implemented a university faculty help desk.

Collaboration

PT3 has collaborated with permanent IT staff and committees on training, services and planning. By working together, we avoid duplication and provide more services than we could separately. For example, PT3 cosponsored many workshops with the Assistant Dean of Technology in the College. In addition, two PT3 faculty sit on the College of Education's Technology Committee, a technology planning body, and one sits on ACPAC, the Academic Computing Policy Advisory Committee of the university; they help shape policy, and the permanent faculty member that sits on both committees will have continued influence after the grant. PT3 staff and the Assistant Dean approached the university technology services about sharing storage of electronic portfolios in their first stage of development. Since portfolios are initially created in a technology course required for admission to teacher preparation, instructors can make use of the new, university-wide course directories at this early stage. Taking advantage of a university service reduces by more than 250 per semester the number of students for whom the college must manage network security and makes the long-term management of portfolios more feasible. Collaboration keeps regular IT staff informed about uses of technology in teaching, gives them a role in achieving the goals of the grant, and keeps PT3 abreast of impending changes. The grant also provided some professional development for regular IT staff, with similar effects. Since our ability to add staff is extremely limited, it is essential that existing employees understand and buy into the implementation of grant goals both during and after the grant.

But prospects are not entirely rosy for continuing infrastructure and personnel improvements after the grant. As noted in the introduction, we belong to the State System of Higher Education, which provides limited operating budgets and a strict cap on personnel FTE. This is one reason why the grant has had such a big impact on our universities – it has supplemented meager support resources. The budget situation in the state of Pennsylvania declined with the economy in the year 2001, especially since September 11. SSHE universities have been advised to expect little new funding in the next fiscal year. Pennsylvania State University (though not a member of the state owned State System of Higher Education, PSU is state affiliated) was actually obliged to *return* some of its state funding for the current fiscal year. So the amount of technology improvements at our institutions can be expected to decrease in the immediate future. In Year 3, for example, IUP honored the three-year replacement cycle but reduced the amount of money made available for each replacement computer. (Some colleges and faculty were able to supplement that amount from other sources in order to get precisely the kind of computer they desired, however.) When a recently hired instructional designer decided to leave Clarion, the university was unable to complete its search for a replacement before a hiring freeze was imposed.

Types of Training and Support

Training now offered by the grant will not continue, but we structured our training in ways that, we hope, will prolong its impact. For example, by co-teaching classes, PT3 personnel not only provided training for faculty and their students but also modeled how faculty might introduce the technology in their courses. During the final semesters of the grant, we are weaning faculty from our support by having them assume increasing responsibility for technology-enhanced lessons. Another example is our cosponsoring training with regular IT staff, which will help shape the training they offer after the grant. In addition, the grant produced materials, templates, videotapes of workshops, and workshop outlines that faculty and IT staff can continue to use for as long as they are relevant. Final editions are being posted on the web, and the workshop videotapes can be borrowed from a departmental library. Production of a CD on creating electronic portfolios is getting under way, which will support new or diffident faculty and can even be distributed to students after PT3 trainers are gone. Taking a cue from Indiana University and Purdue University at Indianapolis, we are publishing a collection of technology success stories both to document grant accomplishments and to model what faculty can do. Finally, the grant co-directors encouraged faculty that wished to present on grant results to do so at conferences which publish proceedings so that they will live on after the grant.

Incentives: Carrots and Sticks

The grant provided incentives for faculty to modify course syllabi to reflect their increasing use of technology, and at the start of Year 3, more than 80 modifications to syllabi had been submitted. Most of the incentives will disappear after the grant, but we do not expect faculty to remove the technology from their syllabi. Since they were in control of the changes, most chose technologies that were relevant to their courses and that were within their abilities. Changes in course syllabi ensure that our support will have a greater impact than will mere attendance at workshops. The ideal would be to change the official department syllabus or course designation, but at some institutions the approval process itself can take years. In our consortium only Edinboro, which had already started the process, designated special "T courses" or technology enhanced courses that will remain on the books for a long time to come. Otherwise, we relied upon providing incentives and help in revising individual faculty syllabi. It has been important to attach the incentives to the specific outcomes that we promised in the grant. Hence, we offer incentives not only for attending workshops but also for submitting syllabi revised to incorporate technology, for team projects that accomplish the same, and for minigrants to support technology use in courses. Many faculty members used their stipends to purchase software and peripheral devices that further supported the integration of technology in teaching. With revised syllabi and the technology needed to implement them in their hands, faculty will be more likely to continue to teach with technology and teach their students to do the same.

Although grant incentives have been successful, they are not the only motivation for increasing the use of technology in teaching. All three universities have either just completed or are preparing for NCATE review (National Council for the Accreditation of Teacher Education). The number of faculty participating in PT3 workshops or requesting class assistance surged when the IUP College of Education, beginning preparation for NCATE review, mandated that students start an electronic portfolio for admission into teacher education programs and complete it for graduation. Suddenly the technology needed to create portfolios became relevant and urgent to both faculty and students. Although NCATE does not require that portfolios be electronic, the College has implemented it in this way because, in a large teacher education program, electronic portfolios are the easiest to archive and make available for review. This external pressure from NCATE will continue, and so we can count on continued measures to implement electronic portfolios in all teacher preparation courses.

To facilitate technology infusion in general, and electronic portfolio development in particular, the IUP College of Education has moved its traditional technology course to the freshman level and is requiring completion prior to admission to teacher education. This move will ensure that students will arrive in teacher preparation courses better prepared in technology. Faculty can spend less time teaching technology and more time guiding students toward appropriate documentation for their portfolios and toward applications of technology to teaching. Thus, the learning curve for faculty can be reduced even while technology infusion is increased.

Some faculty members who gained an interest in technology through PT3 are likely to continue simply because they are so enthusiastic and have even assumed new technology roles. For example, one faculty member collaborated with us on a PT3 workshop and publication and became involved in a second PT3 grant. Another has started to serve on a technology committee within a professional organization in her discipline. A third changed the textbook she is writing to incorporate technology in it – this will have a lasting impact.

Placement of Grant Activities – The Case of Teaching Circles

Teaching circles are another strategy to accomplish the PT3 goal of providing professional support. They have been implemented in different ways at the three member campuses, but one thing they all have in common is a chance of continuing beyond the end of the grant. Some of the teaching circles consist of small reflective practice groups on technology; these circles will continue after the grant wherever the members truly become peer mentors and develop ongoing collegial relationships (Hutchings, 1996).

Where grant programs are located can make a critical difference in their impact and longevity. At IUP, the teaching circle model has been blended into a preexisting program of the local intermediate unit called Academic Alliances. In this program, K12 teachers and faculty are invited to an early evening program and

opportunity to share experiences over supper. With PT3 help, a new Teaching with Technology Alliance was created, and preservice students were invited to join faculty and teachers. With attendance ranging from 25 to 78, this Alliance is likely to receive continued support from the intermediate unit after the grant. It can be expected to continue because it has been successful, because it is housed in a permanent organization, and because a partial funding mechanism independent of the grant is already in place. (Our experience with previous grants suggests that the placement of the entire grant both physically and within the organizational structure in a permanent office or organization increases and prolongs its impact. For example, grant money that helps fuel the work of an ongoing technology or instructional design center is likely to have a more permanent effect.)

Conclusion

This paper has demonstrated how grant activities, incentives, organization, and collaborative relationships with other parts of our institutions can be fashioned in order to prolong the effect of the grant. Nonetheless, resources will be lost when the grant ends. Some grant RFP's frown on the argument that their grant will be sustained by securing additional grants. But at many institutions of higher education, an entrepreneurial and collaborative spirit is in fact essential to keep funds flowing for innovation and change. Budgets are tight and becoming tighter. Grant agencies and donors should consider the capacity to attract additional funds and implement new, related programs a real plus. Our consortium was able to leverage its initial $500,000 ADEPTT grant from Bell Atlantic and Microsoft into a $1.7 million PT3 grant, a $234,000 TLCF grant (Technology Literacy Challenge Fund) from PDE (Pennsylvania Department of Education) to United School District (IUP was the sub-recipient), a $100,000 PDE grant to Clarion University, and a $50,000 CAPE grant (Community of Agile Partners in Education) to the consortium. In so doing, IUP has come to recognize the need to make administrative changes that increase our capacity to facilitate grant writing and implementation, contracts, and fund raising. Such changes will make it possible to embark on more projects of national importance that create a lasting impact.

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Collaborating for Change – Michigan's Consortium for Outstanding Achievement in Teaching with Technology (COATT)

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Abstract: Michigan's Consortium for Outstanding Achievement in Teaching with Technology (COATT) was formed in 1999. From an initial membership of 10 higher education institutions, the consortium has grown to include 16 private and public teacher education institutions and 9 K-12 organizations. COATT was awarded a PT3 catalyst grant in 2001. This paper presents details of the COATT PT3 activities. COATT's PT3 activities include providing leadership for the revision of the state's existing technology standards for entry-level teachers, extending those standards to in-service teachers and administrators, and the delivery of intensive technology training workshops. A full paper that includes more detail may be found at http://www.coatt.org/conferences/site2002/fullpaper.pdf.

In 1999, United States Senator Carl Levin, recognizing an opportunity for Michigan to improve its preparation of new teachers to use technology, spearheaded the creation of a new organization of teacher education and K-12 institutions (McManus, Rubio, Lenze, Charles & Hoffman, 2001). This organization, the Consortium for Outstanding Achievement in Teaching with Technology (COATT), has taken a leadership role in encouraging student teachers to reflect upon and continuously improve their use of technology in education. By setting a high standard, establishing a means of consistently assessing and recognizing accomplishment of the standard, and rewarding outstanding achievement, COATT has both unified the efforts of educational institutions and motivated pre-service and in-service teachers across the state to move in new directions in their classroom practice.

In July 2001, COATT was awarded a grant from the United States Department of Education's PT3 (Preparing Tomorrow's Teachers to Use Technology) initiative. The grant, Developing an Ecology for Preparing Tomorrow's Teachers to Use Technology, is administered by Spring Arbor University with substantive subcontracts at Merit Network, Michigan State University, and Eastern Michigan University. Funds from this grant will allow the organization to reach out to more pre-service teachers, increasing the scale of our

activities. The added resources will also allow us to better support portfolio creation through summer workshops, enhanced infrastructure, and increased on-line resources.

COATT's PT3 Activities
Setting Standards
Pre-service technology integration standards

As part of the PT3 grant, COATT is leading an effort to update the state's technology standard for pre-service teachers to bring an earlier version into alignment with the ISTE National Technology Standards for Teachers (International Society for Technology in Education, 2000). In October 2001 COATT, in cooperation with the Michigan Department of Education, established a committee to draft a revision of the state's technology standard, known as the Seventh Standard. The draft of the revised standard has been developed and may be viewed as Table 1 at http://www.coatt.org/conferences/site2002/table1.pdf. The Michigan Department of Education hopes to present these revisions to the State Board of Education for formal review in spring 2002. The committee working on the revised standard includes COATT member representatives, educators and administrators from K-12 including representatives from the two major teacher unions, and a facilitator from the Michigan Department of Education.

In reviewing the earlier Seventh Standard, the committee found that the first committee had been ahead of its time, as the original Seventh Standard was more like the 2000 ISTE NETS-T than the 1997 ISTE version. While Michigan's standard could be continued with some minor modifications, the new committee determined that a rewrite to bring wording in closer alignment with the national standard had advantages for both educators and students. For teacher candidates, similar wording makes it very clear how the state standard is similar to the national standard. The new standard also makes it easier to relate statewide initiatives to national ones, including the ability to readily adopt and modify curricular materials and assessments developed elsewhere. Additional implementation efforts through dissemination of best practices and incentives such as the MCOATT awards will continue in conjunction to encourage excellence in programs and outcomes.

Technology Training Workshops

Student teaching is a critical period in the training of teacher candidates, yet it is often the time when candidates find themselves looking to reduce risk in order to "survive", and are thus in the greatest need of an environment of technological entrepreneurship. The goal of the COATT Technology Training Workshops will be to help teacher preparation institutions partner with school districts to improve the potential for successful use of technology during the student teaching experience. Teams comprised of a student teacher, cooperating teacher, university supervisor or field instructor, and K-12 building technologist will form a "design community" to assist the student teacher in creating effective technology-infused lessons to be implemented during student teaching. The design team and community becomes a support system for the student throughout the design process and student teaching. The workshops will have both face-to-face and online components, extending over a yearlong training cycle.

A pervasive project objective is to build capacity in schools in low-income districts to provide technology-rich student teaching experiences. Low-income districts are defined as those with higher than 60% participation in the Federal School Lunch program. Over the three years of program activities, 30%, 40%, and 50% of the participating school districts will be low-income.

Summer Intensive Workshop

Face-to-Face Design Community. The training begins with a five-day summer intensive workshop that will include both training and design activities. Design teams work together to help the teacher candidate develop lesson and unit plans that make exemplary use of technology to achieve learning goals. Each COATT member institution is invited to select at least one design team to become part of the first face-to-face cohort of participants to pilot the initial training cycle. These groups will grow in size during the second and third years to four sets of 20 groups each year. As Consortium members assemble teams, their first priority will be to target

technologically underserved schools, such that a significant number of student teaching classrooms will come from these schools. The first workshop will begin in the summer of 2002.

Teams will develop learning activities that focus on strengthening standards-based practice by engaging members in authentic, problem-based activities aligned to Michigan curriculum and technology standards. Video case scenarios of effective teaching with technology will be incorporated as a basis for study and discussion. The workshop will conclude with presentations by the teacher candidates of a proposal and a thoughtful and workable draft set of lesson plans. This is a unique opportunity for pre-service teachers to enhance their teaching skill, and cooperating teachers to more effectively mentor student teachers by developing a collegial, collaborative relationship prior to their teaching placement.

Subsequent to the live component of the workshop, there will be online follow-up sessions, where the design community will gather to mark progress and continue the creative process. The online follow-up will last for a total of 30 hours per individual in a design group, and will conclude with the viewing of web pages that describe a final set of lesson plans.

Online Design Community. Beginning in the fall of 2002, monthly online sessions will be held for 250 teacher candidate/cooperating teacher teams (at least 500 people in all), with additional participation from the K-12 technologists or the faculty supervisors. This training will move the group members from more basic to more advanced understanding. The teams will participate in 10 monthly sessions consisting of two hours each. The curriculum will parallel that of the face-to-face workshop, but will also address any need for development of basic technology skills that is needed to be more inclusive of cooperating teachers districts that are technologically underserved.

Implementation and Beyond. The design team cohort groups will continue to meet on a monthly basis during the academic year, when the various teacher candidates undertake their student teaching. An important feature of their online gatherings will be to support the teacher candidates as they implement their teaching, and allow those who teach later to learn from those who go first. The teacher candidates will then be encouraged to submit an MCOATT portfolio for either the spring or summer round of awards, whichever is appropriate. In addition to meeting the requirements of the application, they will be asked to thoughtfully reflect upon and assess their experience as part of the design community. One of our key concerns is sustainability of our efforts, and to that end we are linking up with different State stakeholders to diffuse those efforts as broadly as possible.

Conclusion

The Consortium for Outstanding Achievement in Teaching with Technology (COATT) is, in its present form, the result of several years of intense work and close collaboration between entities that in the past have not had the opportunity to work closely together. Through organizational support from member institutions and United States Senator Carl Levin, COATT has created a means by which to encourage student teachers and practicing teachers in Michigan to integrate educational technology into their teaching practice in ways that reflect current thinking on best practices. With the increased capacity made possible by this Federal PT3 grant, COATT will support a larger number of pre-service teachers and the in-service teachers with whom they work.

As COATT moves into the future, we feel strongly that we have set a productive direction based on a solid standards-based foundation, working collaboratively to create a vision that will sustain us through growth and evolution yet to come.

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Professors' Reflections on Changes Implemented After Technology Professional Development Sessions

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Abstract: The purpose of this research project was to determine the impact of technology professional development on teacher preparation faculty in colleges of education, arts, sciences, and humanities at five universities in north Louisiana. Participants included 10 randomly selected university professors who attended 6 days of technology professional development. A 10 question structured interview was used for data collection. Interview transcripts were analyzed using case analysis and cross-interview analysis. Attending the technology professional development sessions provided professors with ideas, motivation, and the support needed to incorporate technology into their classroom curriculum.

Technology is a pervasive component of modern life. In order to prepare students to live in this highly technical society, they need opportunities to use technology as they explore and learn content area curriculum. To assure that students have these opportunities their teachers must be competent technology users who provide students with technology-rich meaningful learning environments. One way to assure that teachers model effective technology use is by providing them with technology-rich learning environments complete with technology proficient professors in their teacher preparation programs. Teacher preparation faculty in the colleges of arts, sciences, and humanities, many who do not recognize themselves as preparing future teachers, must model the integration of technology and curriculum (Beichner, 1993; White, 1994).

Dusick's (1998) literature review indicated that faculty members' use of technology depended on these factors: 1) administrative support, 2) computer availability, 3) resources, 4) support staff, and 5) training in the use of computers. Thompson, Schmidt, and Hadjiyianni (1995) in a three year study examining the infusion of technology into a teacher preparation program identified these essential factors for success: 1) easy access to technology; 2) allowing faculty to become personally comfortable with technology before using it for instructional purposes; 3) having technology integration as a department goal; 4) receiving strong support from the administration; 5) inviting participation in the program; and 6) one-on-one mentoring for faculty.

Faculty Development

Technology professional development is key in moving faculty toward successfully modeling the integration of technology in the preservice classroom. The professional development must incorporate technological and pedagogical components (Bullock & Schomberg, 2000) focusing on how to use technology to improve teaching and learning (Cottrell, 1999). Effective technology staff development requires, among other things, immersion in learning over extended periods of time, active involvement, a community of learners, a focus on the learners' needs, and time for reflection (McKenzie, 1991). A learning environment based on adult learning theories with proper sequence and structure facilitates communication and learning (Mandefrot, 2001). The workshop facilitators must take into consideration the concerns and

feelings of the participants (Linnell, 1994). They must provide a friendly, comfortable, relaxed setting in which the professional development is viewed by the participants as an opportunity and not as a threat (Mandefrot). Workshop participants need the opportunity to meet and collaborate with others in ways to stimulate their thinking while building on their professional development experiences (Franke, Carpenter, Levi & Fennema, 2001). Learning to use technology and to infuse it into the curriculum in meaningful ways requires ongoing support from a connected community of learners who use technology. A community of learners provides not only the resources and technical support required to use technology but also the confidence to teach with technology (Ginns, McRobbie, & Stein, 1999; Hruskocy et al., 2000).

Technology Integration in the Classroom

Miller (1995) sees the current technological revolution as an opportunity to make profound changes in teaching that directly effect students' learning. In order for this to occur, faculty members must reflect on their teaching, master their anxieties, and learn to use technology in order to incorporate it into their teaching. Additionally, three conditions must be met for faculty to integrate technology into their teaching: they must believe that technology is more effective than what they are now using, they must believe that technology will not be disruptive, and they must believe that they have the technical skills and resources to achieve their goals (Zhao & Cziko, 2001). Infusing technology in the classroom requires that professors combine experiences with technology with the curriculum they are teaching. This requires faculty to re-examine what they teach and to change how they teach (Miller, Martineau, & Clark, 2000). Faculty who do not integrate technology in their teaching may find themselves overlooked and left behind as other faculty members revitalize their curriculum and the way it is taught (Baldwin, 1998).

Technology integration by faculty is neither spontaneous nor easy; it takes time and effort. Hord, Rutherford, Huling-Austin, and Hall (1987) developed the Levels of Use (LoU) to measure behaviors associated with the use of an innovation. These seven levels include: 1) non-use, 2) orientation, 3) preparation, 4) mechanical, 5) routine, 6) refinement, and 7) integration. Conversations, informal interviews, and observations can be used to assess levels of use to determine the impact of an innovation on the participants.

Barriers to Technology Integration

Barriers to technology integration include organizational ones and individual resistance to using technology (Miller, Martineau, & Clark, 2000). Many universities do not recognize faculty member's use of technology for tenure and promotion decisions, hence, faculty members forego learning to use and integrate technology as they focus on research and publications which are considered in such decisions (Baldwin, 1998). Some faculty hope to reach emerithood before they are forced to change (Miller, 1995). Teacher preparation faculty members do not infuse technology in their classes in part because they lack professional development opportunities, proper equipment, administrative support, and technical support.

Methodology

Participants and Setting

The United States Department of Education's Preparing Tomorrow's Teachers to Use Technology (PT3) program has provided funding for grants to assist teacher preparation faculty as they learn to integrate technology into their teaching. One of these grants is the Technology in Higher Education | Quality Education for Students and Teachers (T.H.E.|QUEST) which provides intensive technology professional development for teacher preparation faculty at universities in Louisiana. Faculty teams from the universities work together as they develop methods of integrating technology into their curriculum. The purpose of this research project was to determine the impact of T.H.E.|QUEST technology professional development sessions on teacher preparation faculty in colleges of education, arts, sciences, and humanities at five universities in north Louisiana.

Sessions extended over 6 days for 7 hours a day totaling 42 hours and were attended by a total of 49 teacher preparation faculty. The professional development sessions provided extended opportunities for participants to work together as they experimented with a variety of hardware and software and discovered ways to use technology to enhance teaching. These sessions were held in T.HE.|QUEST technology lab housed in the College of Education. For the purpose of this study 2 participants were randomly selected from each of the 6 professional development sessions held over the last 2 years for a total of 12 participants. Two participants were unavailable during the time the interviews were conducted, but participants from all sessions were included in the sample. Participants had been teaching at the university level from 3 to 33 years.

Data Collection

One way to determine the impact of technology professional development on teacher preparation faculty is to conduct structured interviews. Hence, ten interview questions were designed to help assess participants' levels of technology use, whether any changes were made in their teaching as a result of the professional development sessions, how they integrated technology in their teaching, whether they required their students to use technology, and whether they had encountered any barriers when integrating technology in their teaching. The researchers designed the questions, which were then reviewed and revised by a professor knowledgeable of the professional development sessions, but not directly involved in them. The interview questions were pilot tested on one of the session participants who was not among those randomly selected to participate in the study. The structured interviews were conducted in faculty members' offices over a period of three weeks by one of the workshop facilitators. Interviews lasted from 35 to 45 minutes and were conducted at the faculty members' convenience. The interviews were audio taped and transcribed by the researchers.

Data Analysis

When using structured interviews case analysis and cross-interview analysis are both appropriate (Patton, 1999). The transcripts were initially coded for case analysis, which provided vignettes of individual participants from which various patterns, categories, and themes emerged. The participants' responses were then grouped by questions and analyzed. This provided a clearer means of organizing the data and establishing linkages between the interviewees' comments. Initial coding and analysis was conducted independently by each of the researchers, providing triangulation (Patton). Researchers then compared and discussed their coding.

Effective professional development requires that the workshop facilitators establish rapport with the participants in a relaxed, comfortable environment conducive to establishing collaborative relationships among the participants (Mandefrot, 2001). The rapport that is established may prevent some participants from responding to interview questions in a forthright manner. Additionally, some teacher preparation faculty may be reluctant to disclose their limited use of technology. These factors may limit the generalizability of these findings.

Discussion and Interpretations

Interview transcripts were examined to determine if participants had made any changes in their teaching that could be attributed to attending the technology professional development sessions, to find examples of the integration of technology in their teaching, to establish whether or not they required their students to use technology, and to explore any barriers they encountered when using technology.

Changes in Teaching

After attending the sessions faculty members commented that they incorporated more technology in their teaching. During the sessions they discovered ways to integrate a variety of hardware and software in their teaching. The sessions provided them extended opportunities to experiment with software and discover ways to adapt it to their curriculum. Participants reported that they had written grants and

purchased additional hardware and software to use in their teaching. Some reported that the sessions had stimulated them to think about additional ways to use technology and had motivated them to use more technology. Others talked about the changes they had made in their teaching in order to effectively incorporate technology (Miller, Martineau, & Clark, 2000). Participants commented on the importance of modeling the integration of technology in their classes (Beichner, 1993; White, 1994). One change mentioned was that in order to integrate technology they had discovered that they needed to stop talking and give students control of their own learning. One participant commented, " *I have to learn to talk less. ... we get very comfortable in talking rather than letting students explore and come to their own conclusions.*"

No Changes in Teaching

A few participants reported that they had made no changes in their teaching since attending the technology professional development sessions. However, these participants reported that they had several ideas for using technology in their teaching and then elaborated on ways they could use technology. These faculty members reported using limited amounts of technology in their teaching. For example, two reported having some course materials posted in Blackboard. They did not, however, require their students to access the course materials. Some of these faculty members saw the benefits of technology, but lacked confidence in their ability to effectively use technology. One faculty member did not believe that using technology would be more effective than what was presently being done and believed that using technology would be disruptive (Zhao & Cziko, 2001).

Students' Use of Technology

Faculty members who reported that they had not made changes in their teaching after attending the technology sessions also stated that they made allowances for students if they did not have access to technology or feel comfortable using technology. Some professors reported providing one-on-one assistance to students to assure that they could successfully complete assignments requiring them to use technology. Other professors simply required students to use technology to complete assignments and assumed the students either had the requisite skills or would acquire them in time to finish the assignment. One professor reported putting *PowerPoint* presentations on the web prior to class meetings and that even though it was not required, most students printed out the presentations and brought them to class to use as an outline while taking notes. Faculty members reported that students completed a variety of projects using different software packages, such as *Microsoft Office, Inspiration, Netscape Composer, HyperStudio, iMovie, KidPix,* and *Blackboard*.

Barriers to Using Technology

Barriers to using technology included lack of hardware and software and limited access to the hardware and the software that was available. Several participants noted the lack of technical support available on their campuses. Technology proficient professors reported being overwhelmed by requests to provide support for other faculty members, which often interfered with their own work. Several reported their biggest barrier was the lack of time to learn to use the available technology and to discover ways to integrate technology in their teaching. Some professors reported that not only was administrative support lacking, the administration impeded their efforts to acquire and use technology in their teaching (Dusick, 1998; Thompson, Schmidt, & Hadjiyianni, 1995).

Levels of Technology Use

Interviews with the participants and conversations and observations during professional development sessions were used to determine their Levels of Use (Hord, Rutherford, Huling-Austin, & Hall, 1987). Three participants were at the preparation level; they articulated definite plans for implementing what they learned in the sessions. One participant was at the mechanical level and was in the process of reorganizing her curriculum to make better use of technology. Three participants were at the routine level indicating that they were making few or no changes in their established pattern of use. Three participants were determined to be at the integration level as they actively worked to coordinate the use of

technology with other professors. Participants' comments on changes or lack of changes in their teaching reflected their levels of technology use. For example, participants who had not made changes in their teaching required only limited use of technology from their students and were at the preparation level of use. Overall attending the technology sessions had a positive impact on professors who were above the preparation level of use.

Conclusions

The technology professional development sessions provided participants with time to explore new technologies in a relaxed, comfortable working environment and to collaborate with their peers as they developed ways to integrate technology into their classrooms. This opportunity for extended exploration and collaboration provided participants with the motivation and stimulation to further refine and develop their technology expertise. Results of this research indicate that the technology professional development sessions enhanced professors' use of technology in their teaching to varying degrees depending on their Level of Use.

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Designing Web-Based Modules to Assist Teachers with Teaching Mathematics to Minority Students

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Abstract

Many teachers are faced with the dilemma of how to effectively bridge the gap in teaching minority students. Specifically, teachers are burdened with the content area of mathematics and communicating its concepts effectively.

A number of factors attribute to why minority students may have difficulty learning mathematic concepts. One factor would be that minority students might process information differently from their counterparts. Minority students tend to be concrete cognitive learners and thinkers, where they typically recall information, as opposed to the more analytical/linear learner and thinker, who has a greater ability to problem-solve. Another factor would be the absence of a technological presence either in the classroom and/or at home. The latter is a concern that has been addressed as a part of educational reform.

The design of a web-based mathematics module was developed to address the needs of teachers, and to bridge the gap with minority students and the learning of mathematical concepts. The module was developed to aid teachers in approaching the teaching of math to minority students in an uncommon way. Mathematic concepts focused upon the standards established by the National Council of Teachers of Mathematics. However, the instruction within each module was different from the standard way of teaching mathematics. Each mathematic concept focused upon integrating previously learned concepts such as addition, subtraction, multiplication, and division with new ways of approaching problem-solving skills. The web-based module allowed the learner to approach learning math concepts at his or her own pace. Also, the modules contained feedback during instruction, remedial instruction, and embedded testing to allow the learner to see where their problem areas exist. The teacher was also an integral part of the process. The goal of the web-based module was to aid in the teacher's classroom delivery of mathematics instruction. Further, the goal of the web-based module was to improve instruction, and change the way that minority students process information. The module was established to aid in smaller classes, where students can interact more closely with teachers, enhance learning, for the benefit of increased time on task. Also, the development of learning activities that takes less time

to master, and recontextualization, which often results in rapid learning, and allows more time for mastery of additional material.

The following recommendations were made after piloting the web-based mathematics module. The first recommendation was to update the module to effectively reach students who use English as a second language. The second recommendation was to duplicate the module for use with the National Science Standards. The third and final recommendation was to introduce the module to in-service and pre-service teachers to further bridge the gap with instruction for minority students.

Student Teaching Technology Sites: Creating Opportunities for Developing Technology-Using Educators

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Abstract: Student teaching is the capstone experience in teacher education programs. Schools and departments of education try to place student teachers in classrooms where cooperating teachers model excellent practice and encourage student teachers to develop as innovative young educators. A dilemma arises when colleges try to help student teachers develop skill using technology. There simply are not enough P-12 classrooms where teachers provide good technology-using models. Moreover, for many reasons many cooperating teachers are reluctant to allow student teachers to use new technologies. This paper will present a solution for ensuring that preservice teacher candidates will have rich opportunities to use technology during their student teaching placements. We will describe the process of developing *Student Teaching Technology Sites* (STTS) and will report on the first semester of implementation.

At the end of September, just a month into student teaching, we were already hearing the rumblings. Cooperating teachers from several of the schools with whom we have long partnered were awed. "Wow! They can do that?" "Can you teach me?" "What will I do when you leave?" Student teachers were heard complaining: "We need more equipment." "We HAVE to have another digital camera." "Where can I get another copy of *Timeliner*?" "You should see the great presentations my fourth graders did!" "This is a great web site to help your kids do research!" The conversations were about *teaching*, but were peppered with comments and questions involving *technology*.

The School of Education at St. Bonaventure University was the recipient of a PT^3 grant in the fall of 1999. PT^3@SBU is a focusing on helping preservice teacher educators become excellent teachers. We are working primarily with elementary education majors as they learn about teaching and about learning but we are infusing all of our courses with technology experiences, exposing preservice teachers to situations where they are learning in technology-supported environments and helping them to design similar learning experiences for children. The foundational beliefs of our project are three:

- Excellent teachers are those who understand how children learn and who know how to plan for and support that learning.
- Technology in education is not important in and of itself; it should support and enhance learning and teaching.
- Learning how to use technology appropriately in the educational setting can only be successful as an integral aspect of learning how to teach in general. We do not teach technology. We teach about children; we teach about teaching; we teach about learning. We help our candidates focus on effective ways of helping children learn.

During the past two years, as we have been working with preservice teachers, we have been helping them use technology as a regular part of their repertoire and we scaffold their experiences as they began to work with children

in learning environments enhanced by technology. The preservice teachers who were sophomores in 1999 – when the PT3 grant was received are now at the end of their undergraduate program, and ready for their capstone experience: a semester of full-time student teaching. These preservice teachers are the "products" of the curriculum and philosophical changes that have been fundamental to the work supported by PT^3. The SBU School of Education faced a dilemma: during the past two years, we had implemented significant curriculum changes focusing on requiring our students to use technology for their own work and in their internships. As we looked at placing them for student teaching, we were concerned about how to ensure that they would be in classrooms where the cooperating P-12 teachers would welcome and encourage the use of technology. We were confident that our candidates *could* begin to use technology appropriately, but we had to find adequate placements.

The Challenges of Student Teaching: An Administrative View

Student teaching is the capstone experience, the time when candidates finally get to do what they have been learning about. Every program that prepares teachers wants to provide top-notch classroom placements for student teachers, but the challenges can be many. For Schools of Education located in rural areas, one of the most pressing is location. In rural areas, public schools are few and far between. They are often small, offering limited numbers of classrooms with tenured teachers willing and able to act as cooperating teachers. It is imperative that schools close to campus not be overwhelmed, and so in order to provide every student teacher with appropriate placements, candidates often have to travel considerable distances from the University campus – often requiring a 60 to 90 minute commute for the student teachers.

It should be the goal of placement offices to find classrooms with quality teachers "having some combination of the following attributes: pedagogical knowledge, subject area content knowledge, skills and attitudes necessary for effective teaching, strong understanding of human growth and child development, effective communication skills, strong sense of ethics, and capacity for renewal and ongoing learning" (Cobb, Darling-Hammond, & Murangi, 1995). The reality is that this is not always possible. When there are large numbers of student teachers, there is a limit to how "choosy" the placement office can be, and so student teachers are often assigned to classrooms where they will have adequate experiences, but in placements that may be less than ideal.

Another challenge is providing adequate supervision for student teachers, especially in rural areas. Supervisors often have responsibility for a number of student teachers in different schools – often at some distance from each other. Supervisors, consequently, have little freedom to spend extended time with student teachers and rarely can provide the just-in-time supervision that may help a student teacher succeed.

Enter technology – a factor that exacerbates the student teacher placement dilemma. One challenge of preparing technology-using new teachers is that there are currently not enough classrooms where quality, technology-using teachers can model appropriate use of technology to support teaching and learning. The ideal situation would be to place student teachers in classrooms where they are encouraged (or even required) to teach using technology. The CEO forum argues that, "Wherever possible, student teaching and practicum experiences should be chosen for opportunities that will expose teacher candidates to: best practices in technology integration, a range of technology resources, and the design and delivery of instruction that incorporates technology as a learning and problem-solving tool" (CEO Forum, p. 10). As much as we would like to follow this advice, in many areas, it is still not possible. P-12 teachers who can expose their student teachers to high-quality technology integration remain rare.

The Challenges of Student Teaching: The Student Teacher's View

Preservice teacher candidates see student teaching as the ultimate experience. Their expectations are high; their anxiety even higher. Student teachers want to prove themselves; they want to try all they have learned about. They want to launch their careers. However, they are generally realistic enough to recognize that there are serious challenges facing them:

- being welcomed into a classroom that is not theirs, with children who have already established allegiances to "the teacher;"

- having the freedom to try things that they have learned about, but that may be new to their cooperating teachers;
- working within an existing learning environment, with resources selected by others;
- and, in the case of technology, being allowed to try to use tools unfamiliar to their cooperating teachers – who often can provide little support and less guidance.

We send our student teachers out with an understanding that they are guests in their host school, and that while they should try to implement as many innovative learning experiences for the children with whom they will work, the student teachers must also cede ultimate decision making about the learning environment to the classroom teacher – the one ultimately responsible for the children's learning. For example, while student teachers have been encouraged to use technology, it has been difficult to put into place requirements for the use of technology in environments where technology has rarely been used – and in schools where resources (both hardware and software) may be unavailable.

Meeting the Challenges: Our PT^3 Response

During the first two years of our grant, the faculty redesigned curriculum, assignments and field experiences for preservice teachers. We created a wide range of opportunities for helping our teacher candidates *learn about* technology, gain experience *using* technology, and begin to *develop learning experiences* and lessons enhanced by technology. Our candidates complete a year-long internship, during which their courses and field experiences are infused with technology. During those internships, many candidates became enthusiastic users of technology, and developed a number of technology-enhanced learning experiences for the students in their internship classes. We wanted to find a way to ensure that they would have opportunities to continue growing and to demonstrate their technology competence during student teaching. Our solution was to invite a number of local elementary schools to become *Student Teaching Technology Sites (STTS).*

Our idea of an STTS is quite simple and straightforward. We approached a small number of school administrators and asked them if they would like to participate in a program that would help increase technology integration in their classrooms. We assured them that if they participated, we would assign to their schools only student teachers who were ready, willing and becoming able to use technology in their teaching. STTS student teachers would be expected to work with their cooperating teachers to develop technology-enhanced lessons and learning experiences. They would be expected to use technology regularly during their student teaching placement. They would be expected to provide some "backdoor in-service" for their cooperating teachers, helping them learn to use new technologies appropriate for their classrooms.

We approached a number of schools geographically close to our campus. We wanted our STTS schools to be close to campus for three reasons:

1. this would provide incentive for student teachers to apply for placement in those schools;
2. it would allow us to go to the schools more often, providing in-service to the student teachers and the cooperating teachers,
3. student teachers would be able to get back to campus to access technology support before offices closed.

In addition, a number of the schools closest to our campus were reluctant in recent years to host student teachers, and we hoped that the technology emphasis would be incentive for them to become involved again in our program.

We let the administrators know that through the PT^3 project, the University would provide all STTS schools with access to:

- a mobile media cart – equipped with a high-end, internet ready laptop computer and a projector, a scanner, a color printer, a zip drive, an electronic microscope and a digital camera;
- licensed copies of a selection of software, to be selected in conjunction with the PT^3 staff;
- training for faculty in the use of the media cart, software and Internet;
- availability of a graduate assistant for "just-in-time" support and troubleshooting;
- a student teacher supervisor who would spend at least one full day per week at the STTS.

We asked the STTS schools to provide:

- two half days of release time for a core group of teachers for training;
- time at two faculty meetings (or at an inservice day) for training for the full faculty;
- commitment to provide seven student teaching placements each semester;
- commitment from the cooperating teachers to allow – and, in fact encourage – the student teachers to use technology in a variety of ways.

Semester 1: STTS Success

Four local elementary schools enthusiastically signed up to become STTS sites. The administrators were enthusiastic and the teachers – although perhaps a bit more cautious – were willing to take on this new challenge. And, although this was something that we put into place rather quickly (and long after student teaching applications had been processed), more than 15% of our student teachers applied for placements in STTS schools. We configured the media carts, made sure that each student teacher knew how and where to get support, and kept in regular contact with them.

One graduate assistant took on the task of sending an email stream with suggestions for using different types of software. There were regular visits to the STTS schools. What we observed was that the student teachers saw this as an opportunity, a challenge and a reward. From the start, they were serious about their commitment.

The student teachers used technology as a teaching aid, but they also let children use a variety of tools. This is one of the most positive results: technology was not just in the teachers' hands. They reported using an amazing array of technology applications – from using *PowerPoint* to play a *Jeopardy*-like game to helping 6th graders learn to take notes, having 3rd graders do research on mammals using the Internet and then creating a presentation, using *Inspiration* for starting the writing process, using *Kidspiration* to help kindergarteners learn to categorize.

As exciting as the student teachers' reports of their own successes were the reports the student teachers gave of the cooperating teachers' reactions. We heard innumerable stories like these:

> "When I was teaching one day, I heard my teacher start giggling. She was at a computer in the back of the room playing with PowerPoint – and she was having such fun. I taught her the day before how to use sound. I think it was a mistake! I kept hearing strange noises and then she'd laugh!"

> "I was in third grade. One day, all of the other third grade teachers came in to watch what I was doing. It was crazy having them all watch *me*!"

> "Everyone fights over the media cart. Even the teachers who don't have student teachers are using it!"

And in one STTS school, two student teachers were asked to plan and run an in-service day for the primary grade teachers teaching them to use the media cart and illustrating the kinds of technology-enhanced lessons they taught.

Looking Ahead

At the end of the semester, we asked the STTS student teachers for feedback. What should we do to improve this undertaking? Their responses came quickly. Some were not surprising:

- put another media cart in each school;
- give each school a second digital camera;
- add a video camera to the media cart;
- have software that was on loan only to STTS student teachers.

A few suggestions were so simple that we would never have predicted them:

- provide floppy disks – most of the STTS schools had used computers so infrequently with classes of children that there were not disks available for children to use;

- make sure that the Internet cables were really long – it was generally hard to position the media cart so that the cable reached the outlet *and* the projector was near a screen!
- find some way around the problems with the Internet filtering software (student teachers would prepare lessons when on campus – where there are no filters; when they got to their schools, what they thought were great Internet sites were often blocked).

A Promising Model

We believe that we have addressed one of the main criticisms voiced in the 1995 Office of Technology Assessment (OTA) report that "most technology instruction...is teaching about technology...not teaching with technology across the curriculum" (OTA, 1995, p. 165). We have simply required our students to use technology. It's not talked *about* a lot, it is just part and parcel of the everyday life in their education courses. They have to use a wide range of technology tools for their own work; if they are to be successful in their internships, they have to use technology as they teach and they have to involve children in the use of technology. As a result, we are beginning to see new teachers use technology as an everyday, non-intrusive tool. These young teachers have begun to internalize technology as a tool – it is not *new*, it is not *unusual*, it is just *there*...something to be used to support learning.

For a long time now we have been involved in helping practicing teachers become familiar with technology – from learning to use new tools themselves to learning about curriculum applications. During in-service workshops, graduate courses and other such sessions, teachers have argued that it is much harder to teach using technology. They do not usually deny the potential that new tools may have, but they invariably point out that it makes their day-to-day teaching harder. And so perhaps the biggest surprise of all came when we asked our STTS student teachers to reflect on how using technology had affected their teaching. "Is it harder to teach this way? Does it make your planning harder? Does it make the day more difficult?" *"Of course not,"* replied one student teacher. And the others all agreed. *"I can't imagine how hard teaching would be if I didn't have technology tools."*

Perhaps the tide has begun to change.

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Letting Technology Support Learning: Preservice Teachers Design Technology-Enhanced Learning Experiences

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Abstract: St. Bonaventure University was a 1999 recipient of a PT3 grant, and we have used the funds to support major changes in our curriculum. Specifically, we now require our preservice teachers to design and implement technology enhanced learning experiences for the students they work with during their internship year and during student teaching. This paper explains the process involved in curriculum change, and explores the success and problems we have encountered. It focuses on the kinds of technology-enhanced experiences our preservice teachers have designed and implemented. Project descriptions and sample lessons are discussed.

Introduction

Elementary teacher education at St Bonaventure University is based on a professional school model that places our undergraduates in local elementary schools for large blocks of time during their teacher preparation program. We believe that preservice teachers learn the art of teaching best through guided practice under the watchful supervision of both university and school-based faculty. Taking example from the medical and legal professions, the professions development school puts teacher interns in actual classrooms where they put the theory learned in university classrooms into practice with children. As we complete the fourth year of this field-based program, we are seeing that, indeed, our new graduates are better prepared to take on the job of teaching in classrooms of their own. This change is evident in our student teachers and in reports from student-teaching supervisors and from cooperating teachers. They report on more mature, confident and proactive student teachers. We are getting reports from school officials who have hired recent graduates and again the report is of confident and proactive new teachers. The implementation of this new program was difficult and required complete curriculum revision; the results, however, show that the effort was well worth it.

The core of our program is a two-semester internship (locally referred to as "Field Block 1 "and "Field Block 2"), during which a cohort of 15 to 20 preservice teachers and two university professors spend two days a week in a PDS site. During those days, students take a 9-credit hour block of theory and pedagogy courses and spend at least half of each day working in an elementary classroom – observing, planning, and teaching. While the interns are in the elementary classrooms, the university professors provide just-in-time supervision, helping the interns with the challenges they face as they learn to teach. This just-in-time approach to preservice supervision is proving to be very effective in all circumstances, but is especially crucial as we require that the interns become technology-using new educators.

Setting the Stage

Two years ago, when we were awarded a PT3 grant, it allowed us to act on what we knew was missing from our newly designed PDS-based program: proficiency in the use of technology. Our curriculum was designed to help our preservice candidates achieve the necessary competence to meet the INTASC standards. The PT3 initiative allowed us to again revise our curriculum, this time adding new experiences that would enable candidates to achieve the competence required by the ISTE standards for classroom teachers.

The redefined program goal was to help preservice teachers develop into excellent new teachers who would use technology as a standard part of their repertoire. For that to happen, they must be able to experiment with a variety of technology-enhanced teaching situations during their field experiences. They must participate in a learning environment where they and their students are using technology in a variety of ways to enhance the teaching and learning process. This might be easy if the classroom teachers with whom they would work during their field experiences were modeling such use for them, and if they could see lessons and activities that incorporated a range of technologies. However, in most cases that just was not happening. During their preservice field experiences, teacher education candidates typically have few role models in the public schools who use technology effectively to support children's learning.

The PT3 grant gave us impetus to examine our program and identify an appropriate sequence of technology learning experiences for the preservice teachers with whom we worked. We began by requiring our students to become technology users themselves – users of basic technology tools for their own productivity. We then identified hardware and software appropriate for classroom use, and the PT3 grant provided the means to acquire those tools. At the same time, because our program was already field based, we were able to develop technology-rich experiences for our preservice teachers that they could then try out in real classrooms.

The PDS sites – our PT3 partners – have evolved into ideal laboratories where our preservice teachers can learn about technology. The schools were all in the very beginning stages of using technology, and there were few resources available for our students to use. We equipped each PDS with a media cart configured with a laptop, projector, printer, scanner, zip drive, and digital microscope. We also provided a digital still camera and a video camera. After one year, these media carts were getting such heavy use that we have now outfitted a second, "minor" cart – with laptop and projector – for each school and a second digital camera. On each laptop, we have installed a number of software packages appropriate to the courses the preservice teachers are taking (for example, they study language arts and social studies methods in Field Block 1 and science and math methods in Field Block 2). We also provided copies of a number of software programs that could be used on the increasingly available classroom computers.

Teaching as They Are Taught...and as They Are Taught to Teach

We want our interns to be teachers who will take advantage of new technology to make their practice as efficient and effective as possible. If we believe that teachers teach as they were taught, then we might be resigned to fighting the battle to change educational practice generation after generation. Most of today's preservice teachers did not use technology when they were in elementary school – and did not see their teachers using it. We are convinced that we can create a sea change by combining the PDS approach to preservice education with an overt effort to model the use of technology in preservice courses. Our interns witness technology being used in instruction on an almost daily basis in their university classroom at the PDS.

During the Field Block semesters, university faculty model a variety of approaches to using technology in the classroom. For example, in the course on Developmental Reading, a professor might use *Inspiration* to model the use of character webs as a method to help children develop reading comprehension skills. During a science methods course, professors and candidates together might use a digital microscope to examine fruit and vegetable peels. During a Social Studies methods class, candidates use *National Inspirer*

to enhance their own learning about US geography and resources, and then plan how best to use software of that genre as they study elements of cooperative learning.

As they take their methods courses where the professors model technology integration, during each of the two internship semesters the students are required to plan and implement a technology-enhanced learning experience for children. Each intern is assigned to a classroom for the whole semester, so as part of getting to know the curriculum, they are required to plan a project that is integrated with what the children are learning – finding a way to support and enhance children's learning by using technology. The project cannot be an "add-on" activity. The second requirement is that the *children must be the users of the technology*. Simply presenting a lesson where the teacher uses *PowerPoint* or *Inspiration* will not suffice.

Putting It into Practice

This is all not quite as easy as it sounds. It might be easier if we were teaching our methods courses in a traditional mode, where preservice students were in campus-based classes, carrying out peer-teaching lessons and designing activities and units that never really got tested in classrooms with children. But we were requiring interns in actual elementary school classrooms to negotiate with teachers so that they could use technology as they learned to teach. Most classroom teachers, if they are using technology at all, use it to support their own work, and have not ventured into designing learning experiences where children are using technology. Teachers in our partner schools *do* use email and word processing, and they are increasingly using digital cameras and printing out pictures for projects and bulletin boards. But they *do not* use technology as a regular tool to support and enhance teaching and children's learning. The children in many of our partner schools use *Accelerated Reader* and in some schools they are using courseware such as *SuccessMaker*. In most cases, however, children are working alone when using these applications. The teacher is rarely involved. More importantly, teachers rarely plan learning experiences where children use technology to construct knowledge in creative ways. If technology is used, it is used to enhance teaching rather than by students to create learning. Rarely do teachers and children use technology together to explore as they learn.

Curriculum-based Technology Projects

Among the many decisions we faced as we implemented this new approach was one of timing. Should we phase in new requirements or should we jump in, sometimes requiring our preservice students to do things with less than optimal preparation? We opted for the latter – believing that it was important for all of our candidates to get as much experience as we could give them before they graduated. Consequently, projects developed modestly in the first two semesters. During that time, interns with limited previous exposure to the use of technology in the classroom struggled with their own understanding of technology and its place in the teaching-learning dynamic. They were struggling with their vision of technology as tool for production and as tool for teaching and learning. They struggled with the decisions surrounding the scaffolding of children's use of new tools. These struggles were all colored by their own experience as learners and by their very limited experiences as teachers. As a result, most of the early projects might be considered "simple" applications of technology:

- Children created class yearbooks with digital pictures short stories about each other. These were printed using color printers and bound.
- Children used *Inspiration* to create character maps about the main characters in the novels they were reading.
- Kindergarteners used *Kidspiration* to create an "All About Me" bulletin board.
- Fourth graders created book-tape packages of popular stories and presented them to the school library.
- Third graders used *Timeliner* to create biographies – from the point of view of the year 2020.
- Fifth graders followed up the study of U.S. natural resources with a rousing game of *National Inspirer*.
- Fourth graders wrote letters to the editor of the local paper about Veterans' Day using a word processor.

Over the past year, the interns have been arriving in Field Block with a richer background – having completed the newly designed core courses in our program, now enriched with technology. The projects they design are showing more sophistication in terms of technology application and in terms of curriculum integrations. We believe that the latter is due to the fact that because they have more understanding of technology they can spend more time thinking about curriculum and less about technology. Typical projects now include:

- Children working in cooperative groups while studying Native Americans, with one writing the tribe's history using *Storybook Maker*, another creating a timeline, a third creating a map of the tribe's location and a fourth using *Community Construction Kit* to develop a scale model of the tribe's village.
- Fifth graders developing a retrospective timeline of their journey through elementary school, to use at their "moving up ceremony."
- Third graders interviewing each other, videotaping the video and then creating an interactive online yearbook using *HyperStudio*.
- Second graders using the Intel microscope to examine plants as part of a unit on plant growth.
- Fourth graders acting as roving photographers, capturing the daily life of their school with a digital camera and creating a hallway display – changed daily – illustrating the things that they think are important in their school.
- Third graders producing a *HyperStudio* stack for parents' night that chronicles a day in their classroom. This presentation presents recorded sound interviews with teachers and students, digital photos, scanned images of student work, and digitized video.

Lessons Learned

If it can go wrong it will. Some days we think **that** should be the primary lesson we teach our preservice teachers -- because when novices are using technology, inevitably things do go wrong. One of our goals is to get the focus away from the technology and on to the curriculum. In so doing, however, we run the risk of treating the technical aspect of using technology too lightly. What have we learned? A lot. We have learned (for the millionth time) that you can never assume that novices will test things out. We have learned that plugging in equipment is not intuitive. Here are a few lessons:

- Teach interns to always test all equipment before the children arrive in school. Then test it again.
- Test access to Internet sites in the classroom where you will be teaching (not from home, not from the teacher's work room). Most schools use filtering programs; many have different levels of filtering set at different locations in the building.
- Don't just test the hardware and software. Test locations! Make sure that you can locate the project close enough to the screen so that the image size is reasonable. Make sure your cables and electric cords are long enough.
- Test the actual program, application or presentation using the computer you will use during the lesson. A presentation prepared on a high-powered computer in the university lab may not run very effectively on a less powerful computer in the school!
- Plug in the equipment. Laptops run on battery, but nothing else does. After moving the media cart, plug it in and reboot the laptop (the zip drive will not be recognized if it is not powered at bootup).
- Try out the software. Use it extensively. Know how it works – you have to anticipate the questions children will ask and they things they will try to do.
- Know how to end the program. (Quitting is not always easy!)

Does It Work?

To help preservice teachers develop proficiency in the use of technology for teaching and learning, it was not sufficient to add course requirements to our program. Rather, we had to seek ways that required our interns to use technology in their professional practice. Those of us who work with new technologies know that proficiency with new tools is not gained solely from reading about their use or by hearing others talk

about the new tools. Therefore, simply adding a course in technology for teachers was not sufficient; we knew we had to add technology-enhanced experiences for our students. Real proficiency is gained when we begin to actually use the new tools for our own projects. Initially we added assignments at each level that required the active use of technology during fieldwork. We require candidates to do software reviews, to produce *HyperStudio* stacks, to use such programs as *Inspiration* and *Timeliner* during their teaching, to use digital photography and video for assignments, to use the Internet as part of lesson delivery, to submit assignments via email, and finally to develop an electronic portfolio during their internship and student-teaching semesters. All of these assignments have produced a growing expertise among our preservice teachers as users of technology for personal and professional work.

Comfort, however, often leads to complacency; when we found that the majority of our interns were comfortable with one set of new tools, we knew it was time to once again push the level of understanding by demanding more complex use of technology during their internship semesters. We wanted to move from the understanding of technology for teaching and learning at the knowledge and application levels of thinking to the higher levels of understanding required of those who analyze learning environments and then design new learning experiences. This would require interns to synthesize knowledge of learners, learning environments, and technology. The complex dynamism created as new teachers push their level of understanding on several dimensions at once is indeed a rich learning environment for both new teachers and the students with whom they are working. Just as these new teachers were feeling comfortable with their understanding of classrooms and the children in these classrooms, they were being pushed into disequilibrium by the requirement that they carry out a technology project that required them to involve children in the actual use of the technology. Even in times when children commonly interact with technology in their homes via computer games, DVD players and such, it is still not common to permit these same children to move into the world of technology in the classroom. As our interns began implementing newly designed projects that introduced children to new software and hardware, a wave of change has begun in our professional development schools. This change has gone beyond the interns and their students to their cooperating teachers, the teachers in classrooms nearby and to the administration of the schools in which they work.

The Clinical Faculty – the P-12 teachers with whom our interns work – are now suggesting new technology projects for the interns to take on. Many are trying some technology integration on their own – and are asking interns for help. The interns who are working with fourth graders this year have noticed that the many of children do not need to learn how to use the digital camera, for example, because the they learned from the interns who were in their classrooms last year. Children in the classrooms in our PDS sites have been exposed to a wide variety of hardware and software tools – and they are beginning to produce amazing products. Older children have produced book-tape packages for children in earlier grades; others have used video to produce school newscasts including local weather reports, producing town plans that include actual pictures of local business and buildings and eventually printing large-scale maps of their local communities. One multi-age first-second grade class adopted Engine Company #1 in New York City and produced a video and a book to send the firefighters. In every case, preservice interns have planned and developed these activities, have tied these activities to local and state standards and local curriculum, and have helped children create amazing products. The interns were learning to teach using technology and children were learning to read, write, compute or problem solve in technology enhanced learning environments.

This is appropriate use of technology in preservice education: mediating the learning of elementary students, preservice teacher candidates, elementary teachers, and college faculty, all at different but appropriate levels, creating true learning communities.

Acknowledgements

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"You purchased the software, now what?" Plan, Implement, Evaluate and Reflect on Software Usage in the Classroom.

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Valley City State University (VCSU) is a small, liberal arts campus in North Dakota. In 1996, the university became the second notebook campus in the nation. All students and faculty are issued a notebook computer and many of the classrooms on campus are networked for the use of computers and Internet connections. This technology literate campus provides an environment conducive to incorporating software programs into the teacher education methods courses. In addition, the University was awarded a PT3 grant further enabling the preparation of technology-proficient teachers.

This PT3 grant (Preparing Tomorrow's Teachers to use Technology) was awarded during the 2000-2001 school year in order to train inservice and preservice teachers to use technology in their classrooms. Three goals of the grant are that preservice teachers will: 1) meet NETS and NCATE standards 2) be provided with technology experience in the K-6 classroom and 3) be able to use technology to help their future students improve learning by developing complex reasoning and problem solving skills.

Collaborative workshops are held to train in-service teachers in a variety of software programs and give ideas for their use in the classroom. Participants include VCSU's Education Department faculty, in-service teachers from grant partner schools and technical support from a statewide Center for teacher training. This Center provides statewide training and consultation for teachers at all levels.

University courses provide students with an opportunity to utilize a variety of software programs and ideas for classroom use through various field experiences. Under the supervision of a University faculty member, the preservice teacher and the K-6 teacher participate in collaborative technology projects designed to develop higher order thinking skills in children. These projects reflect current best practices and VCSU's Teacher Education model incorporating planning, implementing and evaluating. The software program is implemented into the methods courses followed by classroom application. Three specific software programs used are "*Choices, Choices*", "*Kid Pix Deluxe 3*" and "*Storybook Weaver*".

Elementary Science Methods provides an opportunity for preservice teachers to view a variety of materials. One of the commercial products previewed is the CD-Rom simulation "*Choices, Choices – Kids & the Environment*" and its' accompanying handbook. *Choices, Choices* is based on an award winning series called *Decisions, Decisions* available from Tom Snyder Productions. Implementing the simulation aids the development of critical thinking skills through application, prediction, weighing options, and evaluation. Preservice teachers collaboratively develop a scoring rubric for reviewing all materials. Upon completion of the rubric the preservice teacher reflects on the application of the materials in an elementary classroom and considers the National Science Education Standards, inquiry, learner needs, planning and implementing. Knowing about various materials is useful, but knowing does not insure doing. Implementation is promoted through a tutorial developed to assist the preservice teacher in planning for the implementation of *Choices, Choices – Kids & the Environment.* The tutorial incorporates activities to prepare the teacher for the simulation, as well as possible activities to use with the K-6 student during the simulation. Templates for planning and student project scoring rubrics are also included in the tutorial to aid in evaluation. The preservice teacher acts as a bridge and provides assistance to the inservice teacher as they collaborate in delivering the Science based information.

In the field of Early Childhood Education, using computers in the classroom allows children the opportunity to gain experiences with technology as well as support the curriculum in a meaningful way. A challenge to the early childhood professional is finding software that promotes computer literacy without inhibiting creativity. Teachers seek materials that are developmentally appropriate and stimulate the young child's ability to use higher order thinking skills of organizing, summarizing and responding. A software program that is frequently cited as meeting the above criteria is *Kid Pix (*available from The Learning Company), which has been part of early childhood programs since its release in 1991. The teaching possibilities are numerous and varied. *Kid Pix* helps the young child build self-confidence and cultivate their natural creativity. At Valley City State University, preservice teachers are introduced to the software

in methods courses and allowed opportunities in field experiences to work with multi-age children in a variety of classroom settings from kindergarten to fourth grade. With the introduction to the tools of *Kid Pix*, children and preservice teachers can create an array of projects that fit all areas of the curriculum. Preservice teachers act as mentors for the children in designing unique finished projects from original illustrated books to slide show presentations. *Kid Pix Deluxe 3* is the newest edition of the software program. Valley City State University education students have access to this latest edition of software and work closely with inservice teachers in selecting projects, which would cultivate children's natural creativity and reach their creative potential. Preservice teachers, inservice teachers and university instructors collaborate on ways that the projects children create will be evaluated.

Valley City State University provides a number of opportunities for students to learn about teaching Language Arts. In Methods and Materials of Language Arts II students are provided with experiences to view and use the software program *Storybook Weaver Deluxe*, also available from The Learning Company. This software program allows students to be actively involved in the writing process. It includes a simplified word processing program and a variety of graphic features that make illustrating stories fun and easy. *Storybook Weaver Deluxe* can be used to provide an introduction to writing for some and an opportunity to express one self in an enriched environment for others. Preservice teachers view the software and brainstorm ways that this program can be implemented into the elementary classroom. They also evaluate how this software can be used with the Standards for Language Arts. Preservice teachers that are working in a field experience can use the software with elementary students, come back to the methods class to discuss how it was implemented and reflect on methods for improvement. The goal is for the preservice teacher to generate ideas for implementation of the software and leave the cooperating teacher with the ability to continue using these ideas in the future.

As a notebook campus, Valley City State University produces teachers who are technologically proficient. This alone, however, does not ensure that teachers are able to successfully implement these technology skills into a classroom setting. The methods courses and software mentioned allow the preservice teacher to make decisions for planning and to use reflective problem solving skills while implementing these projects in a classroom setting. The collaborative efforts provided in the PT3 grant workshops ensure that evaluation and revisions take place in a supervised setting. All participants addressing reflection and evaluation assist in improving utilization of software. The end product is a learner-centered environment where K-6 students and preservice teachers, as well as inservice teachers learn by doing.

Exploring Digital Equity Using Digital Video Case Methodology

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A major challenge faced by teacher education faculty is the infusion of technology and creating the highest quality learning environment possible. The use of digital video case methodology is a viable instructional approach to meet the learning needs of tomorrow's teachers. Inspired by the dedication to bridge the digital divide and provide high quality learning opportunities to preservice teachers, the National Educational Technology Standards (NETS) Digital Video Library (DVL) incorporated a digital equity expert commentary feature into its collection. A PT3 consortium led by Arizona State University is developing the NETS DVL. The online DVL shows video of teachers and teacher education faculty using technology in the classroom. The collection of digital video lessons are based on the NETS for Students: *Connecting Curriculum and Technology* (2000) and the forthcoming NETS for Teachers: *Preparing Teachers to Use Technology*. Carefully developed to address the NETS for students and teachers, the DVL lessons represent technology as an integrated component to reform-based curricula. PT3 community and digital equity leaders will provide expert commentary.

This presentation describes and demonstrates the possibilities of meeting the learning needs of preservice teachers by framing the infusion of technology into curriculum and instructional practices with a digital equity perspective. Members of the NETS DVL team will demonstrate and discuss the lesson commentary engine created to develop the collection of NETS-based lesson activities and demonstrate its use as a tool for digital video case-based instruction.

Two Perspectives on NETS as a Framework for Change in PT3

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Abstract: Through the program Preparing Tomorrow's Teachers to Use Technology (PT3), teacher educators increase their understanding of the effectiveness of instructional technology and how best to prepare new teachers to be accomplished users of technology. This paper discusses two PT3 grantees' approaches to professional development, where each implementation uses the National Education Technology Standards (NETS) in different ways. The purpose of the discussion it to point out the role of NETS in guiding a PT3 implementation to conform to a set of nationally recognized standards, without constraining the teacher preparation program unduly or compromising its existing standards of excellence.

Introduction

The program Preparing Tomorrow's Teachers to Use Technology (PT3) is consistent with the belief that effective use of technology for teaching and learning should be an integral part of teacher preparation programs. Understanding the uses of various instructional technologies and their potential to transform teaching and learning requires modeling by teacher educators and guided practice by preservice teachers in classroom settings. The difficulty is that many teacher educators and mentor teachers have little or no understanding of the power of instructional technology and are themselves only novice users of technology for professional tasks. Professional development for integrating technology in the curriculum may begin with developing new skills, but much more is needed than offering inservice workshops and classes on how to manipulate a particular software application to produce a result (OTA 1994; LeBaron & Collier 2001). How can teacher education faculty acquire the expertise to prepare preservice teachers to use technology effectively; how can they insure that mentor teachers in their professional development schools are modeling technology effectively; and how can they assess their students' use of technology unless they know what "effective use of technology" looks like? PT3 provides funds and support to address that dilemma. The support includes a comprehensive, timely, and thoughtful set of standards for demonstrating effective use of technology in professional practice and in the classroom.

For those providing professional development to teacher educators and K-12 partners, the National Educational Technology Standards (NETS) represent a graphical organizer that summarizes the technological skills, tools and techniques deemed valuable in teaching and learning. NETS are the result of an ISTE initiative funded by the United States Department of Education's PT3 grant program, developed with contributions from Apple, Milken Exchange on Education Technology and a consortium of distinguished NETS and PT3 partners and contributors (ISTE 2000). Supplementary materials, including exemplary lesson plans, templates, and teaching strategies, are also available in materials like *NETS-S/Connecting Curriculum and Technology* (ISTE 2000). Significant acceptance of the NETS across the country is helping teacher preparation programs to focus their instructional technology efforts on those technologies and their uses that will most benefit the K-12 teachers as they integrate technology into their curricula.

Each PT3 grantee fosters a partnership between teacher education faculty and K-12 teachers and, in that context, decides how those standards can best be implemented. As a result of the partnership and its associated professional development, K-12 teachers come to understand what technologies can help their students improve their critical thinking and problem solving skills and best prepare them for the workplace and for lifelong learning; at the same time, teacher educators increase their understanding of the effectiveness of instructional technology and how best to prepare new teachers to be accomplished users of technology. This

paper discusses two PT3 grantees' approaches to professional development, where each implementation uses the NETS standards in very different ways. The purpose of the discussion it to point out the role of NETS in guiding an implementation to conform to a set of nationally recognized standards, without constraining the teacher preparation program unduly or compromising its existing standards of excellence.

Two Experiences with Implementation

The discussion focuses on two implementations of PT3 with the intention of showing how NETS can facilitate very different approaches to technology infusion in pre-service education. The first example is Notre Dame College in Manchester, NH, in its second year of a PT3 grant. The second is the Warner Graduate School of Education and Human Development at the University of Rochester, which is in its first year of implementation.

Notre Dame College in Manchester, New Hampshire, was invited by the New Hampshire State Department of Education (NHDoE) to participate in the three-year PT3 grant the state was awarded in the Fall of 2000. The timing was fortuitous, as Notre Dame had received a federal grant the year before that provided laptop computers to all faculty throughout the school. The Division of Education faculty were eager to begin serious investigations into how to use their new computers and how to apply them to their teaching. Partnered with Apple Corporation on the grant, the NHDoE supported the PT3 emphasis on the use of NETS as a guiding force. Notre Dame responded by revising their existing courses in instructional technology in line with the standards, and delivering professional development for faculty that also aligned with those standards. Faculty began modeling the use of technology in their instruction in existing education courses, and discussions are underway to revise the preservice teaching preparation program more fully into alignment with the NETS.

The University of Rochester's Warner Graduate School of Education and Human Development applied for and was awarded a PT3 implementation grant in 2001. The Warner School's approach to technology infusion is different from Notre Dame's. In developing its PT3 proposal, the Warner School wanted to shape its PT3 implementation in line with its role as a research school of education. The Warner School, which had no existing courses in instructional technology, regarded technology infusion as a systemic reform effort. The Warner School's instructional techniques emphasize inquiry and critical questioning, an excellent match for technology application (Jonassen 1999; Grabe 2000). In the Warner School implementation, each faculty member prepared an individual professional development plan for technology that addressed professional and research use of technology, integration in methods classes, and development of demonstration sites in area school where preservice teachers can observe exemplary application of instructional technology. Teacher education faculty committed to partnering with technology-using teachers in area schools to develop subject-specific courses on teaching and learning with technology. Warner School teacher education faculty benefited most from NETS as a framework that represents the "big picture" of technology and that articulates the national performance standards against which its preservice teachers and preservice program would be assessed.

Notre Dame College's Use of NETS for PT3

When addressing increased use of computer technologies in the schools, Notre Dame College in Manchester, New Hampshire believes it is important to put their use into a context that brings understanding as to why those particular technologies are supporting education. The invitation by the New Hampshire State Department of Education (NHDoE) for Notre Dame to participate in the three-year statewide PT3 grant aligned with the readiness by the Division of Education faculty to begin serious investigations into how to use their new computers and how to apply them to their teaching. During the first year of the PT3 grant, five integration meetings with the faculty and K-12 partners were conducted by the NHDoE personnel and an Apple Corporation consultant, all of whom supported the PT3 emphasis on the use of NETS as a guiding force. Additionally, an introduction to Apple's Evolution of Thought and Practice model (Sandholtz Ringstaff & Dwyer 1997) brought an appreciation that all participants were at different stages in their understanding of technology use for instruction. Faculty also saw that with each new technology addressed, the cycles of Entry Level, Adoption Level, Adaptation Level and Appropriation Level would be repeated. This reduced apprehension as colleagues recognized they were at the higher levels with some technologies and even the 'experts' were at entry levels with other technologies.

Participation in the PT3 grant by Notre Dame faculty was higher than most colleges statewide. Professional development meetings were hosted on campus once a month on Wednesdays, a day the faculty were already required to be on campus for late afternoon college meetings. All but one faculty member from the division were actively engaged in the grant; one member was on sabbatical.

Technology experience varied greatly across the twelve Notre Dame participants. Two had extensive backgrounds; two knew only word processing and electronic mail. To facilitate professional development, weekly sessions were offered. The instructor for the Technology Applications for Educators courses, who also served as the PT3 project liaison, offered two-hour work sessions for the faculty each week on Wednesday mornings. The initial technology stressed was Microsoft PowerPoint® and Inspiration®. The instructor also reviewed the remaining applications within Microsoft Office®, introduced faculty to Blackboard® and HTML, and provided consulting on any effort faculty memb ers were engaged in with technology.

Attendance at professional development sessions the first year was strong. By the beginning of the second year of PT3 participation, the attention shifted from skills development to implementation. Faculty continued to increase their technology use, attending professional development workshops when they could, and engaged more actively in exploring changes within the preservice program to better equip the preservice teachers to use technology in their teaching.

Notre Dame consciously organized and delivered professional development for faculty that aligned with NETS-T and NETS-S. As a result, faculty became aware of the standards as they began modeling the use of technology in their instruction in existing education courses. At the same time, the Technology Applications for Educators courses, required of all preservice teachers, were reorganized around NETS, giving preservice students a thorough introduction to the standards. By year two, faculty began discussing the revis ion of the preservice teaching preparation courses more fully into alignment with NETS. The expectation is that syllabi will identify what technology modeling and student use will be taking place in each course, and all NETS standards will be addressed throughout the preservice preparation program.

Several ingredients contributed to success in the Notre Dame PT3 implementation:

- faculty ready to address technology integration
- common time available for workshops and discussions
- equipment and software available to each participant
- professional development opportunities in relevant tools and uses
- continual support from a technology-savvy individual working with faculty and encouraging new direction
- significant support from the division dean
- the PT3 grant to serve as catalyst and rallying point.

As with the University of Rochester implementation below, the PT3 grant itself brought focus and a sense of deadline, and the NETS documents provided the structure and criteria for assessment necessary for good course development.

University of Rochester's Use of NETS for PT3

The University of Rochester's Warner Graduate School of Education and Human Development applied for a PT3 grant in 2001. The school felt compelled to infuse technology in all of its departments—Teaching and Curriculum, Educational Leadership, and Counseling and Human Development. Technology infusion represented systemic change for the school, driven by several external forces that demanded technology integration. These included New York State recertification of teacher preparation programs, NCATE accreditation, and CACREP accreditation.

A PT3 Implementation Grant was awarded in July 2001, and a doctoral-level instructional technology specialist was hired to facilitate the school's efforts with technology. A series of professional development offerings were planned, and relevant documents and resources were assembled, including copies of NETS-T and NETS-S for Teaching and Curriculum (ISTE 2000), the draft TSSA standards for Educational Leadership (ISTE 2001), and technology standards for Counseling and Human Development (CACREP 2001). At an all-day institute in September, faculty from the three departments viewed and discussed a variety of approaches to teaching and learning with technology. One structured discussion asked small, cross-department groups to focus on their respective technology standards, guided by the question, "What is a technology savvy educator by

Warner standards?" Faculty recognized the importance of technology skill mastery and embraced the use of technology to promote high-order thinking and a sense of professional community. They also insisted that professional preparation include grappling with the digital divide (PT3 2001), a serious concern in the high-needs Rochester City School District. Throughout the discussion, faculty referred to the standards for their own department and for the other departments, noting and reconciling differences. Faculty acknowledged that their respective programs would be assessed against the standards and agreed to incorporate the standards in their courses.

As a next step, each faculty member worked with the instructional technology specialist to develop a realistic, challenging technology plan, in which they committed to integrating technology in their courses, their research, and their professional/administrative role. Teaching and Curriculum faculty who taught methods classes also agreed to revise courses and develop new courses that highlighted the use of technology in content area teaching and learning. They further agreed to partner with technology-using educators in area schools to develop demonstration sites for preservice teachers to observe best practice with technology. "Best practice" was defined in terms of NETS and instructional innovation, in keeping with the Warner School's emphasis on excellence in teaching.

It is expected that as new courses and course modules are rolled out, students will assess their knowledge and performance against the standards, cast a critical eye on technology implementation in schools, and reflect on teaching practices that incorporate technology.

Conclusion

NETS provides a framework for assessing preservice teachers and teacher preparation programs with regard to technology knowledge and integration. Each preservice program is free to use the standards in a manner consistent with its own emphasis. Notre Dame explicitly uses NETS-S and NETS-T in its course descriptions and syllabi. The University of Rochester uses NETS to guide student assessment and program development, while emphasizing innovative teaching, critical questioning, and social justice. In our experience, the standards provide a framework for technology infusion in complex, rigorous teacher preparation programs without constraining or compromising the excellence of the programs.

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BRIDGING THE GAPS: USING TECHNOLOGY AND OTHER GRANTS TO HELP ENGLISH LEARNERS SUCCEED

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The California student population has recently become ethnic majority. For this reason, immediate steps need to be taken to improve delivery of instruction to EL's (English Learners). Now, if you take three parts ELDPI, two parts PROJECT TNT (a PT3 project which is partnered with StarTEC), one part PROJECT EXCEL, and one part PROYECTO ALIANZA, you have an incredibly effective staff development component (or recipe) to assist teachers who work with English learners and to ensure the success of those learners.

This article will discuss all four grants, their components, intended objectives, and how, in collaboration with one another, they provided teachers with instructional strategies, assessment strategies and technology to use in the classroom. The product of this collaboration effort assisted teachers to implement strategies which have effectively impacted the success of the English Learner. The "best practices" video clips, which are the culminating activity for this collaboration effort, are the most advanced form of professional development in the field at this time.

THE GRANTS:

ELDPI:

ELDPI (English Language Development Professional Institute) is a California state funded project from the University of California President's office, with collaboration from the California State University at Bakersfield (CSUB) and the Kern County Superintendent of Schools Office (KCSOS), along with various school districts. This Institute is held for one full week during the summer, along with five follow-up sessions during the school year. The purpose of this Institute is to educate teachers, administrators, and paraprofessionals in ELD (English Language Development) and SDAIE (Specially Designed Academic Instruction In English) instructional strategies, along with assessment techniques and instruments, and implementation of the California State English Language Development Standards (ELD standards) in their classrooms. Participants are given an overview of the ELD standards, an overview of assessment techniques (in the ELD, Math, Science and Social Studies subject areas), and then many sessions on instructional strategies which they can use, all specific to grade levels 4-12 (4-6, 6-8, 9-12) and content areas, including ELD.

After the annual summer Institute week, follow-up sessions for the ELDPI include home to school partnerships, more strategies and a heavy emphasis on using technology; in particular, participants create personal electronic portfolios and reflect on the effectiveness of the instructional strategies used in their portfolios. The application of strategies learned, (electronic portfolios), is a crucial part of the staff development process, as school teams implement their instructional improvement plan (designed at the Summer Institute) and reflect on how well they are delivering instruction to English Learners (EL's), and how their students are performing in the class. The most effective electronic portfolios ("best practices" videos) are posted on the CSUB TNT website (http://wwwprojecttnt.com). By the end of the school year, participants have often reported a remarkable increase in student performance and in their ability to improve delivery of instruction to EL's.

Two of the project directors, Drs. Borrego and Hirai, from CSUB (California State University, Bakersfield), along with Javier Arreygui (an ALIANZA student), worked this past summer to encode some of the best practices displayed during the week-long Institute (2001). This includes video clips from keynote speakers, as well as teachers and consultants teaching effective instructional strategies to use with the EL student. These video clips can be viewed on the Project TNT (PT3) website, (see above), Learning Circle 3, "OLLE" (Online Language Learner Educators).

PROJECT TNT:

Project TNT (Teaching With New Technologies) is funded by the US Department of Education and it emphasizes "Creating a Technology-Friendly Culture in Today's Schools." StarTEC, Staff Teacher and Restructured Technology Education Consortium), another grant funded by the US Department of Education, is partnered with Project TNT and purchased training and equipment for TNT. Project TNT concentrates on developing "best practices" video cases which will showcase teachers using effective instructional strategies with EL students and with students in other content areas. Many of those teachers are participants of the ELDPI Institute. This project provides the equipment (cameras, lights, microphones and most importantly, "ibook" laptop computers with video editing equipment) which is used by participants to create and edit these videos. Also important to note is that Proyecto Alianza, a grant funded by the Kellog Foundation to assist certificated teachers from other countries (primarily Spanish speaking) obtain their California Teaching Credential, also collaborates with Project TNT.

PROJECT EXCEL:

Project EXCEL (Excellence in Curriculum for English Learners) is a partnership with the Kern High School District to assist in training high school teachers and CSUB faculty to work effectively with EL students. This project is funded by Title VII from the US Department of Education. Their first presentation involved Norm Gold and a discussion of Prop 227 mandates. Project EXCEL has not only provided many high school teachers with the ELDPI training, but also has paid to have many of the sessions videotaped, in addition to purchasing textbooks for them—Teacher's Handbook, Contextualized Language Instruction by Judith L Shrum and Eileen W. Glisan.

THE RECIPE:

ELDPI provided the basic professional development for the participants. PROYECTO ALIANZA worked with ELDPI in offering the opportunity for teachers from other countries to also receive this training. Project EXCEL provided the videotaping, offered opportunities for high school teachers and CSUB instructors to participate in the Institute, in addition to purchasing textbooks. Dr. Borrego and Dr. Hirai worked with Project TNT and Javier Arreygui, to encode the video from the Summer Institute (2001). They are continuing to work on encoding individual teacher "best practice videos", which all Institute participants are expected to produce by the end of the 2001-2002 school year.

The end product is an ongoing and ever increasing supply of teacher "best practice" videos which are organized according to ELD, SDAIE, Multicultural instructional strategies on our website, with open access to all teachers. The ELD, and SDAIE strategies are grouped according to grade levels. The Multicultural strategies are grouped according to content area (Math, Science, Social Studies and other core subjects). These video clips are an average of 2 to 5 minutes long and they focus on ELD, SDAIE or multicultural strategies. Each "best practice" will also include a reflection piece, done either by the participant, a college professor, or other well-known experts in the field.

This is the newest and most readily accessible form of "peer coaching" available. Peer coaching is very time consuming and requires reliance on release time and knowing that the showcased lesson will be effective, with no undue interruptions or discipline problems. With the best practices video clips, teachers can view them in the comfort of their own home, or at the school site with input and reflections from other teachers. If a teacher needs to teach a particular skill, for example, reading comprehension, grades K-2, for ELD, they can "click' on ELD strategies, K-2 Reading, on the project TNT website and view numerous strategies demonstrated by consultants and/or teachers in the classroom. This is the most innovative, state of the art, type of professional development available for teachers.

EQUIPMENT NEEDS:

We began to test the editing process, by encoding video clips from the last ELDPI summer Institute, using all the technological equipment Project TNT had to offer. It became immediately apparent that we needed additional resources to complete our small project! What were we going to do for our 180 participants who were required to produce these "best practices" video?

First we needed lights and digital cameras (with firewires), cordless microphones, and "ibooks" (laptop computers produced by Apple) with firewire ports and loaded with "Quicktime" software for editing video. Then we discovered we needed headphones for the computers, a quiet place to videotape and edit, more hard drive space, a mouse for every computer we were using, a CD rom burner, lots of video tapes and a server big enough to hold all the videos!

In addition, we needed time—lots of it! And we needed training. Learning the program is not that difficult, but it does take time and dedication. We needed training in the editing process and in learning the fine art of videotaping.

Those hurtles overcome, we needed to think about how we would accommodate 80+ teachers and their equipment needs to videotape, edit and reflect on their lessons, in addition to providing time to train them in the videotaping and editing process. During each of the follow-up sessions for ELDPI, our Institute and Project TNT collaborated on providing the training. Each session contained a one and a half hour block of time for training on the portable "ibook" lab which was purchased through TNT. We discovered then that we did not have enough cameras to work with all the "ibooks" and videos the participants brought with them. With the help of Project Excel and the School of Education, we had barely enough cameras for the second session. The third session contained more time (two hours) for editing, more cameras and more "ibooks" (loaned to us by the Apple Corporation). By the end of the second session, participants were exceedingly excited about producing their "best practices" videos and extremely comfortable with using the "Quicktime" software for editing. We all witnessed the production of some very powerful electronic portfolios!

CONCLUSION:

Another project, SLICK (Second Language Institute for the County of Kern) has since joined us and will be encoding their videos and posting them to our website, also. The success of ELDPI is evident in the excitement created by the networking of teachers' creative SDAIE and ELD instructional strategies, and the expertise generated by the participants as they learn to use the "imovie" equipment and software. This year we had different teams return to the Institute from the same schools as last year, and this summer we will hold two separate Institutes to accommodate the growing number of teachers, paraprofessionals, administrators, directors and other district and school personnel who desire this training.

Developing and Integrating Internet-2 video content into Teacher Education Programs

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Abstract

Sonoma State University (SSU) is part of the California State University (CSU) system and has recently been awarded a substantial PT3 Federal catalyst grant over period 2001-2004 for project **'Light Bridge'**. The Light Bridge project aims to develop video content resources for California's Internet-2 network, the next and most powerful generation of today's Internet. The project is both piloting and establishing revolutionary practices in preparing pre-service teachers to be adept and sophisticated in using technology in the classroom.

Overview of the Light Bridge project

The Light Bridge is a PT3 Catalyst project that aims to provide video content for California's Internet-2 Broadband network. The project aims to pilot and establish revolutionary practices in preparing pre-service teachers to be adept and sophisticated in using technology in the classroom. The specific goals of the project are to:

1) Strengthen teacher education programs through the development of rich video content offered via the next generation of the Internet Broadband network;
2) Establish a student teacher support and supervision system that assures high quality support and assistance at a distance; and,
3) Disseminate teacher education video content, online resources, and student teacher support and supervision system.

Specific examples of Light Bridge activities include developing and maintaining rich visual teacher education content; piloting the use of video conferencing for teaching, supervision, and mentoring of pre-service teachers; and, capturing the classroom performance of pre-service teachers for analysis and criticism by mentor teachers and university supervisors over the network. While the Light Bridge project will initially be implemented at the Sonoma State University (SSU) campus (serving pre-service teachers and rural and low-income schools to which they are assigned), it will quickly be expanded to include pre-service teachers at California State University campuses all over the state. This represents a cohort of over 25,000 pre-service teachers per year. Light Bridge has the potential to revolutionize teacher preparation methodology nationally through SSU's connections with nationwide teacher education reform organizations, such as the Renaissance Group and the National Network for Education Renewal.

This paper seeks to explore the pedagogical protocols of using video-based technology as an instructional medium for teacher training. We will consider the cautions of introducing video-based Internet instructional IT media raised by Maddux (1998) and identify pros and cons between using video-based media compared to face-to-face learning environments. Consequently, we will be expanding upon the issues recently raised by Sipusic *et al.*, (1999) in their research report for SUN Microsystems "Virtual collaborative learning: A comparison between 'Face-to-Face' Tutored Video Instruction (TVI) and Distributed Tutored Video Instruction (DTVI)." They reported findings indicating:

1. Most importantly, our research shows that video-mediated communication can in fact support both the content and relational components of discourse that are necessary for effective collaborative learning. The collaborative learning effect is fully intact with DTVI, opening the door to the widespread use of more effective distance learning models than the lecture-based model currently being used.
2. Furthermore, we have demonstrated that video-mediated collaboration can generate high levels of user satisfaction. While the DTVI students reported enjoying their experience slightly less than the TVI students, they reported enjoying it much more than a typical classroom lecture.

3. With DTVI generating higher academic performance and more enjoyment than classroom lecture, distance learning no longer need be considered a poor cousin to face-to-face instruction (*page* 45).

This PT3 catalyst project is also exploring how the use of video-technology pedagogical resources can be integrated into reforming the instructional design of higher education teacher education programs. A principle aim is to implement the joint Educational Technology teaching standards set by both the 'International Society for Technology in Education' (ISTE) and the 'National Council for the Accreditation of Teacher Education' (NCATE). Both ISTE and NCATE have jointly accredited National Educational Technology Standards for Teachers (NETS-T), which are aimed at reforming current practice within teacher preparation courses through the provision of a common set of performance indicators that levers Ed Tech integration. The Light Bridge project has adopted these ISTE Ed Tech teaching standards, as well as the Californian Standards for the Teaching Profession (CSTP), and has integrated them into several funded project areas that involve the following six curriculum development teams within SSU:

1. Classroom management;
2. Reading Language Arts and Second Language Acquisition;
3. Mathematics and Science;
4. Physical Education;
5. Video Case Studies; and,
6. Videoconferencing/Student Teaching

This PT3 catalyst p roject espouses Stenhouse's (1975) notion of achieving best practice curriculum development and reform of practice, through adopting his "teacher as experimenter" approach. Thus, we are funding reforms of *authentic* faculty programs and courses that require the key educational research and development tasks: video content development; course integration; and, obtaining feedback (task review) according to Elliot's (1991) action research reflection-upon-practice recursive cycle. We will be disseminating our first year pedagogical 'findings' of these research 'tasks' to this conference and will also be seeking to hold a video festival of exemplary video-clips that have been compiled from content sources developed by our project teams.

Conclusion

Light Bridge is an innovative Internet2-based dèvelopment of video content for university teacher preparation programs. It relies upon the cooperation of a broad array of both public and private sector partners: school districts; county offices of education; universities; credential programs such as 'CalStateTEACH'; CENIC (Corporation for Education Network Initiatives in California)/DCP (Digital California Project); and, corporate partners such as Cisco Systems and Apple, Inc.

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Developing and Integrating Internet-2 video content into Teacher Education Programs - Video Festival Demonstration

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Abstract

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Video Festival proposal for the Light Bridge project

The Light Bridge is a PT3 Catalyst project that aims to produce exemplary video content material for integration and experimentation into teacher preparation programs across the California State University system.

We aim to show a compendium of videoclip content material as exhibits that capture the classroom performance of pre-service teachers for analysis and criticism by mentor teachers and university supervisors. The following developmental curriculum areas are being 'captured':

1) Classroom management;
2) Reading Language Arts and Second Language Acquisition;
3) Mathematics and Science;
4) Physical Education;
5) Video Case Studies; and,
6) Videoconferencing/Student Teaching

Any video content that has been placed on an Internet-2 server and can be connected via a broadband Internet connection at the conference venue could also be demonstrated as

part of the 1 hour video festival demonstration session. We will produce an instructional handout for the delegates summarizing the project. This festival proposal represents the practical component to our proposed full paper on the topic, which has also been submitted to SITE 2002.

Useful Light Bridge Project Website References:

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Faculty Development and the Process of Change

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The *Partnership to Infuse Technology into the Teacher Education Curriculum,* a PT3 Implementation grant awarded in 2001, focuses on the simultaneous professional development of teacher education faculty and in-service teachers so that they will model meaningful implementation of technology and engage pre-service teachers in its use in university courses and clinical experiences. The primary goals of the project are that faculty and P-12 teachers will model the effective integration of technology for teaching and learning, and subsequently, graduates of the teacher education program will meet or exceed technology standards for first year teachers. The university's Colleges of Education and Liberal Arts and Sciences, the university's Faculty Development and Instructional Design Center, four school districts, two community colleges, and one business have partnered in this effort. The project components include: Integrating Technology in the Curriculum (ITC) course for faculty, the Engaging with Technology (EWT) on-line course for teachers, technology-rich clinical placements for pre-service teachers, technical support for pre-service teachers, a faculty/teacher exchange within ITC and EWT, the Summer Institute, and the establishment of a virtual learning community through the WebForum.

In fall term of each year of the grant, new faculty in the College of Education take the formal 16 week course, Integrating Technology in the Curriculum (ITC) while they are paired with teachers from the four partner districts taking the formal 16 week on-line course, Engaging with Technology (EWT). In spring term, continuing faculty in the university and community colleges take ITC and are paired with district teachers taking EWT. In both semesters, pre-service teachers in both third and fourth professional semesters, are paired, for their clinical experiences, with district teachers either taking or having completed EWT. Thus, active triads of faculty, teachers, and pre-service students are engaged in independent and collaborative efforts to effectively integrate technology into teaching at multiple levels.

Our most critical and fundamental component is ITC and, we have more experience with this component than any other. The ITC course was first delivered in fall 1999 as a mandatory course for new faculty hired by the College of Education. The College of Education has fully supported the delivery of the ITC course during the fall term of each of three years. In 1999, nine faculty completed the course, which met 3 hours per week for 16 weeks. New faculty were reassigned from teaching one course to take ITC. The original objectives were first, to rapidly improve the instructional skills of faculty in effectively integrating technology in their courses, and second, to facilitate the development of a cohort of faculty who were encouraged to work collaboratively in instruction and research using technology. The ITC course was again delivered in Fall 2000 under similar guidelines to 13 new faculty. During that term, new faculty in other colleges at NIU who taught preservice teachers were invited to attend. In Fall 2001, the 16-week, for-credit, ITC course is mandatory for 19 new COE faculty. Faculty were again reassigned from teaching a course to enroll in the course. The content of the course includes topics such as engaged learning with technology, ISTE and NCATE standards for technology, awareness of the technology available for instruction and research throughout the university, information tools, network tools, PC system maintenance, presentation tools, interactive multimedia (digital cameras and camcorders, working with graphics, etc.), distance education, BlackBoard, WebBoard, e-portfolios, assessment by and for technology, copyright and ethical issues, instructional video, and funding sources on-line.

During the spring term of each of the three years of the PT3 grant, 2002 to 2004, the ITC course will be offered to faculty in the partner colleges including College of Liberal Arts and Sciences, the College of Education, and the two community colleges on a competitive basis. Instead of providing a course reassignment, the faculty will be offered a stipend. Over the last two years, many senior faculty have requested the ITC course be offered to them. We anticipate more applications than we have room for in the course.

For the purpose of this paper, our research questions of interest are as follows:

(a) Does the ITC course, as currently configured, provide the framework for faculty to adopt the use of technology throughout their work as faculty, and particularly in their teaching?
(b) In the language of Rogers' Diffusion of Innovations (1995), who are the innovators, early adopters, early majority, late majority, and laggards with respect to adoption of technology?
(c) Using Roger's Model of the Innovation-Decision Process, can we determine the effect of the ITC course on the stages of the innovation-decision process: Knowledge: awareness of the innovation; Persuasion: attitude formation of the potential adopter; Decision: symbolic adoption; Implementation: trial or behavioral adoption of the innovation; and, Confirmation: seeking of reinforcement.
(d) Further, are modifications to the course structure needed to facilitate the adoption of change by the growing number of faculty who have completed the course so that we can observe movement toward the goals: modeling effective technology use in classroom, revising courses to include technology integration, requiring students to use technology in coursework, using new assessment models incorporating e-portfolios, and aligning curriculum with state and NCATE standards and our conceptual framework?
(e) Which faculty are most successful in moving toward the intermediate objectives as directed by the Logic Model based evaluation (McLaughlin and Jordan, 1999)?

Data that have been or will be collected, prior to March 2002, relevant to the project evaluation and decision-making in regard to the ITC course include:

1. Cohort studies of the classes of '99, '00, and '01 through focus group interviews, individual interviews and document reviews of syllabi and course materials, and, a survey of current skills and technology integration and needs for more training, information, and interaction with the technology and grant staff.
2. Pre and post measures of the '01 class of technology integration skills and use, and attitudes toward change in their teaching
3. Survey of undergraduate College of Education pre-service teachers on skills and attitudes related to their technology use, technology use by their instructors, and course requirements using technology; first conducted in Spring 2000 and to be repeated in January 2002.
4. Applications from faculty to take the spring '02 ITC course that will include statements of current competence, interests, needs, and plans for use.
5. Technology survey and needs assessment of regular continuing faculty in the partner university and community colleges

The Logic Model (McLaughlin and Jordan, 1999) "describes the logical linkages among program resources, activities, outputs, customers reached, and short, intermediate and longer term outcomes." This model provides the underlying framework for the project evaluation and therefore guides the collection of data for decision-making purposes. Underlying the evaluation of the grant activities is the Rogers' (1995) Diffusion of Innovations Model. The innovation-decision process is "the process through which an individual (or other decision-making unit) passes from first knowledge of an innovation, to forming an attitude toward the innovation, to a decision to adopt or reject, to implementation of the new idea, and to confirmation of this decision" (Rogers, 1995, p. 163). Within this framework, the data will be examined to answer the research questions noted above. The presentation at the SITE conference of this analysis of the ITC course would focus primarily on the issues of faculty development and change.

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Integrating Technology Use in the Interning Experience

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The use of technology in the classroom can empower both teachers and students. However, its effectiveness in instruction depends on how teachers and teacher candidates use technology in their classrooms (Maddux, Johnson, & Willis, 2001). Teacher preparation programs should prepare candidates to integrate technology appropriately and effectively throughout the curriculum. This preparation must be achieved through instruction, field experiences, clinical practice, and assessments (NCATE 2000 Unit Standards). Assessment of candidates' use of technology in the classroom is an important component part of their field experiences.

The assessment of the candidate's performance should include assessment of the planning for appropriate use of technology, delivery of instruction, active involvement of the students in the use of technology and reflection about the process and the student learning. Performance assessments that include these elements have been developed by the Maryland Technology Consortium. The consortium evolved from a University System of Maryland (USM) task force convened in 1998 to define Maryland Teacher Technology Outcomes and performance assessment tasks for beginning teachers.

The task force consisted of K-12 teachers and coordinators, higher education faculty, Maryland State Department of Education (MSDE) personnel, and personnel from the Maryland Higher Education Commission (MHEC). During spring and fall of 1999, the draft outcomes developed by this task force were distributed to schools and professional organizations for feedback.

During this same time, the task force lead by MSDE applied for and received a PT3 Catalyst Grant to continue its work. The task force membership was then expanded to create the Maryland Technology Consortium. The consortium included the original task force members, representatives from additional institutions of higher education and additional local schools, more representatives from MHEC and MSDE, and representatives from the Human Resources Research Organization and from the Regional Technology in Education Consortium. The goals for the Maryland PT3 Catalyst Grant are 1.) curriculum redesign, 2.) development of performance assessments, and 3.) candidate development of electronic portfolios.

Supported by funding from the grant, the outcomes were revised and draft performance assessment tasks were developed for three of the seven outcomes. The revised outcomes address the following seven areas: 1.)information access, evaluation, processing, and application, 2.) technology communication, 3.) legal, social, and ethical issues, 4.) assessment for administration and instruction, 5.) technology integration, 6.) adaptive and assistive technology, and 7.) professional growth. In development of the performance assessment tasks, each task was to include the technology outcome, the technology indicators, the knowledge and skills needed to perform the task, a task summary, the scoring tool and criteria for evaluation, benchmarks, instructor notes, and curriculum connections.

In fall, 2000, the three performance tasks were piloted on several campuses and work began on the remaining four outcomes. In fall 2001 the outcomes became standards and the performance assessments were disseminated for full scale implementation of the standards and assessments within Maryland higher education. Standard V addresses integration of technology into the curriculum and instruction. Two performance assessments were developed for this standard and it is expected that these assessments will be completed during a candidate's interning experience. The first assessment addresses the use of technology in the delivery of instruction; the second addresses student use of technology to support problem solving, communication and collaboration. Both assessments include evaluation of the planning for instruction, the delivery of the instruction, and reflections about the instruction.

The use of technology in the classroom can empower both teachers and students. However, its effectiveness in instruction depends on how teachers and teacher candidates use technology in their classrooms. Assessment of candidates' use of technology in the classroom is an important component part of their field experiences. Performance assessments that include field-based components have been developed by Maryland Technology Consortium. The consortium evolved from a University System of Maryland (USM) task force convened in 1998 to define Maryland Teacher Technology Outcomes and performance assessment tasks for beginning teachers. To continue its work after the draft outcomes were developed, the task force applied for and received a PT3 Catalyst grant. Supported by the

grant, performance assessments were developed. One of the standards (formerly outcomes) addresses integration of technology into the curriculum and instruction. Two performance assessments were developed for this standard and it is expected that these assessments will be completed during a candidate's interning experience. These field-based assessments will be shared and discussed. Participants will be encouraged to offer feedback on the content and form of the assessments.

PT3: Preservice Teacher Education - How to integrate technology into teaching successfully using Intel's Teach to the Future

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New Mexico State University (NMSU) adopted a unique program to enhance their pre-service teachers program to integrate technology into teaching. This program meets the NCATE technology competency requirements and dovetails with what NMSU has been doing in the College of Education to integrate technology into teaching. Pre-service teachers are learning content knowledge about science, math, or early childhood education as well as the use of technological tools and how they enhance learning environments. Furthermore, these students are becoming technology savvy, more confident and better problem solvers in meeting the needs of the students of the 21st century or the digital generation.

Introducing the "Intel Teach to the Future Pre-Service Program":

> "Intel® Teach to the Future Pre-Service Program was designed to address the challenges that future teachers will face in effectively applying computer technology to enhance student learning. At the completion of the Intel Teach to the Future curriculum, pre-service teachers will have created a well-documented Unit Portfolio that engages students and helps them attain state and national standards.
>
> The planning process begins with pre-service teachers determining what the K-12 student should be able to understand and achieve by the end of the unit. Next, pre-service teachers make decisions about what sort of evidence they would accept to prove that their students have developed this level of understanding and skill development. Throughout the Intel Teach to the Future curriculum, technology is used as a tool for K-12 students to create products that demonstrate their understanding and skills. As part of the Unit Portfolio, pre-service teachers create sample student products along with assessment tools to be examples and models for their future students. Once pre-service teachers have clearly outlined the desired results and created sample projects that demonstrate acceptable evidence of understanding, they then plan instructional activities and create teacher productivity products to support their unit."

http://www.intel.com/education/teach/preservice.htm

We believe that the power of technology cannot be tapped unless it is grounded in new models of teaching and learning based on a student centered, project based curriculum, increased opportunities for active, hands-on learning, and respect for multicultural diversity. The goal of the "Teach to the Future" Program is to help pre-service teachers expand the boundaries of their creativity and the creativity of their students beyond the walls of the classroom. The modules provided by Intel are dedicated to actively engaging the pre-service teachers so that they construct knowledge through actions and interactions within their environment. The skills that the students learn are not isolated, but are integral parts of the classroom environment. With the help of the Intel modules, the NMSU team is helping the pre-service teachers become comfortable with the technological tools and become knowledgeable in using these technological tools to enrich the learning of *all* students in their future classrooms.

We tailor Intel's "Teach to the Future" program to dovetail with NCATE technology competency requirements. Pre-service teachers will take a technology survey at the beginning of the semester with

questions coming from NCATE technology competency requirements. Students will create "technology badges" using MS Excel to see where their strengths and weaknesses are. The technology badge will provide the instructor a blueprint in tailoring students' learning to meet the NCATE requirements. Students build "electronic portfolios" as they progress through the "Teach to the Future" program. At the end of the program students take the technology survey again and create a post "technology badge" to show progress. They will also have a collection of resources in their "electronic portfolio" to help them when go into the classrooms to teach.

Intel program allows instructors to select various modules for their students in the following classes: Language Arts and Social Studies, Methods of Teaching Elementary Science, Early Children Science and Math Methods, Integrating Technology into Teaching. All of them are required courses for Teacher Education Program (TEP) at NMSU. The modules include the following: copyright issues, creating unit lessons plans, locating resources for unit portfolios, creating student multimedia presentations, creating student publications, creating unit support materials, creating student web sites, teacher support materials, developing plans for implementation and showcasing unit portfolios.

The structure for implementing the Intel program is for pre-service students to take EDUC 368: Integrating Technology into Teaching (a pre-requisite course) before entering the TEP. Students taking this course cover 8-10 modules listed above. When these students enter the methods courses during TEP, they will already have the basic foundation of computer technology to allow the instructors to go right into content areas using the skills the students have learned.

The New Mexico State University College of Education is dedicated to the highest standards in our teacher preparation courses. These pre-service teachers will be shaping the future by teaching the students of the future. It is imperative that we keep up-to-date and using technology as the avenue to open wider the world of learning, the Intel modules will be a welcome addition to our curriculum. Dr. Brown, and Ms. Davis compose a team of faculty leaders who will guide others in this implementation of technology modules.

Sustainability of a PT3 Program: A Case Study

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Abstract: A key issue in educational change is the ability to sustain change related to educational innovation. Although vast numbers of educational innovations have been introduced into schools over the past 20 years, few have succeeded in effecting affective, behavioral, and cognitive student gains (Hord & Hall, 1986; Morris, 1997; Rubin, 1983). In 2000, the University of Houston-Clear Lake, in collaboration with eight school districts, DePaul University, and corporate sponsors received a three-year, one million dollar grant from the U.S. Department of Education to infuse technology into teacher preparation. Since programs tend not to be continued after federal funds terminate (McLaughlin and Berman, 1977), researchers with the UHCL collaborative studied factors related to the sustainability of innovations after grant's end. This paper will discuss the factors that influence the successful sustainability of innovations in an educational environment and apply these factors to the UHCL PT3 program, using a case study format.

Introduction

A key aid in initiating school change, especially in the areas related to technology, is the acquisition and use of grants from both public and private sources. Essential in this process is the realization that grants function as temporary catalysts for meaningful change. Many of the attributes associated with sustaining educational programs or innovations need to be in place prior to and during implementation of the grant in order to sustain the program or innovation after grant funding ends. Researchers at the University of Houston-Clear Lake identified attributes that relate to the successful institutionalization and sustainability of educational innovations and incorporated findings into practices related to the Preparing Tomorrow's Teachers to Use Technology (PT3) grant.

Overview of Sustainability

The concept of "sustainability" of any educational innovation is relative new to research and is equally as imprecise. Wormsley (1990) illustrated the ambiguity of the "sustainability" concept through a series of unanswered questions. Sustainability of a grant's innovative process often collapses at the end of the funding period due to local causes including failure to continue financial support, lack of skilled manpower, and lack of interest (Wormsley, 1990). Consequently, decision-makers must be aware of these factors to ensure sustainability for the long-term success of innovations. Without sustainability, any innovation is likely to fail Curry (1992). While the use of the term "sustainability" is relatively new to research, Vaughn, Klingner and Hughes (2000) define sustainability as the extent to which it is reasonable to assume that educators will continue practices over time. This process, then, can be described as organizational change.

Miles' (1983) work illustrated two cogent points about the process of organizational change. First, he pointed out that the majority of work on change stresses the "front end" of the process of change, or the adoption of the innovation. Second, he concluded that a helpful method of viewing the sustainability of change efforts is through a process of providing supports and overcoming obstacles. In addition to the support and obstacle approach, there is a general flow of the activities associated with sustainability that begins with the organization and flows through the users of the innovation to the innovation itself.

Bell (1983) approached the concept of sustainability by discussing the interaction between the innovation and organization, and four categories of factors. These factors, when applied to the context of an innovation, provide a method of assessing the likelihood of the sustainability of the innovation. The factors are those related to the (1) nature of an innovation, (2) nature of the organization, (3) external environment and needs of the external environment, and (4) granting agency. Researchers at UHCL used Miles' (1983) and Bell's (1983) approaches to guide the case study about the UHCL PT3 program. The following case study incorporates issues related to sustainability of educational innovations and discusses the implications of the findings.

Case Study

A key feature in providing organizational support to the innovation is the willingness of the organizational leadership to function proactively at three levels: (1) providing appropriate funding, and (2) supporting the innovation mandated use and rewarding of employees who contribute to the innovation, and (3) providing for staff development activities. The collaborative addressed these features through infrastructure and personnel. Leadership acquired a cold-fusion server for grant project's use and supported professional development among faculty and staff, and helped implement the PT3 program objectives in the teacher preparation program.

A second area of influence on sustainability relates to the ability of the organization to support the users of the innovation through the change process. Particular emphases include activities related to user commitment and staff turnover. Through the grant, leaders provided resources, including release time, to assist users in implementing project objectives and in researching specific facets of the innovation. Additionally, the School of Education, through its own funds, invested in both hardware and personnel to assist in the creation and maintenance of a comprehensive website. The issue of staff turnover, in this particular case, was considerably more difficult to address as the concept of "soft money" could adversely impacted the continued employment of grant personnel.

A final key to sustainability lies in the quality of the innovation. In this area, the collaborative focused on two primary areas: (1) the mission of the School of Education, and (2) the requirements of the granting agency. Through this effort, the innovation became a comprehensive tool for the education of teacher candidates and the improvement of Pre-K to 12th grade education. Ongoing assessments have also been incorporated into the grant cycle and have been a stimulus to adapt professional development activities and to improve the content of the website. According to Stiggins (2001), two conditions underpin assessment success: (1) clear and appropriate achievement targets, and (2) an assessment-literate faculty. Consequently, educational leaders need to understand the issues, e.g., personnel, organizational environment, involved in the change process, particularly when attempting to sustain educational innovations.

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"Ready To Teach"
A Design Team Collaboration

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"Ready to Teach", a Preparing Tomorrow's Teachers to Use Technology project, provides training and support for higher education faculty who will model technology use in their classrooms. University faculty, K-12 cooperating teachers, and preservice teachers work together to fully integrate technology into classwork and curriculum.

In an effort to further the PT 3 initiative at the University of Massachusetts Lowell's Graduate School of Education, we created six design teams. Each team consists of cooperating teachers from local public schools, preservice teachers in the Graduate Program of Teaching and faculty from the Graduate School of Education as well as the division of Arts and Sciences. During the first year of our Implementation grant, we supported these teams in a successful collaboration that cut across grade levels, elementary through graduate school. The ultimate outcome from each team was a curriculum unit infused with technology that can be taught in the region's elementary schools. In addition, preservice, inservice and university faculty were exposed to the uses of multimedia equipment, software and other resources in order to become technology-proficient curriculum integrators.

Our poster presentation will highlight a successful collaboration among a second grade team from a local elementary school, an elementary social studies class of preservice students and their faculty advisor, and a university arts and sciences faculty member who is a specialist in Native American history and culture. The second grade team consisted of four classroom teachers, one special education teacher and the building technology specialist who is a certified teacher. The curriculum unit that is taught at this level is Native Americans in the Merrimack Valley.

We will present a poster of work that was produced as well as demonstrate on two laptops the lesson implementation at the school site and the projects completed by the preservice students. This work will exhibit the participants' use of multimedia, Internet research and web design skills. Our presentation will walk the viewer through the entire design team process culminating in these finished products.

We consider year one to be a pilot year for the use of this design team format. We will share lessons learned that will make the process even stronger in the following years of the "Ready to Teach " project. We have found that successful collaboration can occur among the constituents, that products can be disseminated across school districts, and that technology skills learned by students and faculty can be easily incorporated into university classes as models of teaching and learning.

Evaluating Web-based Environments for Teacher Professional Development on Technology Integration

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Abstract: Quality teacher professional development (TPD) for technology integration is especially needed. Online delivery methods offer much promise for anytime, anywhere teacher learning. Evaluation tools and methods can help designers of technology integration TPD sites meet their goals of providing quality learning opportunities for teachers. We developed and implemented a plan to evaluate issues of quality and quantity in web-based TPD sites. We present these methods and illustrate their application to a technology integration TPD site called Ed-U-Tech.

Introduction

Teacher professional development should support teachers' construction of new knowledge as well as connect with what teachers do everyday (Corcoran, Shields, & Zucker, 1998; Joyce & Showers, 1995; Loucks-Horsely, Hewson, Love & Stiles, 1998; Sparks & Hirsh, 1997). Quality professional development for technology integration is of special importance since as of last year, only 20% of our nation's teachers reported feeling well prepared to integrate *any* educational technology into classroom instruction (NCES, 2000). And new standards for teachers emphasize the importance of professional growth in technology integration competencies (ISTE, 2000; NCATE, 1997).

Many for-profit, school district, and higher education entities are looking to Web-based, technology-focused teacher professional development (TPD) sites to support teachers' expanding their pedagogical repertoire regarding integrating and implementing networked technologies (Goldman, 2001; Schlager & Schank, 1999). Although participating in networked communities, collaborating with peers and exchanging resources might facilitate teachers' development, most educators have not availed themselves of the Internet in these ways. According to Becker's national survey of Internet use by teachers (1999), web browsing and email were the Internet capabilities most often utilized by teachers and students.

For those seeking to offer Web-based learning environments to teachers, it is key they leam: What website characteristics are associated with a quality online learning environment? Which aspects of the site most engage teachers? Which teachers are drawn in to the site? We developed an evaluation plan to help us answer these issues of quality and quantity in web-based TPD sites. We will present these methods and instruments in this paper and illustrate their application to a technology integration TPD site called Ed-U-Tech.

Measuring the Quality of Teacher Professional Development Sites

Web-based teacher professional development sites are most likely to be effective when they are designed and utilized in ways consistent with the research on how people learn. In *How People Learn: Brain, Mind,*

Experience, and School, Bransford, Brown, and Cocking (1999) base the following key dimensions of effective learning environments upon current educational and cognitive neuroscience research.

Knowledge-centered environments focus on developing knowledge of the discipline and of teaching and learning. h a web-based environment, this might translate into digital content-area curriculum that is up-to-date, authentic, accessible and generative, and contains hyper-linked resource areas.

Community-centered environments evolve a community of practice among teachers where members develop common goals and collaboratively work toward achieving them. In a web-based environment, this could be expressed as Internet-based conferencing environments that assist communication over distances, or a repository of artifacts of each teacher's practice.

Assessment-centered environments support teachers' testing of ideas by promoting ongoing reflection and feedback on practice. Effective websites might include a design that use Internet-based networking to promote ongoing reflection and feedback on practice in a manner that is sustainable, wide reaching and affordable.

Learner-centered environments center on teachers as learners, building on their strengths, interests and needs. One of the most promising and under-appreciated qualities of new information technologies is their interactive capacity. This has special significance for judging the extent to which professional development websites provide learner-centered environments or otherwise are able to utilize users' input to support their learning. Users can customize the site according to their preferences and level of knowledge as pedagogical designers.

The above conceptual framework was further developed and operationalized as a checklist of the desirable features of web-based environments for teacher professional development (see Table 1).

Measuring Quantitative Aspects of Teacher Professional Development Sites

In learning about the effectiveness of the website as a dynamic learning environment for teachers' professional development, evaluators need to look carefully at its *quantity of reach*, or the number and frequency of users and how well this profile matches the intended audience.

To measure the reach, or "the who," of a site, it should be backed by visitor traffic analysis software. Several commercial packages are available; we selected *WebTrends* for its good features-to-cost ratio. This traffic analysis package provides both summary and detailed statistics on visitor demographics, the site resources accessed, activity statistics (including visitor behavior in time increments), technical statistics (including server and client errors), as well as data on referrers (links) sending visitors to the site and analysis of keywords used in site searches.

These data allows site designers to: gauge the reliability of the website; triage which content areas to develop further, which areas to focus on less, and how to arrange content most effectively; decide how to optimize the architecture of the website based on where visitors are entering; determine which external links are most effective; and determine, to some degree, visitors' satisfaction with their visits.

Evaluation Methods Applied to a Technology Integration TPD Website

We used qualitative and quantitative methods to help us answer questions concerning the Ed-U-Tech site's quality (http://www.education.umn.edu/edutech), and the quantity of its users. Ed-U-Tech is a website that is designed to serve as a learning environment for teachers both during their licensure program at the University of Minnesota and after graduation. A PT3 implementation grant to the University of Minnesota provided the resources to develop the site. The authors of this paper represent, respectively, the PT3 project's director, coordinator, and two evaluators. We sought to evaluate the project's website to improve its functionality as a TPD environment. The results from our analysis are briefly summarized below.

A visual review and content analysis using a checklist of quality online learning environment characteristics allowed us to evaluate the Ed-U-Tech site in terms of how it mapped to knowledge-, assessment-, community-, and learner-centered standards(see Table 1).

Possible Features of Knowledge-centered Online Learning Environment	***Ed-U-tech Site's Knowledge-centered Features***
❑ Hyper-linked resource area (e.g. links to content area standards, current research on Methods and Learning Theory, etc.) ❑ Digital content-area curriculum that is up-to-date, authentic, accessible and generative.	1. Hyper-linked Resource areas grouped according to content areas with links to content area standards, lesson plans, clearinghouse sites, professional associations, professional journals, professional development and/or college of education courses) 2. Resources in each content area provide links to reviewed sites and digital curriculum that is up-to-date, generative, and cutting edge.
❑ Electronic networking forums to support knowledge sharing (e.g. web-based libraries of: videos of teachers and accompanying descriptions exchanged, reviewed, annotated, and linked to additional resources; lesson plans; journal entries; student work)	3. A series of interactive online case-based scenarios (IMMEX) with opportunity to practice curriculum design in content area and see exemplars 4. A Discussion area where users can post a relevant article and start or join discussion threads focused around the integration of technology in education
❑ Interactive curriculum design tools with electronic prompts to scaffold thinking ❑ Electronic notebooks encourage reflection in design process ❑ Interactive survey instruments that encourage reflection on pedagogy	5. Online Request forms ask educator's to contribute their content area knowledge to the resource base. 6. Introduces conceptual framework for thinking about technology integration (eTIPS) 7. Interactive forms ask users to reflect on eTIP principles and share their thinking
Possible Features of Community-centered Online Learning Environment	***Ed-U-tech Site's Community-centered Features***
❑ Internet-based conferencing environments that assist communication over distances • synchronous mechanisms (e.g. via "chat" rooms, multi-user virtual environments or asynchronous email, bulletin boards, threaded discussion forums) • Asynchronous mechanisms (e.g. email, bulletin boards, etc.) which allow anytime-anywhere communication and archiving of discussions to assist the development of a group understanding over time. ❑ Coherent human infrastructure (i.e. human facilitators who moderate online conferencing environments). ❑ Repository of artifacts of each teacher's practice (e.g. examples of students' work, collaboratively designed lesson plans, electronic records of previous online discussions, URLs to relevant information, etc). that can be quickly retrieved, distributed, organized, and stored within the online community	1. Electronic archives record discussion group history and provide a record of evolving ideas. 2. Threaded discussion forums provide anytime-anywhere access to fellow educators 3. Electronic newsletter organizes community happenings and disseminates new information 4. Discussions are moderated by an experienced educator and technology coordinator 5. Opportunity to share knowledge of subject area by posting to Resource area
Possible Features of Assessment-centered Online Learning Environment	***Ed-U-tech Site's Assessment-centered Features***
❑ Tools for or that encourage self-assessment, reflection, metacognition, feedback.	1. From the website, users can link to Ed-U-Tech-created online case-based scenarios designed to enhance their ability to make good instructional decisions about technology. They receive

	summative feedback on their performance, but the software does not provide formative feedback, such as electronic prompts, during performance.
☐ Tools for or that encourage peer exchange, constructive critique, networking.	2. The site contains a web-based discussion area, but it is not moderated, and receives little traffic and use.
Possible Features of Learner-centered Online Learning Environment	***Ed-U-tech Site's Learner-centered Features***
☐ Data in graphical, text-based, and multimedia forms, acknowledging diverse learning styles	1. The Ed-U-tech website adequately presents information in graphical, text-based, and multimedia forms, acknowledging diverse learning styles.
☐ Searchable online database through which users can search the site by a topic of interest to support teachers in important aspects of their daily work and let teachers easily and quickly find what is of interest to them	2. The site does contain a search engine through which users can search just that site by a topic of interest.
☐ Customization according to user's preferences and knowledge as pedagogical designer (i.e. through web-based tools such as search engines, databases, conversation tools, simulations, visualizations, learning environments, initiate discussion strands, import objects, attach files, store work, download software, post notes to published work, or add sound and video to the online workspace).	3. The site does not allow for any customizable forms or features or personal work space for users. However, users may search the site and initiate discussion in an online forum. They are also invited to submit comments and URLs of sites to add to each learning area's resources section.

Table 1: Characteristics of quality teacher professional development Web sites derived from *How People Learn* framework (Bransford, et. al., 1999) and applied to the Ed-U-Tech web site.

The *WebTrends* software was useful in addressing the question: Which aspects of the site engages users? Eighty percent of the most viewed pages on the site are comprised of the standards-defined curricular areas (i.e. Read, View and Listen, Write and Speak, Mathematical Concepts and Applications, Inquiry and Research, Arts and Literature, etc. About half of the visits are used to look at just one, two or three pages, while only nine percent of the visits are used to look at 10 or more pages. The mean visit is 17.05 minutes long, but the median visit is much shorter, 3.77 minutes. That 76 percent of the visit last less than one minute and that the median is so far below the mean visit length, suggests a small number of core users.

The Ed-U-Tech website's newsletter subscription feature helps us to learn which teachers are drawn in to the site. Of the 146 subscribers to the newsletter, about half indicated they worked at a K-12 school, half of these at a high school. Of the 72 subscribers who indicated their interest in one of twelve content areas listed on the site, the "Read, View, and Listen section for Language Arts attracted the most attention (21%).

The *WebTrends* software further informs our examination of the *reach* of the site. During a recent quarter (from April 1 through June 20, 2001), there were 5,613 visits to the Ed-U-Tech website. This represents an average of 61 visits per day during, with each visitor viewing an average of nearly 7 pages. Of the 5,613 visits, 1,836 were unique visitors. Where the country of origin was known, 96 percent of the visits were from the United States. Sixty-eight percent (1,254) visited just once; 32 percent (582) accounted for the remaining 4,359 visits.)

Summary

The Ed-U-Tech website is strongest on its knowledge-centered characteristics, featuring technology resources specific to over a dozen different content areas. The site links to online cases that prompt users to make decisions about the use of technology to support their pedagogy. These offer some unique assessment capabilities. However, they are not immediately available, requiring registration and log in at a separate web-site. The site has strong capabilities to support community, through "telementor"-hosted asynchronous discussion; this feature has been used effectively in the past, but is currently under-utilized. Finally, the site offers little customization capability, reflecting weak learner-centered design.

Conclusion

Evaluation methods such as a visual review with a checklist and web traffic analysis software are cost effective, in that they can be employed remotely or automatically. This paper illustrates the use of these evaluation methods in a case study of a technology integration TPD site. But such tools do not necessarily reveal the complete picture on what engages teachers and encourages them to return for additional learning. Further development or tools are needed, as are additional examples of their application. Interview or survey data could help to provide this information that would help designers of technology integration TPD websites meet their goals of providing quality learning opportunities for teachers anytime and anywhere.

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Science Made for Teachers

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As a result of this grant and the efforts of the faculty, preservice teachers at Eastern Kentucky University receive college science courses designed specifically with the needs of elementary and middle school teachers in mind. What is unique about the program is that arts and sciences faculty who have been trained in the area of state standards, and current, appropriate teachings strategies teaches the courses.

Most faculty involved with the project received one three hour course release time to work on the project. The team met regularly and consisted of a faculty member in science education, special education, physics, chemistry, biology, earth science, an elementary
education undergraduate student and a classroom teacher within the district. The education faculty served as consultants; sharing education standards set by the Kentucky Department of Education, appropriate teaching strategies, and technologies that assist teachers in the classroom.

The project has opened communication between the College of Education and the College of Arts and Sciences. Professors from both colleges work side by side in an effort to understand and meet the needs of future teachers of Kentucky. Currently data is being collected to analyze the effectiveness of the new program.

This session will share ideas for others interested in improving science courses for preservice elementary and middle school teachers.

Preparing Tomorrow's Teachers to Use Technology (PT3): Applying the Technology Integration Model for School Success (TIMSS)

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Abstract: The University of Houston-Clear Lake (UHCL) in partnership with eight school districts in the Houston, Texas area, called the UHCL Collaborative, has developed a successful, field-based teacher preparation program. The UHCL Collaborative in collaboration with DePaul University and corporate sponsors received a three-year PT3 (Preparing Tomorrow's Teachers to Use Technology) Implementation Grant from the United States Department of Education. The grant's purpose was to design a model to prepare teacher candidates to be proficient in developing and delivering classroom lessons that integrate technology within the curriculum. The organizational development of this PT3 grant incorporated components of the Technology Integration Model for School Success (TIMSS) described by Driskell (2001). This paper will describe the development of these components within the grant's operations.

Introduction

In 2000, the University of Houston-Clear Lake (UHCL) in partnership with eight regional and urban school districts in the Houston metropolitan area, DePaul University, and corporate sponsors, Microsoft, Apple, Inspiration, and Tom Snyder Productions received a three-year Preparing Tomorrow's Teachers to Use Technology (PT3) implementation grant from the United States Department of Education. The focus of the grant was to prepare teacher candidates to become proficient in developing and delivering classroom lessons that effectively incorporate technology in the learning process so that all students (Pre-kindergarten to 12^{th} grade) use technology in demonstrating mastery of lesson plan objectives. The program's specialty is that the lesson plan format has both the teacher and the classroom students using technology in the learning process. The grant's organizational development incorporated the components of the Technology Integration Model for School Success (TIMSS) as outlined by Driskell (2001). The TIMSS consists of four major components: (1) administrative support for technology initiatives; (2) foundations of understanding for campus teachers; (3) modeling and coaching for campus teachers; and (4) on-site campus technology support. This short paper will describe the development of the four components within the grant's operations.

Administrative Support for Technology Initiatives

Administrative support is the first component for successful technology integration in classroom pedagogy. The UHCL PT3 grant proposal requested partnership with school administrators who recognized the necessity of technology in pedagogy, communicated the need for technology on their campuses, and, when possible, modeled technology use. Many of the campus administrators participated in the PT3 grant training sessions, which added understanding of and support for the grant. Grant support from university administrators was crucial, especially for implementation and sustainability of the grant's objectives. Administrative support of technology in education is highlighted by the ISTE (International Standards of Technology Education) technology standards for school administrators (http://cnets.iste.org/tssa/view_standards.html). These standards require that superintendents, district curriculum specialist, and principals, among others, promote a school culture that encourages technology use in innovative ways. "Having a school climate that encourages the use of technology resources in innovative ways" is necessary to breakdown the barriers that prevent technology integration in today's classrooms (U. S. Congress, Office of Technology Assessment, 1995, p. 162).

Foundations of Understanding for Campus Teachers

The second component for successful integration of technology in classroom instruction is the preparation of teachers. Typically, the teacher is faced with the lack of time to learn and experiment with technology (Strommen & Lincoln, 1992). While professional development may mean in-services training that usually last one day, this one-shot strategy is not effective (Benton Report, 1997). The UHCL PT3 grant (http://pt3.cl.uh.edu) provided to preservice teachers, mentor-teachers, and university faculty three days of hands-on technology training, addressing the use of relevant software for student learning and the integration of this technology within the classroom curriculum (i.e., lesson plans). Moreover, grant participants were provided ongoing support in developing and delivering lessons plans.

Modeling and Coaching for Campus Teachers

Classroom teachers need modeling and coaching, especially from mentor-teachers, to successfully integrate technology within the curriculum. A vital part of the UHCL PT3 Grant was to provide to mentor-teachers and university faculty, who are supervising preservice teachers, the three-days of technology training. Together, preservice teachers, mentor-teachers, and university faculty worked together as a team to develop and delivery technology integrated lesson plans, addressing specific grade level needs. Working on these lesson plans provided opportunities to discuss how people learn: actively, constructively, collaboratively, contextually and in a multisensory manner (Hunter, 1993).

On-Site Campus Technology Support

The fourth component for successful integration of technology in classroom curriculum is providing on-site technology support. While school districts have technology support personnel for classroom teachers, they may not have been prepared in professional development specifically focusing on technology integration of curriculum in lesson planning. The UHCL PT3 grant provided training and a website (http://pt3.cl.uh.edu) as a source of support. Many campus administrators, serving as instructional leaders, attended the PT3 grant training sessions to gain additional understanding on the use of technology in classroom lessons. Moreover, school district technology trainers participated in delivering the UHCL PT3 training sessions on technology integration. Campus and school district technology personnel, as well as technology-proficient mentor-teachers, need to coach and guide teachers in using technology software tools, and in successfully developing and delivering technology integrated lessons.

Conclusion

The Technology Integration Model for School Success (TIMSS) as outlined by (Driskell (2001) provides four key components for the successful development of classroom pedagogy that integrates technology within the curriculum. The UHCL PT3 grant operations incorporated TIMSS in assisting teachers to be successful in preparing classroom students (Pre-kindergarten to 12th grade) to use technology in their lifelong learning.

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Technology Support in a School-University Partnership

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This proposal describes a comprehensive effort to improve the Initial/Professional Teacher Education (IPTE) program in order to produce quality educators who will have the tools they need to meet the needs of their students. While technology is just one of those tools, it is one of the most powerful tools and has the capacity to positively influence of the entire schooling experience. This project uses a combination of technology experts at the university and partner school levels and leadership academies to infuse technology into course syllabi, teaching activities and assignments for the programs teacher candidates.

The vision for the IPTE program with regard to technology is that our teacher candidates emerge with the skills, knowledge, and dispositions to enable them to use technology appropriately in every aspect of their teaching career. The goal of this PT3 project is to transform the IPTE program into one where teacher candidates are immersed in technology best practices, both at the university and in their clinical experiences.

The Initial/Professional Teacher Education program (IPTE) serves students seeking initial licensure in general and special education and advanced licensure in special education. Students are admitted to the program in the fall or spring and are assigned to a professional development school (PDS). They follow the school's schedule, returning when the teachers do in August or January. Their time in the PDS is divided into four internships. Elementary teacher candidates usually stay at one school for all four internships, while secondary teacher candidates have at least one internship in a middle school and another in a high school. The first three internships are for two days a week and the final internship is for four days a week. While in the first three internships, teacher candidates are enrolled in courses two days a week or evenings. Coursework takes place on the university campus and in the professional development schools. Individual student progress toward meeting the state licensure standards is measured by performance-based assessments that rely heavily on performance in the PDSs.

Once the teacher candidates complete their internships, they are eligible to apply for a teaching license, assuming all state standards and program expectations have been met. After the teacher candidates are licensed, they may choose a specialty, either a state endorsement or a School of Education certificate, and continue in the master's program. *Program governance*. The IPTE program is lead by two councils. The Partner Principals Council consists of the sixteen PDS principals and two UCD faculty members who are responsible for communicating between the two councils. The IPTE Council consists of the sixteen site coordinators and site professors, and other IPTE course instructors. Each group meets at least monthly to make program and policy decisions. The IPTE Council is responsible for admitting students to the program and placing them in schools. Each PDS has its own leadership team, comprised of the principal, site coordinator, site professor, and four teachers, which is responsible for ensuring that the goals of the partnership and the school are met.

Initial/Professional Teacher Education Faculty

The members of the IPTE program faculty are defined as all those university and professional development school professionals who supervise the learning experiences of the teacher candidates. Site coordinators are K-12 teachers who have been released from their classrooms to work fulltime for the partnership. They supervise teacher candidates and coordinate professional development for the school. Site professors are university professors who spend at least one day a week at the PDS. Clinical teachers are K-12 teachers in professional development schools who supervise a teacher candidate in their classroom for any of the four internships.

The professional development school faculty serve as site coordinators, clinical teachers, and course instructors. The university faculty, serve as course instructors and site professors, and include instructors from two divisions in the School of Education and instructors from the College of Liberal Arts and Sciences. Faculty members often fill more than one role.

The Teacher Candidates

The School of Education only serves graduate students. A few of our students come to the university directly from an undergraduate institution, but most have had other careers, from homemaker to lawyer to business owner. All students are placed in professional development schools for four internships over a period of a year and go through the program as a cohort. After licensure, a majority of these students are employed in the metro area where the university is located, but others are employed throughout the state and in many other states.

Professional Development Schools

Sixteen professional development schools (PDSs) are located in six districts in the metro area, which ranges from inner city urban to industrial to rural. Their students represent a diverse population with many languages, ethnic groups and socioeconomic groups, but an overwhelming majority of the K-12 students are from low socioeconomic families.

The PT3 Grant Activities

The project consists of a team of support personnel. Site Techs are partner school teachers who spend the equivalent of one day a week working with the school, teachers, and teacher candidates to move the school forward on their use of technology. University Techs are mentors hired to work with faculty on revising their courses to infuse more technology, build their technology skills, and to work with teacher candidates on their technology skills. All of the Techs meet once a month to share successes and challenges and develop strategies for meeting those challenges. This Technology Council has the responsibility of planning and leading the semester's leadership academy based on the need of those they work with and shares a parallel role with the IPTE and Partner Principals' Councils.

The purpose of this short paper is to share the progress that we are making in the first year of this grant and discuss the successes and challenges we are encountering and how we are addressing those challenges.

Need for the Project

To determine the need for and the design of this project, data was collected from all partners in the IPTE program. Members of the IPTE Council were asked to describe the technology vision they wanted for their schools and classes and what it would take to get them there. Those working in PDSs were asked about the technology available in their school and the skill level of their teachers. Teacher candidates and course instructors were asked to fill out the Technology Prerequisite Skills Checklist. Course instructors and site professors were asked to complete a survey based on the Colorado Teacher Licensure Technology Standard 7 and report how able they were to meet the standard and to teach others to meet the standard. In addition, experiences from the current program redesign efforts to integrate technology across the IPTE program were a part of the data collected. The grant committee met to analyze the data and determine possible solutions. The resulting proposal was taken to the IPTE Council and Partner Principals Council for their approval. The needs described below and the proposal described in the project design are a result of this process.

Technology in IPTE

Since the first program redesign in 1994, infusing technology throughout the curriculum has been a stated goal. No separate technology course has been part of the course of study, though students were offered a technology course as an elective in the post-licensure portion of their program. While progress has been made, the IPTE program has yet to fully integrate technology across all courses and internships. .

When we started, few of the instructors possessed the skills necessary to make this integrated curriculum a reality. During the first year, the courses included one or two guest lectures on technology. The second year, an instructor with technology expertise joined the elementary team and added lessons and assignments that required the teacher candidates to use technology. In the third year of the program, an instructor with technology expertise was hired to teach one section of one of the two general secondary methods courses. At this time, the program faculty also identified places in the entire curriculum where technology and other skills could be integrated, beyond the methods courses. During the fourth year of the program, all students were required to use the email system sponsored by the School of Education.

Beginning in January, 2000, all students entering the Initial/Professional Teacher Education (IPTE) program are required to have 24 hour access to a computer and modem. This past fall, we began distributing a technology prerequisite skills checklist to all applicants. The checklist contains basic technology skills that will be required of all teacher candidates when they enter the program, along with suggestions of opportunities available to the applicant for mastering these skills. Beginning in 2001, all teacher preparation programs in the state of Colorado will be required to verify that their candidates for teacher licensure have met eight new standards. Standard 7 requires that the teacher is skilled in technology and is knowledgeable about using technology to support instruction and

enhance student learning, and has five supporting elements: (a) apply technology to the delivery of standards-based instruction, (b) use technology to increase student achievement, (c) utilize technology to manage and communicate information, (d) apply technology to data-driven assessments of learning, and (e) instruct students in basic technology skills (see: http://www.state.co.us/cche_dir/agenda/marivb2.html).

UCD Faculty Technology Use. The faculty have gradually increased their personal use of technology. They were asked to fill out the same Technology Prerequisite Skills Checklist completed by all program applicants. Fewer than half reported that they would be unable to complete any of the individual skills described. The range on each of the skills was from 0 to 42%, with 15 of the 38 skills being met by all of the faculty. Only one or two faculty could not complete an additional eleven skills. The areas most in need for training were in digital camera use, creating and using spreadsheets, and setting their VCR clock.

Despite these personal skills, most faculty members lack the support and vision for how to apply that knowledge in the courses they teach. During program redesign meetings, it was common for a faculty member to state that they did not have to worry about technology because it didn't fit into their course. This is not the case. In a survey of those teaching IPTE courses and serving as site professors, no one felt that they were well enough prepared in the state technology standard elements to be able to teach all of them to our teacher candidates. While all but three of the nineteen surveyed had some idea of what the standard elements addressed, only three felt fully prepared to teach any of the standard elements.

We are making improvements. Up until last fall, university classroom technology was inconvenient at best. Now, with the addition of two upgraded computer labs and one technology rich classroom in the School of Education, and the number of technology-equipped classrooms on campus, using technology while teaching is less of an ordeal. Most faculty members have required some form of electronic communication as part of their classes, advising, and professional interactions. Based on a previous and very successful faculty technology mentoring project, an internally funded grant is being used this semester to proved assistance to course teaching teams to include at least one technology-based activity or assignment. Most of the faculty are at the point where a program like the one proposed here will be welcomed and effective, even without the current pressure to integrate technology coming from the state.

Based on these results, some IPTE program faculty need assistance with basic technology skills, but all need assistance to see how technology fits into their courses and then in making it happen. As stated earlier, faculty from the College of Liberal Arts and Sciences are part of the IPTE program and will be included in all grant activities.

Technology in the PDSs

When the partnership began in 1994, most professional development schools (PDSs) had a computer lab, but few had computers or other technologies available in their classrooms. During the past four years, the amount of technology available in the PDSs has increased tremendously. Now, every PDS has between one and seven computer labs, with seven of the sixteen schools having more than one. All but one have from one to five computers and Internet access in every classroom. The remaining school has computers and Internet access in about 75% of its classrooms. Every PDS has a technology plan that guides their technology acquisition and use. Each of the six partner districts have district level technology teams that provide assistance to schools. This demonstrates a commitment to the use of instructional technologies.

PDS Faculty Technology Use. In a survey of the PDSs, the school leadership team was asked to determine the technology skill and use level of the teachers at their school. The ratings they used were: (1) Technology experts who use technology in creative and innovative ways, (2) Teachers who regularly use technology in their classroom, (3) Teachers who use just enough technology to meet school standards, (4) Reluctant users who need lots of encouragement and assistance, and (5) Non-users who avoid using technology at all. While some schools had more or less expertise, across the partnership, data indicate that 9% were considered to be experts, 21% regular users, 40% using just enough to get by, 20% reluctant users, and 6% non-users.

One school in the partnership chose not to participate in this proposal. We believe their reasons are factors that affect all schools and must be carefully considered when carrying out this proposal. The school's reasons dealt mainly with a feeling of overload. State-mandated, high-stakes, standardized testing, participation in a literacy grant, and district-mandated inservice leave little time in a teacher's day.

Based on these results, there is a need for teachers to be able to use the technology that is becoming more available to them in better, more innovative ways. As with the UCD faculty, some skill building will be necessary, but using inservice training is not likely to be successful. More creative ways must be found to work within the constraints of a teacher's day.

Teacher Candidate Technology Skills

During the first six years of the IPTE program, teacher candidates were asked to choose a leadership area to focus on while they obtained their license. One of the leadership area was technology. While during the first few years of the program, nearly all students with any technology background chose technology, in the last cohort of teacher candidates in leadership areas, technology expertise is not a determining factor. Teacher candidates with technology skills are just as likely to be in technology as any other leadership area. The revised program eliminated leadership areas in favor of post-licensure endorsement and certificate programs.

The teacher candidates entering the Initial/Professional Teacher Education program were asked to complete the Technology Prerequisite Skills Checklist. While no one skill was mastered by all teacher candidates, fewer than 10% of the 118 teacher candidates indicated that they could not pass 25 of the 38 skills. The biggest need areas were in creating PowerPoint presentations, creating spreadsheets, downloading and using pictures from a digital camera, and setting their VCR clock. This indicates that teacher candidates are entering with a higher level of technology experience, a reflection of the change in society in general. Based on these results, teacher candidates will need some assistance with basic technology skills.

Summary

All members of the IPTE partnership need some assistance in developing basic skills. All IPTE faculty, in the university and the PDSs, will need help in developing technology best practices and carrying them out in their classrooms. Creative ways of facilitating these changes that build on successful IPTE program structures must be developed in such a way as to not overly burden the participants.

Project Design

This proposal is part of a comprehensive effort to improve the Initial/Professional Teacher Education program in order to produce quality educators who will have the tools they need to meet the needs of their students. While technology is just one of those tools, it is one of the power tools that has the capacity to positively influence of the entire schooling experience.

Goals, Objectives and Outcomes

The vision for our program with regard to technology is that our teacher candidates emerge with the skills, knowledge, and dispositions to enable them to use technology appropriately in every aspect of their teaching career. The goal of this proposal is to transform the UCD Initial/Professional Teacher Education program into one where teacher candidates are immersed in technology best practices, both at the university and in their clinical experiences.

Michigan Teachers' Technology Education Network

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Abstract: The purpose of this paper is to describe Michigan Teachers' Technology Education Network (MITTEN) project and some of the program's early impact on the preservice teacher preparation at the University of Michigan-Dearborn. MITTEN is in its first year in a three-year award funded through the U. S. Department of Education's Preparing Tomorrow's Teachers to use Technology (PT3) fund. The defining component of the MITTEN model is its creation of a networked learning community. The project's goal is preparing a cadre of future teachers with improved knowledge, skills, and confidence integrating information technology into the teaching and learning process in meaningful ways. The project will redesign computing, methods, and content courses, field experiences, and student teaching to ensure that students meet National Educational Technology Standards for Teachers (NETS*T) throughout their programs. A further intent is to form a self-sustaining development network among future teachers, faculty, and P-12 educators. MITTEN establishes networked learning circles (NLC)-comprised of student teachers, P-12 teachers, supervisors, technology specialists, and faculty-that focused on: a) early childhood, b) language arts, c) mathematics, d) science, and e) social studies.

Recent studies indicate that if future teachers are to effectively use technology their preservice preparation should employ multiple components. These components include course work in education computing, opportunities to observe faculty modeling the use of technology and the meaningful integration of technology into clinical field experiences (Duran, 2001; Moursund and Bielefeldt, 1999). Strategies for addressing each of these are becoming more common. But models for drawing all of the components coherently together are in short supply. This paper discusses the MITTEN project, which is aimed at tying all three components into preservice teacher preparation at the University of Michigan-Dearborn (UM-D).

MITTEN: A Networked Learning Community

MITTEN is designed to prepare a new generation of future educators with improved skills, knowledge, and confidence in integrating information technology into the teaching and learning process. MITTEN addresses this goal by creating a networked learning community dedicated to the transformation of teacher preparation at UM-D through integration of information technology throughout the entire educational experience of all prospective teachers.

The specific program objectives are:

- to prepare a new generation of P-12 teachers who are able to creatively and critically use technology to enhance student learning;
- to increase current teacher educators' ability to use technology to better prepare tomorrow's teachers and to model meaningful uses of technology in their professional practice;
- to increase inservice teachers' ability to integrate information technology into their curriculum and to mentor student teachers to use technology in a technology-enriched environment.

- to develop a series of technology learning resources (including software tools, Web-based curriculum materials, and hypermedia best practice cases) that model intelligent and powerful uses of information technology for future teachers, practicing teachers, and teacher educators; and
- to form a self-sustaining professional development network among future teachers, practicing teachers, and teacher educators to reach and use technology resources for their further professional development.

Preparing Technology-Proficient Educators

MITTEN offers three types of interrelated professional development activities to preservice teachers, inservice teachers, and education faculty: a series of Capacity Building Activities, a sequence of meetings of the Networked Learning Circles (NLCs), and a pair of Seminar activities. The meetings of the NLCs and the work undertaken within them are of primary importance to the project. The other sorts of activities, however, constitute important sources of support for that work.

Capacity Building Activities

The Capacity Building Activities are part of preparatory activities geared toward enhancing the productivity of the NLCs. Capacity building activities are designed to increase the levels of confidence and competence with information technology tools. The format of the activities is as group workshops, working lunch sessions, and one-on-one mentoring sessions. The general scope of the activities encompasses three needs areas—telecommunication tools, productivity tools, and educational multimedia—while specific emphases correspond to the needs that participants identify on needs assessments surveys.

During the Fall 2001, the first cohort group participated in the capacity building activities. The researchers will present the implications of these activities at the time of the conference.

Networked Learning Circles

The Networked Learning Circles or NLCs will facilitate learning about content specific use of technology in the subject areas. The participants' work within NLCs constitutes the core activity of the project. Each consists of faculty members in content areas, in teaching methods, and in educational technology together with student teachers and their mentoring school teachers and field supervisors. This alignment parallels in small-scale Goodlad's center of pedagogy idea (Goodlad, 1994). As Figure 1 illustrates, Goodlad's contention is that effective interaction regarding teaching improvement calls for engagement among three entities: schools of education, school districts, and colleges of arts and sciences. Certainly, while each of these three participants has its own functions other business to attend to, Goodlad has stressed that each is an essential and equal player in a healthy teacher preparation "ecosystem" (p. 9). Specifically, each NLC consists of student teachers (4), cooperating teachers from P-12 schools (4), student teaching supervisors (1), educational technology specialists (1), methods courses faculty (1) and content courses faculty (2) from related schools and colleges. More than just a setting, then, the center of pedagogy "brings together simultaneously and integratively the commonly scattered pieces of the teacher education enterprise and embeds them in reflective attention to the art and science of teaching" (p. 10).

Figure 1. The "Networked Learning Circle": a structure for collaboration on technology integration, adapted from Goodlad (1994).

Content experts: arts and sciences faculty	Student teachers and their technology-enhanced lessons	Methods and educational technology experts: education faculty
	Practitioner experts: school-based master teachers; college based student teaching supervisors	

MITTEN creates five NLCs, each related to one of five fields of study: (a) early childhood, (b) language arts, (c) mathematics, (d) science, and (e) social studies. The overarching task of each NLC is to develop and field-test authentic projects in which technology enhances teaching and learning in specific subjects addressing National Educational Technology Standards for Students (NETS*S).

During the Winter 2002, an initial cohort group of NLCs has commenced. The researchers will present the implications of the NLCs at the time of the conference.

Technology Seminars

Technology seminars address the social and cultural implications of information technology for schools and society. MITTEN offers two technology seminars in a year focusing on different issues. The Seminar activities are designed to build awareness of broader social issues related to educational technology, with attention to topics such as the "digital divide."

The first technology seminar will take place in the Winter 2002 focusing on the "digital divide" and its implication on the Michigan schools. The researchers will present the implications of the technology seminar at the time of the conference.

Learning with P-12 Partners

The members of MITTEN view teacher preparation as a university and community-wide responsibility. In addition to the project's private sector partner, RWD Technologies, the MITTEN program is a collaborative effort of the UM-D's School of Education and College of Arts, Sciences, and Letters, the Henry Ford Community College, and the public school districts of Dearborn, Livonia, Westwood Community, West Bloomfield, Redford Union, and Jefferson.

MITTEN is a three-year program with expanding participation. In each year, the project participants will include additional cadres of student teachers, cooperating teachers from P-12 schools, student teaching supervisors, educational technology specialists, and methods and content courses faculty from related schools and colleges.

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CONSTRUCTING SCIENTIFIC MODELS DURING TEACHER PREPARATION

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Abstract: An example of a content-area approach to technology infusion is presented. A physical science team helps pre-service teachers who have learned science in a traditional lecture setting develop the necessary skills to implement a discovery approach to learning in their own classrooms. Pre-service teachers use technology to follow the same inquiry-based model of experimentation that scientists employ in research. They observe phenomena that have been digitally recorded, slowing down the phenomena to collect data. They develop models to explain the data and test them by predicting unobserved phenomena, thereby constructing their understanding of physics concepts. The project has significant influence over abilities and attitudes of teaching candidates as they develop expertise in their disciplines.

Introduction

Science standards call for a discovery approach to learning but this method is hard to implement. One reason is that many teachers themselves learned science through a traditional lecture method and do not feel comfortable with a discovery approach (Tilgner, 1990). Science departments in the universities continue to deliver content in a traditional manner, so prospective teachers might only have the opportunity to learn science through discovery during teacher preparation courses in schools of education (McDermott, L.C., 1974, Zacos et.al. 2000). An inquiry approach to learning physics can be enhanced through the use of digital videos and Internet archival data bases (Etkina et. al. 2000).

The current project is part of a longitudinal study of a content area, team based approach to technology integration, where teams of professors, K-12 teachers, graduate students, and teaching candidates innovate and implement new technologies for learning (Barnhart, 2001). The Physical Science team focuses on using technology in real time data analysis. Data are collected by videotaping physical phenomena that happen so quickly, or on such a small scale, that naked eye observations are unreliable for data collection. Digitized videos allow students to slow down the phenomenon, see the details that go unnoticed in real time, and measure the position of an object at a given instant.

Experiments in Physics Instruction: a New Approach

Experiments are typically used in physical science instruction for two reasons: (1) To demonstrate a phenomenon, showing students what happened and why it happened, and (2) to test and verify a physical law taught in class (for example: students might conduct an experiment to verify Newton's second law). In both cases the instructor gives a lot of verbal and/or written guidance as students move through the procedures. Research has shown that such use of experiments has been ineffective in providing a context for meaningful learning (Roth et al, 1997). Instead, students learn much better when they construct their understanding, following a path like the one that physicists follow to construct new knowledge (Etkina & Van Heuvelen, 2001). This allows new roles for experiments in instruction.

Scientist's use of experiments may be organized into observational experiments and testing or application experiments. These two types of experiments are used together to construct a coherent scientific theory. The cycle may be summarized as follows: (1) A physicist observes a physical phenomenon, and may invent physical quantities to describe what is seen, looking for patterns in the data. (2) If some interesting patterns are seen, she may propose a

mathematical model to fit the patterns. (3) She then uses the model to predict new (unobserved) phenomena or devise a real world application. (4) She then designs an experiment to test the prediction or try out the application. (5) If the results of the experiment were contrary to expectations, the physicist may make more observations, or revise the initial model asking such questions as: What simplifying assumptions did I make? Is there a different model that would adequately describe the initial observations? Can I make a more accurate calculation? And so on.

Using this approach as a guideline, we made videos of more than 50 experiments in mechanics, molecular physics and static electricity. Each was digitized and put on the web as a clip. Prospective teachers download the clip (http://www.pt3.gse.rutgers.edu/physics/frontp.html) and watch the experiment either in real time or frame by frame. The videos are categorized as scientists would use them: (1) observational experiments, for the first stage of the cycle as students observe phenomena, collect data, learn to represent them in multiple ways (tables, graphs, etc.) and interpret them, and (2) testing experiments, used later to evaluate the models students develop to explain the phenomena.

The initial work is usually done at home as a home lab. The next day in class the instructor discusses the observations with the students. Students are encouraged to suggest different explanations for the patterns of data. Using the explanations, students predict the results of a number of digitized testing experiments. After making their predictions, students watch the testing videos in class and see if their predictions were correct. An example of this cycle is the "Motion" module, one of nine modules used in science methods classes for pre-service elementary teachers. First students observe a clip of two objects (one 200 g and the other 500 g) dropped from the same height. They record positions of the objects at each frame, and use the table of data to draw a graph of position versus time and velocity versus time. The next day, using graphs created at home, students discuss the data in class and come up with a model to describe it. For example, they may create a model showing that the objects fall in the same way and the acceleration of their motion is constant at about 9.5 m/s^2. They use the model to predict what will happen if two objects are not dropped simultaneously. If they are falling with acceleration (the proposed model), the distance will increase; if they are falling with constant speed, the distance between them will remain the same. They test their predictions with the video clip of two balls dropped with a time delay. In this case the experiment confirms the prediction based on their model.

In the process, the students are given little or no explanation for what they see. They construct their own knowledge of physics in the same way physicists do. As part of the project, pre-service high school teachers follow the same process but provide more quantitative analysis, using real time data available through the web, such as NASA X-ray archives of photon counts collected by satellites (Etkina et. al 2000).

Conclusion

Teachers who have learned science in a traditional lecture setting are hampered in their ability to encourage constructivist learning in their classes once they begin to teach. This weakness can be overcome by modeling the approach scientists take when observing and predicting phenomena. The current project demonstrates that pre-service teachers who work in a digital science lab setting, given minimal but important guidance as they observe time and other variables, develop more meaningful understandings of physics. They then are able to provide their own students more innovative and authentic technological support for learning. Continuing work shows that the project is having significant influence over the abilities and attitudes of teaching candidates as they develop expertise in their disciplines.

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Infusing Technology Use into Pre-Service Teacher Courses: Lessons Learned

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Abstract In June of 2000, the Department of Educational Technology at the University of Northern Colorado (UNC) received a PT^3 grant to prepare teacher education graduates to use technology effectively in their K-12 classrooms. This paper focuses on the lessons learned by PT^3 grant team members, while working collaboratively to redesign coursework in the department of Educational Technology, College of Education, and College of Arts and Sciences for undergraduate pre-service teachers.

Description of the Project

In June of 2000, the Department of Educational Technology at the University of Northern Colorado (UNC) received a PT^3 grant (Preparing Tomorrow's Teacher to use Technology). The grant, "Infusing Technology Use in the Preparation of Colorado Preservice Teachers," proposes a plan for systematically changing the teacher education programs at UNC by infusing technology throughout the curriculum. The grant plan builds on the strengths of the existing UNC Partnership Schools and the internationally recognized graduate programs in educational technology. The project has three overarching goals: (1) graduates of the UNC teacher education programs will effectively utilize technology for instruction in their classrooms when employed as full-time teachers; (2) UNC student teachers will effectively utilize technology for instruction in the partner school classrooms; and (3) UNC faculty members will effectively utilize technology for instruction and model appropriate technology use for the preservice teacher education students.

We are making progress toward these goals through five specific initiatives: (1) enhance the required educational technology courses for students in the professional teacher education programs; (2) model appropriate technology use and integrate technology utilization into the professional teacher education program courses; (3) model appropriate technology use and integrate technology utilization in the general education and content area discipline courses; (4) integrate technology use by preservice teacher education students in partner schools; and (5) build a model for the effective use of technology in preservice teacher education programs. All grant activities are focused on one or more of these initiatives.

The UNC PT3 project is now in its second year of activities. To this point, the project team has primarily focused on two main activities. The first was to incorporate the expectations set forth in Colorado's Standards-Based Teacher Act of 1999. This act requires a number of changes for the teacher preparation programs in the state, including the integration of technology across the PK-12 curriculum. The second area of focus has been with three cohorts of UNC faculty who have learned about and applied technology in new ways in their undergraduate preservice and general education courses.

Teacher Preparation Programs

Although there has been a major investment in technology for K-12 schools, the actual utilization and integration of this technology has been somewhat disappointing. A National Center for Educational Statistics (2000) study showed that 95% of public schools had Internet access in 1999. Although 65% of teachers had Internet access only 20% were using advanced telecommunications in their teaching (NCES, 1997). In 1997 and 1998, Persichitte, Tharp, and Caffarella completed studies commissioned by the American Association of Colleges of Teacher Education, which investigated student and faculty use of technology by colleges and departments of education. Both studies emphasize the importance of preservice teacher education students' (a) ability to use technology and embed

it within their content areas and (b) exp osure to effective models of technology use and integration throughout their preservice preparation programs.

UNC's PT3 team collected similar data during visits to the 21 partner schools (K-12) to speak with principals, teachers, and technology coordinators as well as observe each school's classroom uses of technology. The initial evaluation of the data collected have highlighted several key issues which are being addressed in redesign of the 200- and 300-level courses: (a) all schools visited have a fairly extensive infrastructure, both new and old machinery that is not being used to its fullest potential; (b) networks and file servers are playing a much greater role than could have been imagined; (c) the balance between platforms is shifting away from MAC and toward PC machines running the MS Windows platform and this is true across all grade levels; (d) teachers are not able to generalize how to use software outside of the way they have been originally instructed to either use it, or utilize it; (e) K-12 faculty want and need activities that they can integrate into their curriculum successfully; (f) student information management systems have become a critical component both in the individual schools, and in those schools' districts because state regulatory agencies demand extensive and comprehensive student data every year; and (g) with standards and assessments demanding more and more physical (time and energy) and financial (budgetary resource) support, technology facilitators (technology support personnel) have, as of late, become one of the lowest priorities on the K-12 personnel/time-allocation matrix.

Qualitative data gathered and analyzed by Lohr et al., that is significant to this project, found students felt the following about the introductory educational technology class: (a) the self-paced format was not only convenient, but gave freedom and flexibility; (b) the projects and rubrics were not as challenging as they could have been; (c) more examples and non-examples of each project would have been beneficial; and (d) fewer open laboratories would be preferable. The project team as a whole was disappointed the rapid application development (RAD) process and decided on implementing a full instructional design model for the PT3 redesign efforts of the ET department's undergraduate courses.

As a result of this study, the PT^3 team decided that self-paced instruction should be created using a template that has been originally designed to deliver learner-friendly instruction. This template allows for continuity and uniformity of language and format. In the process of the Lohr et al., research study, the two educational technology courses it encompassed (a 200-level course for freshmen and sophomores, and a 300-level course for juniors and seniors) have been brought current not only in the knowledge and skills they taught and developed, but also in the utilization and implementation of latest in computer hard and software.

The team has also imposed a collaborative structure onto the process in order to efficiently and effectively redesign the undergraduate coursework in the department of Educational Technology at UNC. The graduate assistants were divided into three teams: design, development, and utilization. The design team was to conceptualize the assignments, rubrics, and tutorials, as well as complete a task analysis, identify standards, write objectives based on the standards, and create the assignments and rubrics. The design team components were given to the development to operationalize. They put the design into practice by creating the text, graphics, tutorials, and PowerPoint instruction. Once the pieces of each project was uploaded to the team website, the usability reviewed all components making suggestions for additions, changes and corrections.

Faculty Cohorts

Currently, fifteen UNC faculty fellows (8 from the College of Education & 7 from the College of Arts and Sciences) have redesigned at least one of their courses to effectively utilize and seamlessly integrate technology. An advanced doctoral student in Educational Technology who serves as an instructional designer has individually supported the professors in their efforts. The faculty fellows also participate in seminars on technology use in the classroom delivered by experienced technology integration specialists. The content for each seminar has varied slightly based on the needs of the participants each semester.

After having worked with two cohorts of faculty, the UNC PT3 team agreed structure as needed for the process of working with faculty fellows. A checklist of sorts was created so the graduate assistants could make the best use of their time and expertise. The graduate assistant, faculty team go through the process of reviewing the original faculty proposal, identifying goals, setting a schedule, deciding on project restraints, producing mid-term and final reports, equitable division of responsibilities, and identifying faculty needs.

Summary

The need for well-prepared, technology proficient teachers who know how to infuse technology into the curriculum has been identified at the national level and also exists at the state and university program levels. Many state legislatures have mandated appropriate technology training for preservice teachers. The Colorado state

legislature has mandated appropriate technology training for preservice teachers and local school districts have previously identified a technology deficiency in the teacher education programs that the UNC administration is committed to enhance. The UNC PT3 team, through the initiatives described here, is committed to support and advance the integration of technology in classrooms at the local, university, state and national level.

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Project Partners: K-12 /University Collaboration

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Abstract Project: Partners is a collaborative PT3 grant between California State University, Hayward (CSUH) and the New Haven Unified School District in the San Francisco Bay Area. To achieve our goal of helping pre-service teachers learn to use technological tools in teaching and learning, we have matched technology-proficient K-12 teachers with CSUH Department of Teacher Education faculty. The K-12 Teacher-Partners model the use of technology as a learning tool in their classrooms, and they work with faculty members to integrate technology-based instruction into pre-service methods courses.

Modeling Matters

Project Partners was founded on the idea that modeling matters; when teacher education professors model technology for their candidates, pre-service teachers are more likely to use computers with their students. The articles in the *Journal on Computers in Teacher Education* and the *Information Technology for Teacher Education* report that teachers are more likely to use computers with their students when technology is infused into their methods courses, and when pre-service candidates see computers being modeled by their instructors.

For example, British researchers, Yell and, Rehabber, and Stokes (2000), argue that teaching candidates must learn to use computers in the context of the subject specific disciplines they are learning to teach. Central to their "permeation" model are university faculty who model instructional technology, and who assign tasks where candidates must use computers to complete their course work. ("Technology in Teacher Education: examples of integration and implementation in early childhood courses", *Journal for Information Technology for Teacher Education*, Vol. 9, No 1, 2000, 95-109).

K-12 Teachers Model for University Faculty

To prepare University instructors to infuse technology into their courses, faculty members make monthly visits to the classrooms of NHUSD K-12 teachers who are expert in integrating computers in their curriculum. University instructors observe K-12 students working on computers and the management strategies employed in computer-based lessons. Professors post the practices and activities observed on a reflective journal page on the PT3 web site. In addition, they explain how technology enhanced student learning and discuss possible applications to their methods classes.

Not only do K-12 Teacher-Partners open their classrooms for observations to their Professor-Partners, but they also help education faculty infuse technology into their methods courses. Some K-12 partners visit the University methods classes to share a tech-integrated lesson with candidates. In other partnerships, K-12 teachers suggest ways that faculty can redesign their syllabi to include technology.

K-12 partners also submit the lesson the professor has observed to the K-12 Lesson Library. The Lesson Library contains over 300 technology inclusive K-12 lessons. These lessons all incorporate student use of computers to support teaching and learning core K-12 curriculum. Most of the lessons were designed by and used in classrooms of K-12 teachers from the New Haven Unified School District. Some Pre-service candidates contributed lessons as part of their credential preparation program; these lessons have been selected for inclusion through a juried process.

University Faculty Model for Candidates

In order to prepare University faculty to model technology with their candidates, Project Partners provides a variety of faculty development opportunities. On Friday mornings faculty attend Tech Tutelage sessions designed to improve instructors' technology skills. At these sessions professors learn to make PowerPoint slideshows and web pages for their courses. During the summer, twenty-seven CSUH professors attended the Summer Faculty Institute, which provided twenty hours of faculty training on educational hardware and software. In addition, professors received a laptop computer or stipend for attendance. During the school year, a full time PT3 staff member meets with professors to provide one on one tutoring, and help with curriculum redesign. As professors design tech-integrated activities for their teaching candidates, they post them in the PT3 Curriculum and Instruction library.

The visits to K-12 schools, and the PT3 skill development activities, help professors redesign syllabi in their curriculum and instruction courses, and to deliver instruction in new ways. In addition to putting their syllabi on-line, and using Power Point for classroom presentations, professors also have candidates design instructional activities with computers. A mobile cart, with ten i-books purchased by the PT3 grant, is brought into methods classes, giving candidates hands-on experience using computers. Candidates are asked to design lessons, which incorporate technology. Pre-service teachers also have access to the K-12 Lesson Library where model lessons are available on the web.

Candidates Use Technology with Students

The modeling of educational technology in the University classroom helps teaching candidates to use computers with their students. For example, action research conducted in the CSUH single subject social science methods class confirmed that modeling instructional technology was the single most influential factor in candidates' use of computers with their students. In addition, modeling in the methods class positively influenced social studies candidates' attitudes regarding their future classroom uses of computers.

The PT3: Project Partners has made headway in helping teacher candidates use computers with their students. However, modeling is a necessary but not a sufficient condition for new teachers to feel confident about using computers in their first classroom experiences. New teachers must also have accessibility to computers, see good modeling at their school site from veteran teachers, and feel that they have sufficient competence in others area of their teaching to experiment with computer based instructional strategies.

Future Directions

Now in its third year, the PT3: Project Partners has expanded its K-12 University partnerships. The Lesson Library continues to grow. In addition, Project Partners is collaborating with another PT3 project to produce six videos of K-12 teachers effectively using computers with their students. These videos will provide visual materials for candidates and professors to discuss in methods courses. Project Partners is also helping professors to redesign their courses with technology inclusive lessons. The inclusion of these lessons into the Curriculum and Instruction Library will be a major focus this school year and next summer.

Our hope is that when PT3: Project Partners grant ends, the modeling of educational technology for candidates in methods courses will be a regular part of pre-service instruction, so that our new teachers will be prepared to use 21st century tools with their students.

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Technology Integration: The Pedagogy of the 21st Century

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Abstract: The College of Education at Pittsburg State University (PSU), Pittsburg, Kansas, is establishing, evaluating, and validating a comprehensive, standards-based technology professional development model for teachers and teacher candidates that can be customized for each local context. This model uses a computer-based performance assessment to allow teacher candidates, university faculty, and cooperating teachers to demonstrate their proficiency in technology use and integration. In partnership with an educational software company, Synergistic Systems, Inc., and the University of Kansas, PSU is designing and implementing a web-based performance assessment system for validation of technology outcomes.

Introduction

Research indicates that few teachers believe they are adequately prepared for the challenge of using technology (Northover, 1999). The leading obstacle to the implementation of technology in education is not a lack of hardware or software, but rather the fact that many teachers are not technologically fluent. National statistics have shown that teachers receive far less technology staff development than any other professional group.

According to the Office of Technology Assessment (1995), the lack of teacher training is one of the greatest roadblocks to integrating technology into a school's curriculum. "Most teachers have not had suitable training to prepare them to use technology in their teaching" (p. 43). A majority of teachers reported feeling inadequately trained to use technology resources, especially computer-based technologies. Only twenty percent of educators felt their technology skills were high enough to integrate technology into their lesson plans. Forty percent of all teachers have never received any kind of staff development regarding technology (OTA, 1995).

In a 1997 report for the Milken Family Foundation, Kathleen Fulton used the term "technological fluency" to describe the changing definition of what teachers need to know and do with technology. Technological fluency is a combination of the information skills and literacy, communications skills and literacy, and the technology skills necessary to function in a technological environment. For students to acquire technological fluency as a part of their educational experience, they must be taught by technologically fluent teachers. Faculty with technological fluency would be characterized by modeling technology use in the classroom, applying technology skills across the curriculum, and applying technology skills to problem solving and decision making in authentic learning environments. Brand (1997) stated, "If technology is to be used by students, then teachers must possess the confidence, understanding, and skills to effectively incorporate technology into their teaching practices" (p.11).

Overview

While most professional development models are based on teacher attendance or participation in a workshop or training activity, this project turned the model upside down and required in-service teachers to demonstrate technological proficiency through performance assessment rather than only attend workshops or courses. With this approach, learning expectations are expressed in advance and participants may use a variety of learning strategies to acquire the skills necessary for demonstrating their attainment of competency.

This project attempted to increase the quality and quantity of teacher interactions with technology by providing educational opportunities for college faculty and cooperating teachers through workshops, summer institutes, or small group and individualized learning experiences. The technological fluency of teachers was then validated through a performance assessment process related to relevant and authentic learning experiences. The PT3 grant, a three-year federal grant from the U.S. Department of Education's Preparing Tomorrow's Teachers to Use Technology program, provided the funding for this project.

Performance-Based Assessment

The role of assessment in many educational reform models or movements has taken on new meaning as reformers are finding that assessment standards and methods have considerable power as agents of change (Sheingold & Frederiksen, 2000). Although performance assessment can take many forms, it generally differs from the short answer or single problem approach of conventional assessment by focusing on the application of newly learned skills.

Performance assessment generally includes activities that could be called authentic activities similar to tasks a person performs in the real world. Performance assessment includes activities that accommodate multiple approaches and a range of acceptable products and results. Performance assessment activities may require learners to solve open-ended problems, create portfolios of products, or conduct experiments using computer simulations. The primary benefit of performance assessment is that it constitutes a measure of standards for performance of valued skills in a realistic situation and the performance task itself engenders a learning activity (Sheingold & Frederiksen, 2000).

Technological Fluency Standards for Teachers

Standards reflect shared values by identifying and describing those things that are important for a student to know and do. Sixteen technological fluency standards for teacher candidates, college faculty, and cooperating teachers were defined and established through a consensus process by the PT3 Steering Committee and were based on the PSU Technology Plan and the ISTE technology standards for students and teachers.

Technological fluency standards were organized into three phases: 1) technology operations, 2) technology management, and 3) technology integration. Each successive phase was intended to identify a set of technology skills and instructional strategies that exemplified increasing technology implementation and integration into classroom instruction and learning.

In our PT3 project we first established a set of technology standards and indicators that clearly described educational best practices for teaching and learning with technology that university faculty, cooperating teachers, and teacher candidates should implement in their classrooms. We defined teacher technological fluency as the integration of technology in the classroom by modeling technology use in the classroom, applying technology skills across the curriculum, and applying technology skills to problem-solving and decision-making in authentic learning environments. The technology standards and indicators were formulated by synthesizing national, state, and local technology standards and then identifying educational best practices that supported these standards within a local context. We then reinforced a pedagogy that enhanced and improved teaching and learning using technology tools and resources through performance assessment and financial incentives.

A technology standards integration matrix was established to serve as a basis or benchmark for performance assessment. The 16 technology standards comprised the main components of the matrix and then

variations for each standard or component were mapped. These variations attempted to identify the actual teaching practices and instructional strategies that classroom teachers employ when integrating technology in a classroom. Variations for each component consisted of discrete categorizations that described best teaching practices using technology. The variations were mapped along a continuum from unacceptable use to ideal use.

The final version of the matrix consisted of the 16 technological fluency standards and a set of variations (best practices) for each standard. Each successive variation indicated a level of use representing a closer approximation of ideal use (see Technological Fluency Standards Matrix). The technological fluency standards were organized into three phases: Technology Operations (standards 1-6), Technology Management (standards 7-11), and Technology Integration (standards 12-16). The technology standards and best teaching practices were construed to be a reasonable and appropriate set of the instructional practices of teachers integrating computer technology in a classroom and to reflect the actual and ideal practices of teachers integrating technology in classrooms. Although these technology standards and practices were developed and tested in a particular educational context, their application may be relevant for use in analyzing the integration of computer technology in other educational contexts as well.

Technological Fluency Standards Matrix

Phase I – Technology Operations				
PT³ Standards	PT³ Indicators			
	1	2	3	4
1. Operate common technology devices including computer keyboard, mouse, monitor, printer, video camera, digital camera, VCR, scanner, or projection device	Use mouse and/or keyboard function keys to select a screen icon	Configure printer settings	Configure a computer's monitor for projection	Scan an image with a scanner and transfer to an electronic file
2. Perform basic file management tasks using a local computer drive or drive on a computer network	Search for a file on a local hard drive by name, type, or date	Create a folder on the hard drive and copy a file to that folder	Create an icon or shortcut on the desktop and use it to open an application	Zip and unzip a file
3. Apply trouble-shooting strategies for solving routine hardware and software problems that occur in the classroom	Properly shut down and restart computer when computer hangs or locks up	Check RAM usage and hard drive space	a) Run a utility to determine if a disk is repairable	Download and install a program from the Internet or a local drive
4. Use software productivity tools to prepare publications, analyze and interpret data, perform classroom management tasks, report results to students, parents, or other audiences, and/or produce other creative works	Create a word processing document and format for printing	Prepare a word processing document that includes a spreadsheet	Prepare a form letter and merge it with a mailing list file	Prepare a PowerPoint project
5. Use technology to communicate and collaborate with peers, parents, and the larger community through email, Internet, and discussion groups to nurture student learning	Send an email message to an existing name in the address book	Add a name and address to an email address book	Set e-mail program to apply a signature to email messages	Prepare a distribution list and send an email message to every contact on the list
6. Use technology to locate, and collect educational research/best practices information from a variety of sources such as library databases	Browse the Internet to locate useful information using specific URLs	Perform a search using an Internet search engine	Subscribe to and read electronic newsletters or journals related to an area of education	Perform a search of an academic database

Phase II – Technology Management		
PT³ Standards	PT³ Indicators	PT³ Rubric
7. Practice and model responsible use of technology systems, information, and software	Adopt, adapt, and/or develop written classroom guidelines and procedures for students for computer and network use based on acceptable use policies, proper use of computer equipment and software, and copyright/license policies	1) Work product should be age appropriate 2) Address issues of copyright, proper use of equipment, and acceptable use policies a) Copyright/license b) proper use of equipment c) acceptable use policies d) age appropriate

8. Facilitate equitable access to technology resources for all students 9. Manage student-learning activities in a technology-enhanced learning environment	Conduct and facilitate student learning activities or assessment by creating a lesson plan, unit, or project that uses technology resources such a computer lab (modular systems, mobile lab, or classroom computers), or discipline-specific technology tools, or web-based curriculum management tools	Create a learning activity that allows all students the opportunity to access technology resources (graphing calculator, metabolic cart) Create and post a web-based learning activity or assessment tool that allows all students the opportunity to access technology resources
10. Select information and educational resources, hardware requirements, and software features to support curriculum needs and standards	Investigate technology resources that align with learning objectives and curriculum standards	Submit a list of appropriate resources that support district, state, or national standards
11. Demonstrate strategies to assess the validity and reliability of data gathered with technology	a) Develop a strategy or strategies to determine validity and reliability of an educational website and use procedure to evaluate one website	1) Establish criteria to evaluate website validity and reliability 2) Select a website using the established criteria for evaluating the validity and reliability of the selected website

Phase III – Technology Integration				
PT³ Standards	PT³ Indicators			
	1	2	3	4
12. Employ technology in classroom learning activities in which students use technology resources to solve authentic problems in various content areas	Students may or may not use a computer go to support the completion of classroom learning activities	Students use productivity software to supplement classroom learning activities	FACULTY: Integrate one technology-based project within methods and field experience course work COOPERATING TEACHERS: Integrate one technology-based learning experiences per year into classroom instruction that is established for targeted curriculum themes or learning objectives TEACHER CANDIDATES: Integrate one technology-based learning experience per semester into classroom instruction that is established for targeted curriculum themes or learning objectives	FACULTY: Integrate two or more technology-based projects within methods and field experience course work COOPERATING TEACHERS: Integrate two or more technology-based learning experiences per year into classroom instruction that are established for targeted curriculum themes or learning objectives TEACHER CANDIDATES: Integrate two or more technology-based learning experiences per semester into classroom instruction that are established for targeted curriculum themes or learning objectives
13. Employ technology to address the diverse learning needs of students	Use small groups to complete some classroom learning activities	Use individual and cooperative instructional strategies to support the completion of classroom learning activities	Use individual and cooperative instructional strategies to support the completion of technology-based products of learning	Use technology resources to develop individual learning plans as appropriate for diverse learners
14. Apply multiple methods of evaluation and assessment to determine learners' use of technology for learning, communication, problem-solving, and productivity	Evaluate student technology skills using objective tests only	Evaluate student technology skills using objective tests and subjective evaluation of student-produced materials	Evaluate demonstrations of student technology skills using pre-determined checklists, rubrics, and benchmarks to assist students in assessing their own performance	Students are given the opportunity to demonstrate technology skills through live presentations, multimedia presentations, or web-based presentations
15. Engage learners in the development of electronic portfolios that document their technology-based educational experiences	Student work products are returned to student upon course completion	FACULTY: Teacher candidates maintain work products in a folder on disk media (hard drive, diskette, zip drive, etc.)	FACULTY: Teacher candidates develop an electronic portfolio of technology-based products of learning using a word processing document	FACULTY: Teacher candidates develop an electronic portfolio of technology-based products of learning using web pages or multimedia presentation applications

		COOPERATING TEACHERS/ TEACHER CANDIDATES: Students maintain work products in a folder on disk media	COOPERATING TEACHERS/TEACHER CANDIDATES: Students develop an electronic portfolio of technology-based products of learning using a word processing document	COOPERATING TEACHERS/TEACHER CANDIDATES: Students develop an electronic portfolio of technology-based products of learning using web pages or multimedia presentations
16. Use technology resources and productivity tools to collect, analyze, interpret, and communicate learner performance data and other information to improve instructional planning, management, and implementation of instructional/ learning strategies	Write summaries or reviews of student progress and provide to students and/or send to parents using word processing or email	Use an electronic assessment tool to keep record and calculate student grades	FACULTY: Maintain, aggregate, and analyze teacher candidate performance data using an electronic assessment form COOPERATING TEACHERS/TEACHER CANDIDATES: Maintain, aggregate, and analyze student performance data using an electronic assessment tool	FACULTY: Teacher candidates use action research methods within methods and field experience course work to determine that technology or classroom teaching methods are impacting student learning COOPERATING TEACHERS/TEACHER CANDIDATES: Teacher and students use action research methods to determine that technology or classroom teaching methods are impacting student learning

Next Steps

While the progress to date has met with substantial success, there is still much work to do. Currently, the project's corporate partner is converting the Phase I assessment instrument into a commercial product with March 1, 2002, selected as the product launch date. The overall instrument is now being extended and expanded to include Phases II (technology management) and III (technology integration). The management aspect of the instrument developed for Phase I will support implementation of the additional phases, but greater human intervention will be required for their full implementation. Participants will develop portfolios as directed by the software, submit the portfolios for review, and receive feedback as to the level of fluency the participant has demonstrated. While each participant will have the freedom to choose the context and content of his/her portfolio, the rubrics will ensure that the skill indicators related to specific standards are captured within the portfolio. Submission of the portfolio, review, and feedback will all be transacted through an online interface. The instrument's data management system will allow the project directors to track and direct the participants through the phases of technological fluency.

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Teacher Candidate Applications of Telecommunications

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Abstract: Telecommunications offers the teacher candidates an environment through which to delve into higher order thinking skills within the methods coursework, student teaching internship experience as well as within the PreK-12 classroom environment. Modeling of appropriate uses of technology within the learning environment as the teacher candidate progresses through out their course of study emphasizes the numerous constructive opportunities to integrate telecommunications to reach the lesson objectives.

Introduction

Teachers desire numerous tools through which to communicate lesson objectives to the learners, opportunities to build communities of learners, as well as to focus efforts upon the unwritten curriculum that is of importance within all schools through out the nation and the world at large. Teacher candidates are novice instructional designers as well as instructors but the majority of teacher candidates, at this juncture within the history of educational training, are more comfortable with the idea of technological ideology. The philosophical as well as conceptual leap that must occur with the teacher candidates' use of technology within a learning environment is the instructional design and implementation of technologies. Further, modeling of such activities must be an objective of superior teacher education units.

The integration of technology within teacher candidate's methods coursework offers the opportunity to communicate at numerous levels of understanding. Through the support of the United States of America's Department of Education Preparing Tomorrow's Teachers to Use Technology grant, the design and development of a World Wide Web site through which the teacher candidates, inservice educators associated with the professional development schools (PDSs) that support the training of teacher candidates, PreK-12 learners and university faculty have the opportunity to delve into the world of telecommunications. A supportive environment has been created through which access to telecommunicative environs is available to the teacher candidates, as well as faculty and learners whom support the teacher candidate's professional learning opportunities.

Telecommunications encompasses several elements that can be positively modeled within a learning environment. listservs, chat sessions, bulletin boards, and electronic mail creates positive environments within a learning environment when focusing upon the scope and sequence of the instructional design process. Further, the instructor-centered and learner-centered focuses of telecommunicative uses are also elements that deserve further review.

Cognitive Flexibility

Cognitive flexibility offers further theoretical understanding concerning the nature of learning and the opportunities through which learning occurs within complex domains as well as ill-structured domains.

Spiro and Jeng state that, "By cognitive flexibility, we mean the ability to spontaneously restructure one's knowledge, in many ways, in adaptive response to radically changing situational demands.... This is a function of both the way knowledge is represented (e.g., along multiple rather single conceptual dimensions) and the processes that operate on those mental representations (e.g., processes of schema assembly rather than intact schema retrieval)" (1990, page 165). Additionally, cognitive flexibility "is largely concerned with transfer of knowledge and skills beyond their initial learning situation" (Kearsley, http://tip.psychology.org/spiro.html, paragraph 2). As such, cognitive flexibility is especially structured to support the integration and success of interactive technologies, such as telecommunications within the learning environment.

Telecommunications has the opportunity to reposition the learners beyond the mere obtainment of basic knowledge, towards opportunities through which the learners are enveloped within a world of understanding, analyzation and evaluation of the knowledge they are integrating into a conceptual framework of understanding. The complex and ill-structured domains delineated within cognitive flexibility theory aptly describe the world of telecommunications, as well as the opportunities towards achieving higher order thinking skills within the learner's conceptual framework of understanding.

Bloom's Taxonomy of the Cognitive Domain

As learners begin to obtain subject-specific knowledge, an emphasis must be placed upon the developing conceptual framework of understanding that is created. Bloom's Taxonomy creates an appropriate format through which to view the developing levels of higher order thinking skills as the learner moves beyond basic knowledge levels of information towards a level at which the learner is comfortable analyzing the information and then, finally, synthesizing and evaluating the information that has been appropriately and successfully incorporated within the learner's conceptual framework of understanding. Following is a brief explanation of the distinct levels of Bloom's Taxonomy, with a short definition and sample learning objective verbs made available for review. Further, examples of behavior are presented to emphasize the specific levels of understanding.

LEVEL	DEFINITION	SAMPLE VERBS	SAMPLE BEHAVIORS
KNOWLEDGE	Student recalls or recognizes information, ideas, and principles in the approximate form in which they were learned.	Write List Label Name State Define	The student will define the 6 levels of Bloom's taxonomy of the cognitive domain.
COMPREHENSION	Student translates, comprehends, or interprets information based on prior learning.	Explain Summarize Paraphrase Describe Illustrate	The student will explain the purpose of Bloom's taxonomy of the cognitive domain.
APPLICATION	Student selects, transfers, and uses data and principles to complete a problem or task with a minimum of direction.	Use Compute Solve Demonstrate Apply Construct	The student will write an instructional objective for each level of Bloom's taxonomy.
ANALYSIS	Student distinguishes, classifies, and relates the assumptions, hypotheses, evidence, or structure of a statement or question.	Analyze Categorize Compare Contrast Separate	The student will compare and contrast the cognitive and affective domains.
SYNTHESIS	Student originates, integrates, and combines ideas into a product, plan or proposal that is new to him or her.	Create Design Hypothesize Invent Develop	The student will design a classification scheme for writing educational objectives that combines the cognitive, affective, and psychomotor domains.

EVALUATION	Student appraises, assesses, or critiques on a basis of specific standards and criteria.	Judge Recommend Critique Justify	The student will judge the effectiveness of writing objectives using Bloom's taxonomy.

(Huitt, 2000, paragraph 2)

The focus of the learning environment is to aid the learner in reaching the synthesis and evaluation stages of Bloom's Taxonomy. The higher order thinking skills that the learner must reach are areas of further interest and discussion.

Bloom's Taxonomy of the Cognitive Domain and Higher Order Thinking Skills

Achieving higher order thinking within the realm of a learner's conceptual understanding of the subject matter under discussion is an art that teacher candidates must glean from inservice educators, university faculty and numerous other mentors. Higher order thinking skills provide opportunities to provide higher order thinking occurrences for learners within a learning environment are supported by the further examination of Bloom's Taxonomy. Further, broadening the focus of higher order thinking offers the opportunity to emphasize the creation and understanding of information beyond merely the knowledge level of comprehension. Thomas, Thorne and Small (2001) offer a brief description of what higher order thinking skills emphasize.

> Higher Order Thinking, or HOT for short, takes thinking to higher levels than just restating the facts. HOT requires that we do something with the facts. We must understand them, connect them to each other, categorize them, manipulate them, put them together in new or novel ways, and apply them as we seek new solutions to new problems. (Thomas, Thorne & Small, 2001, paragraph 7)

Higher order thinking skills (HOTS) can be distributed into three main categories of understanding: content thinking; critical thinking; and, creative thinking. HOTS emphasize distinctly different levels within Bloom's Taxonomy, which offers the range of simplistic knowledge attainment towards more complex levels of understanding and working with information. The complex levels of working with information and learner's thinking processes and skills associated with HOTS parallels Bloom's Taxonomy within the levels of the synthesis and evaluation. "As patterns of higher order thinking are emphasized in learners within all levels of the educational system, each subject area emphasizes the creation of innovative aspects that aid the learner towards the creation and reconceptualization of thought patterns; in other words, viewing the information from numerous perspectives and within real-world environments" (Brown & Crawford, 2001).

Therefore, there is a clear pattern towards Bloom's Taxonomy of the cognitive domain and HOTS, which leads towards cognitive flexibility's ill-structured domain that offers the learner the opportunity to create and delve into further understanding of subject matter through the appropriate and successful integration of telecommunications into the learning environment. The modeling of telecommunications within the learning environment is accomplished through the integration of specific available opportunities within the teacher candidates' professional development. Following are specific telecommunicative opportunities that have been made available to teacher candidates, through the Preparing Tomorrow's Teachers to Use Technology (PTTT) grant.

Listservs

Listservs have been integrated into the communicative levels of electronic discourse for numerous years. Such a telecommunication ally offers the ability to disperse information to numerous people within a simplistic mode of interaction and transmission. The listserv available through the PTTT grant maintains a bi-weekly message to all teacher candidates, university faculty, inservice educators and administrators who have become subscribers to the listserv community.

Digital newsletters offering updates on professional development opportunities, new technological innovations for the learning environment, useful Web sites for subject-specific or foundational knowledge are offered. Each digital newsletter is focused upon a specific topic, so as to offer significant information that will be useful to the subscribers. As well, a listserv is a simplistic format through which to disperse

important or useful information in an up-to-date, digital fashion. This ease of use maintains a one-way, asynchronous communication between the PTTT grant and the participants.

Bulletin Boards

Another asynchronous communication tools available forintegration within learning environments is the bulletin board. The opportunity to create threaded discussions maintains a communicative quality to the learning environment, without hampering the learner's ability to create an "anytime, anywhere" attitude towards information attainment. The communication is occurring within a threaded discussion, yet the learner can access and respond to the discussion at any point within their busy daily schedule. Teacher candidates are expected to maintain a rigorous schedule within the PDS learning environment and may not have the opportunity to maintain designated time allocation towards telecommunicative activities at specific points through out the day. Therefore, the ability to offer bulletin boards as a communicative activity maintains the thought pattern displayed within the discussion, but also maintains the freedom to review the discussion as an asynchronous entity. Further, the teacher candidate has the ability to develop and submit thoughtful responses to the discussion, without being hampered by time or keyboarding ability.

Electronic Mail

As a one-on-one asynchronous communicative tool, electronic mail (e-mail) is unsurpassed. Documentation concerning previous communications is easily obtainable within e-mail, due to the ability to archive e-mail communications for future use. This is an important aspect for teacher candidates to consider, as documentation of learner and parental communications are important elements when issues arise. Further, the ability to maintain personal communication with parental figures is a lifesaving event, as telephone communications can be wrought with difficulty. E-mail has the ability to communicate with a parental figure, as well as document the communication attempts. As well, the ability to communicate with a learner who may have course difficulties is an important element to the success of the learner.

Chat Sessions

Synchronous telecommunication opportunities are also an important element within the learning environment. Teacher candidates maintain that a virtual office hour are useful during their plan of study, and maintains communication with their university faculty whenever questions arise concerning coursework issues. The positive element concerning chat sessions is the ability to communicate back and forth within a real-time setting; however, the negative elements associated with chat sessions are the designated date and time allocation as well as the keyboarding abilities of some teacher candidates.

Integration of Telecommunications into the Learning Environment

As stated by the International Society for Technology in Education (ISTE), "Technology must become an integral part of the teaching and learning process in every setting supporting the preparation of teachers" (International Society for Technology in Education, 2001, paragraph 2). Further, "A combination of essential conditions is required for teachers to create learning environments conducive to powerful uses of technology. The most effective learning environments meld traditional approaches and new approaches to facilitate learning of relevant content while addressing individual needs" (International Society for Technology in Education, 2001, paragraph 1). Therefore, ISTE supports the integration of technology into the learning environment so as to create a supportive environment that emphasizes effective learning and addressed the learner's individual needs.

Instructor-Focused Versus Learner-Focused Integration

The implication for telecommunications modeling is that the ability to integrate telecommunications into the learning environment is simplistic; however, this is definitely not the case. Careful modeling of telecommunications integration into the learning environment must be created and supported by university faculty and inservice mentors. Only through this modeling of appropriate and

successful telecommunicative ventures will the teacher candidates expand their conceptual framework of understanding concerning the integration of technology into the learning environments. Emphasis must be placed upon the ability to integrate technology as an instructor-focused activity as well as a learner-focused activity. Telecommunications could easily be integrated as an instructor-focused activity through the support of a listserv environment; while a learner-focused activity could easily be designed and implemented through the support of bulletin boards and chat sessions.

Conclusion

With the inclusion of telecommunications through out the learning environment, it remains that "The most obvious benefit of the electronic classroom is that it achieves what progressive educators could only dream of: a union of work and play.... There is no certainty that the electronic classroom will actually fulfill this promise, but it is this hope that makes the realization so attractive" (Ravitch, 1987, p. 28). The creation of learning environments that ready our learners for the complex, ill-structured world in which we live can only be appropriate towards the success of the future generations. Through the inclusion of technology, specifically telecommunications, the communicative nature of information and bonding has the opportunity to flourish.

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A Journey through Learning with Technology

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Abstract: This paper describes a preservice teacher's journey as she learns to use technology -- first for her own work and then as she learns to teach in elementary classrooms. Examples of lessons and projects in primary classrooms are discussed.

U.S. schools are adopting technology for instruction more than ever before. Certification programs are teaching and encouraging future teachers to integrate technology into their classrooms. The cohort of teachers graduating in the upcoming years will graduate with the knowledge of how to use technology to help them and how to integrate educational software into their lessons to benefit their students. Research shows that when teachers work together to make technology part of their classrooms their students learn more effectively and also prosper more in the world outside of their school. Studies conducted by the McRel organization show that students with access to technology in their classrooms perform better than their peers who do not have the same opportunity (McRel Products, 2000).

To fully appreciate the effect of technology one must look at the benefits technology has for teachers, how technology helps students learn, and how technology affects the students. During the first years of my college career I was introduced to technology. I learned how to use programs such as *HyperStudio*, *Inspiration*, and *Microsoft PowerPoint*. The university professors encouraged us to use these programs to organize our work and to help us during presentations. These programs, among others, are very helpful when teachers are organizing information for units or lessons plans. Programs such as *PowerPoint* can also be valuable for teachers if they need to put on a presentation for other school personnel or for parents who come to an open house or other meeting. For example, I created a *PowerPoint* presentation to encourage the parents in my community to accept Internet use in the classrooms. When I began using these programs another activity that I was working on was a unit on Alaska. We were focusing on how the position of Alaska in the United States helped promote explorers and travelers to populate America. First, I completed an Inspiration Web showing how I would integrate information about Alaska into each of the subjects that I was teaching. I have used this program for this purpose throughout my teaching career at Saint Bonaventure. I found that it was extremely helpful when planning my unit on the Healthy Body. I was able to brainstorm many ideas for each subject area and then I was able to create lesson plans and activities from there. It also helped because I was able to see the array of ideas that I wanted to cover and could then plan how long the unit would take to complete. Using the web as a guide for lesson planning is not the only benefit. You can use the web to help plan and create other activities. For example, when I created the web on Alaska, I was able to use it to help create a HyperStudio on Alaska. Having a base of the most important information I wanted to teach allowed me to create and interactive slide show to teach the children this information.

Another technological bonus for educators is the Internet.. Once again, referring to the Alaska presentation, I was able to create the Inspiration web and the HyperStudio based on information I obtained from the Intemet. Teachers learn that the way to succeed in their career is to utilize all of the resources that are available to them. And the Internet is one of the best teaching resources available. There are countless web sites with teaching ideas, and even more that have information that you can share with your students. Planning lessons used to take teachers days...the Internet really helps speed up and spice up this process.. I am currently preparing to student teach next semester and the Internet has been one of my most important resources. I have been able to fins many important facts that I can share with the children, interactive web sites that I can teach them through, and a tremendous assortment of activities the help my lessons to become more exciting. Teachers have told me, and I used to see, that planning lessons used to take teachers days. I think that the Internet has not only helped to speed up this process but has also helped spice up lessons, and made them fun not only for the children but the teachers too.

As my college years continued I became more involved in elementary school classrooms. In the past year I have started interning in primary level classrooms. This opportunity has broadened my perspective of how to use technology not only for my purposes but also when I am teaching the children. By taking this step and bringing technology into my

lessons, I have seen first hand what all of the research says. Technology is exceedingly effective when teaching children. Technology helps to draw the children into an activity, and because they are so intrigued by the new way of learning, technology helps keep them engaged in what they are doing, sometimes without even realizing that they are learning. I have taught the students in my classroom to make character and phonics webs using the program *Kidspiration*, and have also used Tom Snyder's *Community Map Maker* to teach the students characteristics of a community. Kidspiration is a program that helps children learn how to organize thoughts that they have and see the relationship between ideas they are being taught. For example, when I was teaching the children how to make a phonics web they learned about organization and relationship of a letter, to a word, to a picture. Each student chose a letter and then wrote three words in the connected bubbles that started with their letter. After this, they drew another bubble from each of their words and put a picture of the work they had chosen. When the students made character webs they put a picture of themselves as the main idea and branched five statements about themselves from the picture. From there they connected each bubble to one more to explain the idea they had previously stated. This helped them understand how to take their explanations to a higher level of thought.

Bringing a computer into a classroom is a wonderful anticipatory set. When I began my lesson I had the students' attention without using any words. When I began to explain what they were going to learn I did not lose their attention because they stayed focused on the technology that I was showing them. Children learn by doing, and part of that is visualizing. Technology allows you to show the children what they are learning, and then allows them to do what they have learned. Technology use supports greater learning because it allows students to immediately apply what they are learning. This is one reason that the community map-making lesson was extremely successful. The students enjoy drawing and if I had them create a map of their town on paper it would have showed them the same concept that the computer map showed them but by far the students learned more from taking their information and organizing it well enough to produce a replica map on the computer screen.

A final step in the learning process is excitement. Any teacher can tell you that children learn better when they are motivated and excited by what they are learning. Children love technology. My experience tells me that there is no other better way to motivate children than through the use of technology. When I taught the children in my second grade class how to use map making software to create a community it was one of the most successful lessons I taught all year. The students did not speak to their friends while I was talking, they worked in groups together to create a list of things that they wanted to put in their community, and when they had the chance to put their information on the computer they took turns with each other and worked together to make sure that their map was a replica of their real town. Finally, when the project was over and I printed them out a copy of their maps the delight in their eyes was astonishing!

As a teacher this is the factor that proves how important technology is to the children. The students looked at what was printed like it was a complete masterpiece. Technology helps children create pictures and write words in ways they never thought possible. Typically I see delight in the children's eyes when they realize that they have learned something new. When they learn something from technology this delight in insurmountable. The feeling that I get from seeing them happy makes the entire process worthwhile.

Technology can benefit all those that take time to use it in their classrooms. "Properly used, technology can enhance the achievement of all students, increase families' involvement in their children's schooling, improve teachers' skills and knowledge, and improve school administration and management" (U. S. Department of Education, 2000). My experience has also shown me that not only teachers and students benefit from technology use, but anyone that those teachers and students show the technology to also benefit. If all of these "players" join in the technological challenge, growth will occur, school systems will become more enriched, and together everyone will share the rewards of the new system they have created. During the presentation of this paper I will be able to introduce some the technology that I have used with my students. I will be able to present some of the students' work and hopefully portray the feelings that the students had from participating in my technology lessons.

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A Team Approach to Integrating Technology into the Teacher Education Program

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Abstract: In the last decade, the College of Education (COE) at Wichita State University (WSU) has experienced the same challenge to better prepare teacher candidates to integrate technology that has been experienced by Schools, Colleges, Departments of Education (SCDE) throughout the United States. At WSU, the teacher education faculty decided to address this lack of teacher preparedness by adopting the ISTE NETS*T as technology standards for our graduating students. This presentation describes the three-layered approach used at WSU to integrate technology into the teacher education program to meet those standards. In the first layer, teams of teacher education faculty discussed, argued, collaborated, and finally developed a proposal to document how our teacher education students meet the ISTE NETS*T standards. The second layer involved student and faculty mentors who provided one-on-one assistance to faculty as they learned to use the technology in their instruction. The third level involved a series of faculty development workshops ranging from hands-on small group sessions to technology fairs open to the entire college. This presentation will share what our technology leaders learned from this process and the final integration proposal that resulted.

Layer One: Integration Teams

The process of integrating technology into teacher education courses presented a challenge to the faculty in the teacher education program at Wichita State University. The faculty in the COE had decided several years earlier that all technology should be integrated into undergraduate teacher education courses rather than covered in separate technology courses. Confident of having made a pedagogically sound decision to integrate, the faculty began exploring what integration really means and how it could be accomplished in our program. We discovered that this approach is simpler in theory than in practice. At first our attempts at integration were haphazard since faculty were already overloaded with goals and standards to be met and were not comfortable enough with technology to infuse it into their instruction. Our efforts focused on presentations to students in core courses, hands-on training in the computer lab when needed, and faculty development workshops and training to introduce new technologies to faculty.

In 2000, the Undergraduate Teaching Programs Committee adopted the ISTE standards (ISTE 2000) as our criteria for student proficiency in technology. The ISTE standards provided a starting point for structuring our technology integration. The Coordinator of Educational Computing distributed copies of the standards to all faculty in the teacher education program and began educating faculty about NETS*S and NETS*T standards and essential conditions for implementation. As faculty members discussed the standards, they began to question how the standards should be addressed in their courses. A number of issues arose as faculty attempted to integrate the technology to meet technology standards. Some of the more frequently voiced concerns and issues:

- Which standards should be addressed in what courses?
- What is my responsibility in teaching my students how to use the technology?
- I only have so much time to cover content, how will I manage to teach them how to use PowerPoint and other technologies without taking away?
- Should I require students to use technology to meet the course objectives or should I make technology optional?

The First Learning Experience

Our initial approach to supporting technology integration was to use the consultant model. WSU's teacher education program is organized in 4 blocks of courses. Each block addresses major program goals and builds on a scaffolding set of experiences with extensive field experiences. Supported by a PT^3 grant, a technology instructor and a curriculum specialist were given reduced loads to meet with each member of the first two blocks in the teacher education program and plan for technology integration. Faculty discussed the kinds of technology they required of their students, how they assessed student performance, and brainstormed new ways to use technology to help instructors meet the goals of their courses. This approach proved to be time-consuming and resulted in only marginal success in developing technology activities. Much time was lost trying to set up individual meetings with busy faculty. It also meant that dialog was only going on through the technology and curriculum specialists. The faculty members were not communicating with each other about their decisions on how to use technology, their concerns, or their successes. Some faculty members interpreted this consulting approach as an effort to tell them what to do in their classes. The difficulties with this approach reflect the necessity for change to be systemic if it is to be lasting and meaningful (Darling-Hammond & McLaughlin 1995; Kanter et al. 1992; Peterson 1995; Senge 1999). Instead of moving upward through levels of technology adoption (see Sandholtz, Ringstaff, and Dwyer 1990), the faculty continued to rely on the "experts" and to wait for further instructions. It became apparent that we needed to change our strategy to a more collaborative approach. We had learned first hand that isolated efforts of change are not effective and are often short-lived. If we wanted programmatic changes that would have a lasting impact on our teacher education program, we obviously needed to change our strategy.

The Solution

In order to increase communication and collaboration among the teacher education faculty we decided to bring faculty together in ongoing dialog about technology integration. A pilot team of 4 instructors was brought together to discuss technology integration in Blocks 1 and 2. These instructors represented special education, educational psychology, secondary education, and elementary education. Their goals were to identify ways that technology could be modeled in their classes and to determine what technology skills their students needed to be successful in meeting the recently adopted standards. Lively discussions centered on what technology integration really means, what skills should be expected of students, what responsibility did the instructor have in providing instruction in using the technology, and how should students be assessed.

At the end of the semester, faculty members and the technology specialist had formed a cohort that had some common understandings of both the challenges and the benefits of integrating technology. When asked to describe their experience to the next integration team made up of methods instructors, the first team members were excited about sharing what they had accomplished. At the end of their presentation, members of Team 1 strongly recommended that the second team work toward a sequence of technology skills within the block classes. They even volunteered to continue to work with Team II to accomplish this on their own time!

A second integration team included 9 methods instructors in Blocks 3 and 4 of the program. This group was considerably larger than the first integration team and represented a variety of adoption levels, technology skills, and content areas. This team used an online rubric generator to create a rubric to set goals and to guide their work toward integrating technology into their classes. As they discussed technology integration, it became apparent that they needed more training in how to use the technologies. A list of topics of interest was drawn up and used to plan faculty development workshops. This list was further developed into a whole day of concurrent sessions for the entire College of Education faculty and teacher education faculty in Liberal and Fine Arts.

The second team was unable to agree on a sequence of skills or how they should hold students accountable for meeting the ISTE standards because they only represented 2 of the blocks and didn't feel they could speak for the other blocks. Instead, they decided to focus on developing technology activities within their classes and sharing with each other. All technology activities were entered in a central database and a Web portal was set up so that faculty could view, edit, and search activities and technology tools for their classes. A grid of technology activities was designed that showed which classes were using technologies to meet their course objectives.

Again, the second team decided that the next integration team really needed to address issues related to student assessment in meeting the ISTE standards and to develop a plan for sequencing technology skills in order to scaffold student experiences in technology. Consequently a third team was developed with representatives from all blocks. A letter of invitation was sent out from the Dean inviting participants to engage in discussion with the end

result being a formal proposal to the teacher education program committee of how the program was going to ensure that students met the ISTE standards. This time the technology specialist served only as a facilitator, bringing supplies and setting up computers when needed and only occasionally offering suggestions or asking questions. The faculty members were told that they were to come up with their own proposal based on their own understandings and needs.

Issues Addressed

All three integration teams addressed basic issues related to technology integration. Questions addressed were: (a) Which technology skills must students have and at what point in their program? (b) Is it enough for students to see technologies modeled or must they be able to use the technologies to teach? (c) How do we determine if our teacher education students can actually affect their students' learning by integrating technology? (d) Since we don't offer a basic skills course in technology, whose responsibility is it to train students to use the technology? (e) Some of our older students are really stressed out by all the technology. What can we do to help them? (f) When do faculty members find time to learn about the technology? (g) When do faculty members find time to re-design their courses to include technology?

The Final Proposal

These questions were discussed and argued at length over several months. The final proposal described three levels of learning about technology: (a) seeing (instructor models), (b) doing (student learns how to use the technology, and (c) applying (student plans lessons and activities with integrated technology. Five technology themes were identified to be carried out throughout the Block program: (a) communication, (b) instructional strategies, (c) research tools, (d) assessment, and (e) ethical, social, and legal issues. These themes were based on the content within the teacher education courses, rather than an outside model. The technology specialist was delighted that the teacher education faculty were able to work through issues and concerns and to come to their own understanding of technology integration through dialog and collaboration.

This team also developed a sequence of technology activities in each block that was presented to their colleagues in each block for feedback and comment. Suggested technology tools or strategies were indicated but not required. For example, Block 2 instructors decided that students would be able to conduct a Web search to solve a problem and to evaluate Web resources for authenticity and credibility but they decided not to identify WebQuests by name. This allowed more flexibility for instructors to choose the strategy that best matched their teaching style. Each block identified technology skills that students would need to meet course requirements and published those in course syllabi. Students were encouraged to improve or acquire technology skills by attending mini-workshops provided by the Tech Center staff on a variety of productivity and instructional software, by enrolling in one of the computer workshops offered for both undergraduate and graduate credit, or by seeking help through online tutorials. The final proposal measured student competencies by assessing the ability to complete an assignment or project that required the use of technology. For example, students were not graded on their ability to use desktop publishing but rather on their ability to meet a course requirement for effectively communicating information to parents through a newsletter.

Layer Two: Mentoring

Funding by a PT^3 grant provided student mentors for faculty. The student mentors were selected from undergraduate student applications and trained to meet faculty needs. The most popular requests were for assistance with setting up a Blackboard courses, creating Web sites, and media production. Our first mentoring efforts led us to conclude that student mentors could not produce work for faculty. They could only teach faculty how to produce their own instructional materials. Some faculty members resisted at first, saying they didn't have time to do the work for themselves. They really wanted a student assistant who would do the nitty-gritty work. However, the PT^3 grant staff decided to encourage faculty to become independent of technology and instructional support as much as possible and to limit mentor assistance to teaching faculty rather than doing their work for them. Eventually, most faculty came to realize that they learned more and were able to use the technologies better if the mentor functioned as a guide rather than as an assistant. We also discovered that by involving student mentors in faculty development

activities, students learned more in order to be able to teach their instructors and that faculty members were impressed when students could use the technologies so expertly.

We also learned to limit the kinds of assistance offered to faculty. Instead of asking, "what do you need?" and then scrambling to train the student mentors to meet those needs, we decided to offer a menu of assistance from which faculty could choose. That decision allowed the staff to focus on training student mentors in depth and resulted in more independent mentors and mentees who required less supervision. Our student mentors began to be popular not only with faculty, but with their peers and college staff. We eventually had to develop guidelines to protect the mentors from all the demands on their time. We also discovered that increased technical assistance was necessary as faculty use of technology increased.

Layer Three: Faculty Development

We began our faculty development efforts with 2-day workshops led by outside consultants. These were minimally successful and involved only a few faculty members who were motivated to find two consecutive days they could devote to a workshop. Offering a variety of professional development opportunities has found to be more successful in both K-12 and higher education (Milone 1999, Rogers 2000). We finally developed an approach that provided this variety of experiences by including one-hour mini-sessions on topics requested by faculty, field trips to local schools and nearby Colleges of Education for inspiration, all-day technology fairs made up of concurrent sessions that faculty could select from to meet their needs, individual consulting by PT3 grant staff, and a network of model instructors we could refer faculty to when they had more questions.

The technology fair was one of our more popular efforts. Our partner K-12 schools requested we repeat the fairs at their schools with sessions designed to meet their teachers' needs. Grant personnel were also asked to help design and participate a university-wide technology fair as a result of faculty response to the college-wide events. For each fair, we selected a theme that was carried out in flyers, posters, signs, and the activities themselves. The excitement for our Dive into Technology event was heightened by lifesaver t-shirts, inflatable swim toys, ducks floating in the fountains, and a large seascape on a glass wall facing the computer center. Some faculty members ended up attending sessions all day, while others came and went according to their needs and schedules. The President of the University accepted our invitation to stop by one major event and even brought his wife to see what we were doing with technology.

Conclusion

Technology integration in the College of Education at WSU has evolved from sporadic efforts, one-shot workshops, and good intentions to an exciting program of activities. Technology is evident in teacher education courses, course syllabi have been revised to include technologies, faculty and students receive a variety of technical and instructional support, and excitement continues to build as the technologies become everyday tools for learning. A visit to the Technology Center may show students working on papers, completing online forms, developing instructional materials, and learning how to use HandSprings to track student progress. Students and faculty move between classrooms and the Technology Center with wireless laptops, digital cameras, and projectors. Technology is no longer confined to the Technology Center but is found where ever students and faculty are working together.

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Arkansas Schools: Erasing the Digital Divide

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Abstract: This paper is a report of a graduate action research project and a Preparing Tomorrow's Teachers to use Technology (PT3) digital equity study. The study looks at technology access and other barriers at a metropolitan high school. A survey based on the International Society for Technology in Education (ISTE) standards for students was conducted in the spring of 2001 and is compared to a survey conducted four years ago at the same high school to assess ways the digital divide is being erased.

Introduction

The digital divide is of particular concern in the Little Rock metropolitan area. According to a recent article in the Arkansas Democrat (2001) Arkansas' technology work force is growing at one of the slowest rates in the nation and is ranked 45th nationally. Another example of the divide is illustrated by the following demographics from an urban Little Rock high school. JA Fair has a population that is 80 percent African American; many of them coming from low-income homes. It also has a new high-tech computer lab that has a student enrollment of 52 percent white and 31 percent African American. This type of information confirms the digital divide. A plan to erase that divide led to the school receiving a grant to become an information systems and technology magnet school which means state of the art technology. This study is an assessment to determine current student and teacher use of technology that will act as a base line for future implementation and improvement.

The Study

This research compares student access and use of technology at J. A. Fair high school. A survey based on access issues and the International Society for Technology in Education (ISTE) standards for students was conducted in the spring of 2001 with 260 students from a variety of classes that can be considered representative of the student population. Students in English, science, social studies, business and a technology lab were asked to complete the survey. The results were tabulated and compared to a prior survey. The previous survey was conducted four years ago with 700 out of 930 surveys completed. Although the surveys differ, some of the data is similar and can be compared to look at issues of access and barriers to technology for students and teachers.

The Findings

After studying both surveys and interviewing a teacher at JA Fair, several observations were made. In 1998, 40% of the students reported having a computer at home, compared to 78% in 2001. Another interesting statistic is the number of students who used the computers in the library. The 1998 survey reported 70% use of the computers at the school library, compared to only 40% of the 2001 students. A teacher suggested that in 1998 there was a librarian who placed an emphasis on using the Internet to conduct research and the current librarian does not. Another reason may be due to the fact that the students now have access to an Environmental and Spatial Technology (EAST) lab, a Plato lab, which has grown from six to sixteen computers, and more access to computers at home. The EAST Lab is a high tech lab centered around problem-based learning and the Plato lab is designed around a courseware program based on skills acquisition in a variety of content areas. There were three business education

computer labs in '88 and four in 2001. In 1998, none of the Career and Technical classes had computers but now three are in home economics, seven in Marketing Education, and one in Coordinated Career Education. The Media Center has grown from four computers in 1998 to nine. In addition, the Little Rock School District now has its own technical support rather than using outside companies in as it did in 1998. In 1998, the only department office/workroom that had a computer was the Science department and it was outdated. Presently, each department has a computer with Internet access. In 1998, the only classes that had a computer were the business education classes. The science classrooms now have at least one computer with Internet access, and every classroom is wired for the Internet with computers on the way.

The Future

Greater improvements should occur since J.A. Fair has been approved as an IS and Technology magnet high school. It is becoming a center for advanced scientific research and experimentation with an emphasis in the environmental sciences, engineering and information sciences, and medical sciences. A vital part of this program will be the close tie with University of Arkansas at Little Rock's newly developed College of Information Science and Systems Engineering, as well as the Schools of Medicine and Life Science. A state of the art technology lab is in the works. One of the culminating experiences of the program will be a student operated and staffed business. "Connected Technologies ", the student business, will be implemented by eleventh and twelfth grade students proficient in information technologies. Students will research, plan, market, and manage a business that addresses the community's technology needs. Teachers will mentor the activity and will establish collaborative partnerships with local businesses and technology professionals. Information technology professionals representing various ethnic and racial groups will be invited to collaborate and share their perspectives on this and other large projects. This will allow students the capability to communicate with the Little Rock Public Library, University of Arkansas Medical School, and University of Arkansas at Little Rock Library Systems. To access these databases, students will register with each system. Parents will be encouraged to communicate with teachers via e-mail.

Another series of important and motivating experiences will occur in the "Information Systems Management Center." Activities in this area will train students in troubleshooting for the campus network and share information and software programs with all the computers on campus. These activities should excite students about Information Technology related careers while strengthening traditional academic programs with project-based learning experiences. This opportunity for entrepreneurship and small business management combined with Information Technology services will provide students with a meaningful "real world" understanding of the need for technology to ensure their success and advancement in the world of work.

It is evident that there are many hurdles to jump before the issues and concerns associated with bridging the digital divide to bring about digital equity are no longer concerns. JA Fair is in a unique position to help close the digital gap in this area. The success of this program will adequately prepare students for life in the 21st century. Student progress as they undergo this technological transformation will be tracked by keeping an on- going survey of students in the 9th grade as they progress to the 12th grade.

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On-Line and On Target: Strategies for Assessing the Educational Technology Competency of Pre-service Teachers

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Abstract

The Nebraska Catalyst Project has sought to develop a convenient resource kit of educational technology assessments for the 17 teacher preparation programs within the state of Nebraska. Significant progress has been made in the range and quality of assessments being developed, which now encompass a variety of organizational approaches, including performance/portfolio, self-report, self-reflection, focus groups, surveys, and classroom observation strategies. Although these assessments are in various stages of development, they are beginning to be systematically available, and are starting to help the Nebraska teacher preparation institutions assess their individual progress in educational technology and teacher preparation. This paper provides a brief overview of each instrument under development by the project.

Introduction

It has been said that "You can't teach today's students with yesterday's materials, and expect them to have success tomorrow" (Teacher Librarian, March/April, 1999, p.34). It is indeed becoming a technological world, and the preparation of our pre-K – 12 students for the challenges of tomorrow no doubt demands a teacher preparation program that takes full advantage of educational technology. But how do we know when pre-service teachers are achieving the experiences that they need in educational technology through our programs? A good institutional linkage to teacher competencies in educational technology, and a good assessment process for those competencies, would seem to be two keys (Krueger, Hanson, and Smaldino, 2000; Smith, Harris, Simmons, Waters, Jordan, Martin, Cobb, 2000; Waugh, Levin, Buell, 1999). This paper overviews a variety of assessment strategies being tried at the 17 teacher preparation institutions participating in the Nebraska Catalyst Project.

The Nebraska Catalyst Project is funded by a grant from the U.S. Department of Education Preparing Tomorrow's Teachers to Teach with Technology (PT3) program and builds upon a strong partnership among the 17 Nebraska Teacher preparation institutions. This project is seeking to help create systemic improvements in the preparation of new teachers related to educational technology within Nebraska. This partnership also extends to various other Nebraska stakeholder institutions, including the Nebraska Department of Education, the Nebraska Association of Colleges of Teachers Education, the Nebraska Council of Teacher Education, the Educational

Service Units, the Nebraska Distance Learning Association, the Nebraska Educational Telecommunications Commission, the Nebraska Educational Technology Association, and the Nebraska Distance Learning Association. Participants also include a newly organized group of Nebraska pre-service students called SETA (Students Educational Technology Association).

The overall focus of the Nebraska Catalyst project is to strengthen teacher education settings as they relate to training future teachers to use technology effectively in the classroom. Four task forces are operating aggressively within the project, including Task Force I---Assessment Development, Task Force II---Completion Requirements, Task Force III---K-12 Teacher Cadre Development, and Task Force IV---Distance Learning. Task Force I and II have worked together to undertake the development of various prototype instruments to help assess pre-service teachers classroom readiness in educational technology.

Across the country, there are already a considerable number of informal instruments in use by institutions of higher education (IHEs) that attempt to get a sense of the success of their educational technology preparation of pre-service teachers. However, somewhat more rare, are instruments that have been systematically developed and carefully refined, targeted at reliability in administration and validity in content, and based upon standards or competencies such as those from the International Society for Technology in Education (ISTE). During the last few years, institutions also appear to be moving more toward a wider variety of assessment strategies, or are targeting strategies that are generally more qualitative ands hands-on in format, such as portfolios (Milman, 1999; Georgi & Crowe, 1998; McKinney, 1998; Petrakis, 1996)

The instruments that do exist are also fairly scattered across the institutional landscape, and thus sometimes not very convenient to interested institutions. To develop a locally convenient and multi-institutional resource kit of solid instrumentation was a major goal of the Nebraska Catalyst project. We believe that we have now made some strong progress in this effort, and the range of efforts and strategies undertaken is quite extensive. The efforts to date include a variety of organizational approaches, including performance/portfolio, self-report, self-reflection, focus groups, surveys, and classroom observation. These assessments are in various stages of development, but are even now becoming systematically available to help Nebraska institutions assess their progress in educational technology and teacher preparation.

The Instruments

The assessment instruments being developed are currently well within the refinement process, and within various pilot efforts by individual institutions. A brief narrative describing each of the instruments under development is provided below. More complete descriptions and background information can be found at the Nebraska Catalyst web-Site of http://www.necatalyst.org.

A Self-Report Instrument:

The Technology Ability Perception Self-Report Instrument (TAPSI) is an online survey that has been developed by administration to pre-service teachers at three IHEs in Nebraska. The Technology Ability Perception Self-Report Instrument (or TAPSI) has been developed as a general self-report instrument related to a pre-service teacher's perceived educational technology skills and knowledge. This instrument is already examining pilot data from more than 150 pre-service teachers retrieved during the spring of 2001, and is in a formal refinement process based upon that data analysis. The instrument is currently available for interested institutions, and the Nebraska Catalyst Project is offering initial consultancy help.

A Classroom Observation Instrument:

The Classroom Technology Observation Instrument (CTOI) is an instrument that is primarily for supervisors of student teachers. This Classroom Observation Instrument was prepared for the Nebraska Catalyst Project and is currently under further refinement (prototype already completed), with the assistance of an assessment specialist at WestEd in San Francisco. This instrument has already been used during the fall of 2001, and is structured to formalize the identification of the classroom uses of educational technology by both teachers and

students. It includes an interpretive rubric for examining these various levels of educational technology (as well technology supportive constructs such as constructivism). Current conceptualization with the instrument are exploring its potential use on computer laptops or perhaps hand-held Palm devices, to make it more convenient to users.

A Web-Based Student Portfolio:

The development of a prototype for a web-based student portfolio has been underway through a direct collaboration between the Nebraska Catalyst project, and the two Nebraska PT3 Implementation projects (underway within the University of Nebraska system). The initial prototype of the student portfolio, which is currently "institution-based", now contains information from more than 500 students, across four different classes, and has been considered by NCATE (institutional visitation team) to be an evolving model that might be recommended to other institutions. The prototype is now available for more extensive use and refinement. In addition, the Catalyst project is also supporting a portfolio-developers special interest group, and is helping support various portfolio spin-off efforts at several of the partner institutions.

Pre-Service Teacher Focus Groups Protocol:

An initial focus group protocol was developed for use with pre-service teachers to support a group reflection process to examine pre-service teacher perceptions of how well Nebraska institutions are preparing their teacher candidates related to the use of educational technology for teaching and learning. To date, focus groups have been conducted at four representative institutions. The data from these focus groups has been carefully summarized, and is available on the project web site. In a follow-up process to the focus group effort (and based upon that protocol), a pilot web-based survey was also prepared for pre-service teachers. This web-based survey is expanding the input base of pre-service teachers, and provides valuable additional feedback on the perceived value and reform needs of their pre-service preparation programs.

Nebraska SnapShot Survey:

This web-based survey was conducted during February, 2000 and 2001, and focused upon determining the beliefs, use of technology, and the technology based needs of all Nebraska teachers, as connected to in-service education. A total of 4800 Nebraska teachers responded, providing a rich perspective on the current practices and needs of teachers in Nebraska, as it relates to educational technology in the classroom. The results have been disseminated to all Nebraska institutions of higher education, and the state legislature. Further information is available at the Nebraska Catalyst website or more directly at the URL of http://ois.unomaha.edu.

Faculty Survey:

A fairly extensive faculty member survey has now been piloted at one of the NE Catalyst's institutions, and Likert scale self-assessment data has been collected on more than 90 participating faculty members. Survey questions focus on two main areas, including 1) faculty knowledge and experience related to educational technology, and 2) faculty attitudes related to educational technology. Interested institutions have the instrument freely available to them for potential revision and use with their own faculty.

Technology Skills Certificate:

The Technology Skills Certificate effort is underway at a NECatalyst participating institution (The University of Nebraska at Lincoln) and is being conceptualized as a "class-based" electronic portfolio for pre-service teachers. The students within the class undertake a variety of technology related assessments, which result in a certificate of successful completion. The effort is currently under development, and is targeted at being a model

for other interested institutions. Several institutions have benefited from periodic review of this effort, and from collaboration with the developers at the initiating institution.

Profiler Basic Skills Checklist:

Over 1200 pre-service teachers, at several Catalyst institutions have now taken this on-line self-assessment instrument. The data generated consisted of Likert scale responses to self-reflection based questions. Each individual pre-service teacher taking the on-line instrument receives both a response summary and a peer-based comparison diagram of their perceived strengths and weaknesses related to specific educational technology skills. The checklist prototype uses the popular Profiler web site and Internet data collection service, which can be contacted at http://profiler.com/.

CEO Forum Institutional Self-Assessment:

The Teacher STaR chart (School Technology and Readiness chart), established by the CEO Forum is also used by the Nebraska Catalyst project itself to provide an institutional profile for each of the 17 partner institutions regarding the status of educational technology within their teacher preparation programs. Questions provide feedback on technology integrated courses, faculty support, field experiences, and technology standards integration. Each institution receives an individual profile from the instrument web site for formative evaluation of the institution itself. It is also used for summary information on relative institutional progress across the project, which is being made available on the NECatalyst website. The Teacher STaR chart can be accessed from their web-site at http://ceoforum.org.

Stepping in the Right Direction

Although there is still considerable work to do, the Nebraska Catalyst Project believes that it has made a solid start on providing an array of assessment instruments for interested institutions. The institutions themselves have been good partners in this effort, and are taking ownership of various pieces of the assessment puzzle. A real contribution to the success thus far has been the willingness for institutions to experiment a bit, and a genuine interest by the talented members of participating institutions to collaborate.

As you might surmise from the descriptions of the instruments themselves, there has also been a keen interest to try to do as much as possible, in an *online* format. The participating institutions are finding this online format to be very convenient, and such a format has been one of the key reasons that so many pre-service teachers and faculty have already participated thus far in the prototype and refinement process.

The Nebraska Catalyst Project has also been a strong believer in a development approach that also provides a careful linking and integration of the instruments to various standards for pre-service education, such as those from ISTE. Such a commitment is helping ensure that the instruments that are developed are indeed *on-target*, for what they need to help assess, and encourage, related to educational technology.

By striving to be both online and on-target, the Nebraska Catalyst assessment instruments are seeking to become model examples of using technology-based data collection to assess the educational technology preparation of pre-service teachers. The Nebraska Catalyst project is also hoping that such instruments become truly useful tools for helping Nebraska teacher preparation programs examine the technology preparedness of their pre-service teachers. In essence, these new instruments are beginning to help us ensure that Nebraska institutions themselves will indeed be *"on-line"* and *"on target"* as they strive to help teachers prepare students effectively for their educational futures.

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Technology Integration Best Practices: Multimedia Style

Michele Hardwick, University of New Mexico, US

Abstract

The University of New Mexico PT3 (Preparing Tomorrow's Teachers to Use Technology) Project entitled "Shared Visions" has developed Multimedia Lessons that provide examples of technology integration best practices. The lessons were created in collaboration with K-12 schools and are presented using a Cognitive Apprenticeship Model template developed by the University of New Mexico. The online lessons provide an interactive approach to teaching and an additional resource to College of Education faculty in the area of technology integration. Conference participants will have an opportunity to view the lessons and explore the application of the cognitive apprenticeship model. The session will cover both practical and theoretical issues encountered in identifying field practitioners, articulating the instructional design process, and creating meaningful video footage of best practices.

Technology That Works in the Classroom for PT3: From Low Tech to High Tech Mobile Computing

PT3 Management Team, Albany State University, USA
Betty Hatcher, PT3 Project Director, Department of Educational Leadership and Foundations; Gerald Burgess, Director of Educational Technology Training Center; K. C. Chan, Department of Natural Sciences; Rani George, Department of Educational Leadership and Foundations; Rosemarie, Department of English and Modern Languages; Sam Masih, Department of Mathematics and Computer Sciences

Abstract: The support of a U. S. Department of Education initiative, Preparing Tomorrow's Teachers to use Technology (PT3), has enabled a multidisciplinary faculty teaching strategy reform process using a mini grant proposal/award model. With this support, core faculty are revising course syllabi to incorporate technology-rich teaching, enabling all core students to experience a model teaching setting, beginning with their earliest college classes. As year three of the reform process begins, changes in teaching strategies indicate that faculty continue to add additional technology, incorporating the latest in hand held, wireless mobile technology applications.

Introduction

The PT3 project at Albany State University, the SOWEGA Project, is now in its third year and has expanding the strategies which has marked the initiative as a hallmark for faculty support in implementing change on a small, historically black campus. Through the activities of the SOWEGA (Southwest Georgia) Project, faculty are embracing new teaching strategies and providing models for technology rich instruction for all core course enrollees, including teacher education majors.

Each PT3 grantee has distinguishing characteristics and for the SOWEGA Project, a hallmark of its design is the involvement of all faculty disciplines represented in core subjects. This factor allows PT3, through a mini grant system that supports faculty from all core disciplines, to influence students enrolled in all core content courses. This project design targets students for exposure to faculty who are teaching with technology-rich strategies thus impacting future teachers from the time they begin their college career.

During year two, with some carryover funds approved, the SOWEGA project management team expanded the mini grant award system from the first year of seven awards, to 12 awards. The number of faculty who proposed to enrich their teaching expanded, and in some cases, they each worked with teams of faculty within their departments. The departments with participating faculty were teacher education (7), mathematics and computer science, science, fine arts, English and history.

The funded proposals in the College of Education included the following: The course called Prep for Teachers proposed to incorporate a multimedia portfolio component for the class. Student teachers complete their final product during the course, but until this year, it has been in a hard copy format. The project involved technical support from the Educational Technology Training Center on campus. Two other COE projects targeted a course revision that moved the course to an on-line course format, using Web CT. Two other faculty awardees revised methods courses in the area of social science and language arts in ways that promoted student interaction with multimedia assignments. In special education, two faculty teamed to revise courses to incorporate increased student access to assistive technology product knowledge.

One faculty person in English and Modem languages continued that department's extensive adoption of revising teaching with technology, using student interactive assignments for the freshman core composition courses. In Fine Arts, the faculty teaching music appreciation explored software and Internet support and revised that core course with student-centered technology activity. In the natural sciences, a physics lab science course was converted to a web-based course delivery. In mathematics, an instructor with a research background and K-12 teacher training expertise used graphing calculators to provide workshops for math faculty and for K-12 teacher partner school faculty. Two courses in the social sciences (Georgia History and U. S. Government) were redesigned for content delivery via power point and Internet-based support, with a substantive assignment for student presentations. The student assignment supporting increasing writing skill development using technology resources and delivery.,

One project goal that did not progress during year one was implemented with a mini grant this year, with multimedia portfolio production for students beginning with the existing course called Prep for Teachers. During this course, students begin their student teaching, with one day per week devoted to completing Intech training, a model for implementing technology for K-12 teachers. One outcome of the Intech training is putting their portfolio work into a multimedia format. The first of these portfolios was completed this summer (5), with the Fall class (which will more appropriately be in the year three annual report) reaching completion for the entire class.

A major finding or outcome from the multimedia project has been a new awareness concerning the quality of student writing in the portfolios. With the entire portfolio more readily available, education faculty are now addressing an improved system for monitoring student portfolio work, with grading and rewriting/correction built in to each course component. In the previous design, students turned in their portfolio work as hard copy at the ending of the semester, a timeline that did not support student rewriting and editing with faculty supervision.

Project dissemination continues to expand, with presentations via panels, papers and workshops presented at venues that are local, regional, national and international. Local dissemination is regularly scheduled with the SOWEGA Project Summer Seminar, and one-day event that combines area K-12 teachers, our students and mini grant faculty in a session where technology-rich teaching strategies are shared. These outcomes are also shared in settings (state meetings) with other University System of Georgia teacher educators. Presentations have been made concerning the project outcomes at national conferences, and one international conference. Presenting faculty have been members of the PT3 management team. Workshops have been offered by both the management team faculty and mini grant faculty on campus for students, faculty and for stipend-supported area K-12 partner teachers.

During the year two phase of the project, the project model continued in its primary goal to provide a mini grant award funding for faculty who proposed syllabi revisions, incorporating technology to demonstrate model instructional technology applications; to support teacher education students in an intensive technology training process (Intech) and to collaborate with system partner schools in supporting K-12 student teacher supervisors in technology training with Intech.

The scope of the mini grant activities has broadened, with increasingly strong development of technology applications, indicating a new willingness to adapt teaching for on-line learning and student interactions. As newer technology has emerged (hand-held computers), more faculty are seeking training to incorporate newer developments into their already revised strategies, one indication that the initial faculty proposals are indications of a long-term process of change.

Outcomes of faculty efforts, including both year two outcomes and highlights from the year three activity will be presented here, including evaluation outcomes. Using a continuation of the formative process, evaluation outcomes are guiding the successive focus of each year during the three-year process.

Results of the Evaluation

The second year of the PT3 SOWEGA project was a major success. We had more faculty receiving mini grants. Faculty from the Colleges of Education and Arts and Sciences were given up to $6000 to revise their courses by infusion technology in their teaching. Twelve faculty members were awarded mini grants. Of these 7 faculty were from the College of Education and five were from the College of Arts and Sciences. Four of the professors put their courses on WebCT, three of these four faculty had web-enhanced courses, while one of the faculty members one had a full-fledged online course. The other professors included more technology in their teaching. One of the professors had students in the Preparation for Teaching course do multimedia portfolios.

In addition to the revision of courses, SOWEGA PT3 Project also conducted Palm workshops, Graphing calculator workshops and a summer seminar for college students, faculty and school teachers from the two local school districts.

Evaluation data was collected from the students and professors. On the student side, the measures included projects, essays, extended performances, portfolios, student attitudes, morale, and satisfaction. On the teacher side, we evaluate had them provide evidence of infusion of technology in their courses. Professors also completed surveys that provided information about technology assignments and the type of software they had used in their classes.

Students completed a computer attitude survey that measured their attitudes toward the use of technology. About 288 undergraduate students from the Colleges of Education and Arts and Sciences students answered these surveys. More than 85% reported positive attitudes toward the use of computers and a high degree of comfort in using the computer. About 15 Professors in the two colleges answered a technology survey that asked them about their use of various software programs. This survey measures faculty use of basic technology in their teaching and regular daily activities. Based on the results it can be stated that competency with basic computer operations ranges from beginning to more advanced. A system wide survey is underway to get a better understanding of faculty's level of technology competence. The SOWEGA PT3 organized a one-day summer seminar in June 2001. Approximately 65 participants responded to a survey about the usefulness of the summer seminar. Of the 65 participants who attended the summer seminar 95% rated the seminar as an "outstanding activity" and stated that they received "ample information." About 10 of the mini grantees made presentations at the summer seminar

The major aim of the SOWEGA PT3 project was to encourage professors to infuse technology into core Arts and Sciences courses and education courses. The pre- and post surveys were evaluated to see how many changes were made in the courses redesigned by the mini grantees. More than half of the twelve original syllabi had little or no

technology components. The findings related to the revised syllabi are complex. When judged against the National Education Technology Standards, the syllabi were found to echo strongly with the standard Technology Operations and Concepts and Teaching learning and Curriculum standard but weak in Social, Ethical, Legal, and Human Issues.

SOWEGA PT3 - Year Three Indications:

Many of the initial changes in teaching strategies in the SOWEGA Project focused on level one changes, with beginners adapting their lecture style to incorporate technology in very basic ways. As year two progressed and as campus-wide faculty interest expanded, faculty began to look toward newer applications, such as moving to web-based delivery for much of the course or using Palm technology to support class management.

One change from the core focus has been an award to two different faculty teams whose focus is directed more toward the school system partners. This supports the project's goal for pairing student teachers with K-12 teachers who are both technology trained and practitioners. Dr. George Thomas teaches graduate courses in both statistics and Educational research, a course assignment that enrolls students from the K-12 classroom. His work with this population will expand that partner system's awareness of the need for student teacher supervisors who can support student teachers who are using technology in teaching.

Another faculty team composed of Dr. K. C. Chan and Dr. Gerald Burgess is designing a system to support faculty who are seeking ways to incorporate the use of hand held computers in teaching. This team is developing a workshop delivery for training both K-12 and college faculty in applications of this technology to support and manage instruction.

SOWEGA PT3 - Core Faculty Mini Grants from Year Two: An Overview

1. Instructor: Zephyrinus Okonkwo– College of Arts and Sciences
Course: College Algebra

The purpose of this project is to infuse technology in the teaching of MATH 1111- College Algebra. The outline of the technology-enriched MATH 1111–College Algebra course includes objectives such as the use of graphing calculators, interactive mathematical software, mathematical software, web-based tutorials, and multi-media classroom presentations. The students enrolled in the course will be given workshops on the use of the Interactive College Algebra Software, Maple V mathematics software, and graphing calculators. A web-based computer resource will be provided for students and faculty. Homework assignments will be provided on the web and students will be able to solve problems and submit their solutions to their instructors online. The three principal participants, other faculty, and two pre-service interns will participate in workshops to be organized by INTEC and the Project Director. The interns will develop the materials to be posted on the web. The interns will also help develop power point presentations, web pages, and other mathematical documents for instructors of the course. An in-service teacher will facilitate the training of the interns. Dr. Samuel Masih and Mrs. Connie Leggett will be the principal consultants for this project.

Project Outcomes included:The course outline for MATH 1111- College Algebra has been revised to include the infusion of technology in the teaching-learning process,Dr. Okonkwo, Mr. Shelton, and Mr. Myricks have undergone extensive training on the use of the graphing calculator technology in the teaching of College Algebra, faculty are getting training on the use of MathType, EXP for Windows, web-based instructional materials and document preparation, and the MAPLE software. A website is being developed. Our temporary page is http://www.asuemath.asurams.edu/algebra

2. Instructor: Dr. Deborah Bembry
Course: Early Childhood Curriculum:

This course is being redesigned to become a Web CT enhanced class. Students' syllabus and assignments were posted to the Web for easy access and retrieval. This format allowed the students to interact with the professor as well as each other.

Students still attended some classes since this is a web enhanced class rather than a strictly online course. Students presenting and demonstrating in class utilized more technology than previous classes. They searched the Internet for articles to crit ique, evaluated lesson plans for appropriateness for various ages and stages of development annd brought in software and evaluated its ease of use and suitability for elementary and preschool children. .

The following objectives directed the project: 1) Students will use a range of technology to demonstrate a comfort zone in locating, using and disseminating information. 2) Students will use a variety of technology and media to demonstrate a level of proficiency in use of technology in locating, using and disseminating information. 3) Students will interact with various technologies for the purpose of both transmitting and retrieving information. 4) Students will

use technology routinely to transmit messages to the professor, each other and other customers as needed. 5) Students will use technology to help redefine the role of the teacher form "presenter" of selected information to "manager" of active learning. 6) Students will have access to data, reports, curricula and other documents necessary for proper preparation to teach. 7) Students will collect and share information while actively engaged in the learning process. 8) Students will explore and evaluate technology resources as they relate to early childhood and developmentally appropriate practices. 9) Students will practice responsible, ethical and legal use of technology, information and software resources.

3. Instructor: Dr. Surendra Pandey
Course: PHYS1001 Physical Science

The purpose of the project is to develop and offer the Physical Science course online as well as in traditional format. Since the course will be offered during Fall 2001, the development of materials is in progress. A web site has been created for the above course PHYS1001 on the WebCT, http://webct.usg.edu/; a list of simulations using Java applets has been prepared that will include various topics covered in the course; a list of sites has been prepared that include data, graphics, virtual experiments on selected topics in physics; the syllabus is being modified to reflect the online offerings and necessary instructions for students and the PD and student assistant have registered for InTech training to be held on May 7-17, 2001.

A list of useful sites to be used by Physical Science students (online or traditional) include:
Physics tutorials & simulations: http://smet.asurams.edu/physicsweb/
Selected topics: http://www.glenbrook.k12.il.us/gbssci/phys/mmedia/vectors/mzg.html
http://www.colorado.edu/physics/2000/waves_particles/wavpart2.html
Interactive: http://www.explorescience.com/activities/index.cfm
Periodic Table: http://trackstar.hprtec.org/main/display.php3?trackkid
JAVA Graphic User Interface: http://www.scis.nova.edu/~venkata/CISC665/gui.html
Resources for teachers: http://www.4teachers.org/

4. Instructor: Mrs. Gina Harbor- College of Education
Course: Special Education 3306

The mini grant course revision proposed was for SPED 3306. In addition, I have completed 12 modules for an additional course, SPED 5501, and I designed a course that is being taught by adjunct faculty, SPED 5515 (15 modules) All of the students in my courses are special education majors, and we meet class in a room equipped for teaching with technology. There are connections for the Internet and a projector. Student interaction is enabled through the use of such applications as WebCT, PowerPoint, Excel, IBM HotMedia, Netscape, Internet Explorer. Students use the discussion board and chat room features in Web CT to interact both in and out of class. Papers are graded and returned online, and grades are posted to an online grade book. Self tests online help students prepare for exams.

Sites such as PBS, CNN, and ABC help to keep students informed about current issues affecting special education. These sites usually require RealVideo Player. Students are then shown how to download and install the software. The objectives for my lessons focus on special education. The activities chosen to successfully meet the objective integrate technology. Students are taught the skills necessary to meet the objective on an as needed basis. I request that all of my classes be scheduled in the computer lab because I use the computer so frequently.

5. Instructor: Dr. Babatundi Abayomi- College of Education
Course: Measurement and Evaluation for Early Childhood Majors

Revisions for enhancing this course with technology will include moving toward more online interaction for students. This course is an introduction to the preparation, administration, and scoring of classroom assessments and tests. This course will also focus on the selection, administration, scoring and interpretation of standardized achievement and aptitude tests. The course will also address issues related to test norms and how to use test scores for effective guidance and evaluation. The course text has a companion website: A Virtual Learning Environment, and will utilize online information for review, student reporting and for accessing the syllabus and course assignments. The course includes four weeks of class meetings, with online instructional strategies composing the additional weeks of the semester.

6. Instructor: Mr. Michael Martin– College of Arts and Sciences
Course: Music Appreciation

The revision of the one of the core courses in fine arts, music appreciation, involved not only the addition of software and hardware, with some Intech training for the instructor. An additional need included a summer course in

learning applications of software especially designed for music appreciation instruction. The redesign of this course was more technology intensive than some, owing in part to the large class size typical of most semester enrollment. The scarcity of teaching space for large classes, and preference given usually to departmental major courses, created a teaching situation for this course in which the instructor taught the same course in several different classrooms. The challenge of this arrangement was creating a portable technology support setting.

The changes to this course have inspired other faculty in the fine arts to technology for instruction to the extent that one of the year three awardees is a fellow faculty, teaching art appreciation. The addition of technology rich applications in these areas has truly revived the departmental approach to technology. Since all freshmen rotate through these courses, this is a critical area to demonstrate a model approach to instructional technology applications for teaching.

7. English and Modern Languages – College of Arts and Sciences

Instructors: Mary Gervin and Gloria Ridgeway

Course: English Composition – a two-course sequence for core instruction

The course revisions accomplished by a team of English and modern language faculty produced an improved, web-interactive process for student learning. Using the increased access to web-based teaching settings, the instructional focus changed to allow increased student t initiative for improving their writing skills. Via an on-line writing lab (OWL), students were able to monitor their own progress and access feedback beyond the traditional red ink, teacher-directed methods.

Hypertext resources were preferred over most other available software, as some of the limitations of software programs were prohibitive, including their expense, their hardware platform or specific network application limitations and the fact that they were time consuming.

The technology enhanced the writing process by empowering students to develop their writing skills. Instructors were able to achieve pedagogical goals while incorporating technology into the learning experience. The use of technology as complement to writing instruction can afford learners the opportunity to practice skills, promote self-direction, and meet individual needs without diminishing the learning experience.

The course revisions described are representative of the year two SOWEGA PT3 mini grants, and indicative of the broad range of both participation and variations of strategies employed by the mini grant faculty.

INTIME (Integrating Technologies into the Methods of Education): A PT3 Catalyst Grant

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Reports from the National Council for Accreditation of Teacher Education (NCATE) and the Office of Technology Assessment (OTA) have called attention to existing deficiencies in teacher preparation programs in preparing preservice teachers to use technology effectively in the PreK-12 classroom. *Technology and the New Professional Teacher* (NCATE, 1997) reports that preservice teachers should be required to apply technology in their courses and should see faculty model technology use in the classroom. In addition, *Teachers and Technology: Making the Connection* (OTA, 1995) suggests that in teacher preparation programs where faculty model technology use, students will adopt the use of educational technology in their instruction. The National Center for Education Statistics survey of 2001 points to the immense progress in computer and Internet accessibility made in U.S. public schools since 1994.

But in order for undergraduate students to learn to use technology when they teach, it is vital that university professors change the way they prepare teachers to use technology.

According to conclusions drawn by the OTA, it is not enough to tell students about what is possible. "They must see technology used by their instructors, observe uses of technological tools in classrooms, and practice teaching with technologies themselves if they are to use these tools effectively in their own teaching" (OTA, 1995, p. 185). It is far more common, however, for education faculty to discuss technology, have students read about it or demonstrate technology, rather than model it or require students to incorporate technology use into their lessons or units (OTA, 1995, p. 185). The purpose of the INTIME project is to provide the necessary resources for methods faculty to revise their courses to model technology integration and require preservice teachers to apply technology, along with components of quality education, in their lessons and units.

The information presented in the National Center for Education Statistics survey (2001) makes the INTIME project even more relevant and necessary in the total picture of how preservice, inservice, and methods teachers can improve student learning at all levels through the use of technology presently available in U.S. educational institutions.

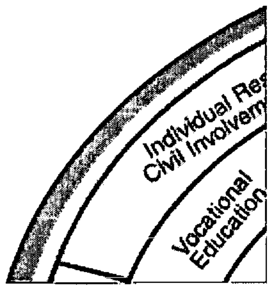
INTIME Goals:

INTIME (Integrating Technologies Into the Methods of Education) is a $2,397,594 Catalyst Grant to the University of Northern Iowa's College of Education from the U.S. Department of Education. The three-year INTIME project addresses deficiencies in teacher education programs in preparing preservice teachers to use technology effectively in the PreK-12 classroom. The purpose of INTIME is to provide the necessary resources for methods faculty to revise their courses, model technology integration, and require preservice teachers to integrate technology, along with components of quality education, in their lessons and units.

This session will show how the project is intended to produce change in teacher training programs in three ways: 1) The project provides web-based learning resources to support new teaching and learning processes in teacher training courses; 2) Teacher trainers can model technology integration in their classes and use the video scenarios and online discussion forum to discuss the technology-based learning process; and 3) INTIME provides a Faculty Online Discussion Forum through which teacher trainers can share strategies for integrating technology with other trainers.

Participants Involvement and Outcomes:

1) The participants will understand the "Technology as Facilitator of Quality Education Model". The model includes the following dimensions: students at the center of their own learning, principles of learning, content standards, teacher knowledge, information processing, democracy, teacher behavior, and



technology. Technology encompasses and permeates all the "lenses" or elements of the model that involve interaction of student learning elements.

The seven dimensions of the model provide a way for educators to view the integration of technology related tools into a robust educational environment. The materials the project features include over 300 web-based video scenarios of preK-12 teachers using technology as part of their daily instructional activities. Each of these examples includes the lesson plan, an interview with the teacher, a lesson overview, alignment with content standards, and a list of technology tools and resources. Beyond providing the information necessary to recreate the lesson, the activity is also viewed through the lenses of Technology and quality education elements.
The project sets up a framework for a robust educational environment and identifies key points at which technology should be implemented and evaluated to determine its impact. The project also allows the integration of new research findings into the appropriate segments of the model while maintaining the structure to evaluate the impact of technology tools on these new findings as part of an ongoing evaluation process.

2) The participants will view and critique online video vignettes of technology integration and quality education in a PreK-12 setting via video streaming technology. They will consider what content standards are addressed, how technology is integrated in the curriculum, and what other components of quality education are implemented in the lesson.

3) The participants will discuss the project as well as share their ideas about its goals, applications, strengths, and weaknesses.

ABSTRACT:
The purpose of InTime (Integrating Technologies into the Methods of Education) is to provide the necessary resources for methods faculty to revise their courses, model technology integration, and require preservice teachers to integrate technology, along with components of quality education, in their lessons and units. The project develops online video vignettes to be utilized in methods courses that include videos of best practices showing from PreK-12 classrooms where teachers are integrating technology in a robust educational environment. The participants will view and critique one of the online case studies of best practice in technology integration and quality integration via video streaming. The issues addressed in this session will be interesting for deans, administrators, faculty, and decision-makers of all expertise levels.

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Explorations in Modeling and Visualization in Mathematics and Science Immersed in Pre-service Teacher Education

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The National Council for Teachers of Mathematics has articulated in Principles & Standards 2000 (NCTM, 2000) the integral nature of the *processes* of doing mathematics. To know mathematics is more than recalling a loose-leaf notebook of facts—to know mathematics is to do mathematics. The Principles and Standards call for mathematics teaching to reflect these emphases in several ways. Mathematics learners should interact with mathematics concepts in multiple representations. Visual, numerical, and verbal means of viewing mathematical relationships should be employed as well as symbolic development. Viewing concepts from multiple perspectives promotes an environment conducive to making connections between mathematics concepts and phenomenon in real life, as well as to other mathematics concepts.

Today's citizenry must make informed decisions daily that involve such an assumed understanding of mathematical and scientific relationships. NCTM (2000) refers to a 'model' as a "mathematical representation of the elements and relationship in an idealized version of a complex phenomenon" and urges educators that "students' use of representations to model physical, social, and mathematical phenomena should grow through the years." Similarly, the AAAS Benchmark science standards also point to the importance of modeling in the science curriculum. Students should be able to create models that reflect the nature of increasingly complex phenomena, understanding both the underlying assumptions of the model and the mathematical/scientific relationships between the elements of the model.

The national report *Shaping the Future: New expectations for Undergraduate Education in Science, Mathematics, Engineering and Technology* (NSF, 1996) strongly recommends that undergraduate programs "make creative uses of technology to promote modeling and visualization." Technology enhances greatly the ability of students to explore models in mathematics and science. The types of representations and methods available to construct and manipulate different models allow students to explore many more interesting and realistic problems than traditionally experienced in high school classrooms. But the question remains as how to generate widespread implementation in the K-12 environment. The National Research Council (1989) makes the suggestion in the report *Everybody Counts* that "reform in undergraduate mathematics education is the linchpin for K-16 reform." Furthermore, "college and university faculty [should] make introductory courses attractive and effective...lecture less; try other teaching methods...[and] link scholarship to teaching."

As a component of the Ed Grid PT3 group, the Office for Mathematics, Science, and Technology Education at the University of Illinois at Urbana-Champaign works with the pre-service teacher education programs in mathematics and science to provide opportunities for modeling and visualization. In this panel presentation, faculty from the disciplines of science education and mathematics education will share this model for pre-service teacher education. Collaboration has been a theme that has contributed to the success of this model as science and mathematics education faculty work together to promote connections between the two disciplines. Different ways to implement visualization tools in pre-service coursework will be demonstrated and discussed. The panel presentation will provide a more detailed view and discussion of how various offices and grants within a college/university combine to support the integration of intensive technology tools in a pre-service teacher education program.

Within the pre-service teacher education program, there is an intentional recursive pattern of "immersion→reflection" that eventually leads to synthesis. We cannot expect beginning teachers (or any teachers) to use a tool for learning if they have not learned via those tools themselves. Learning about instructional technology is not sufficient; one mu st learn mathematics/science through the use of powerful technology to realize the power itself. Rather than teaching pre-service teachers about how to use the tool in mathematics and science, we have afforded them the opportunity to explore different representations of concepts via the use of powerful technology tools.

Throughout the teacher education programs in mathematics and science, pre-service teachers engage in multi-layered activities to enhance pedagogical content knowledge. In the first year of the two-year program, an emphasis is placed on engaging the pre-service teachers in activities that deepen their content knowledge of mathematics/science in an inquiry environment via the means of tools such as computer-based laboratories or Internet-based Java applets. Pre-service teachers are often unfamiliar with the use of these tools in secondary mathematics/science classrooms. Pre-service teachers in the cohorts are encouraged to reflect on how such inquiry and tools contribute to their deeper understanding of mathematics and science. At the end of the second year in the professional program, novice teachers who have completed 3 semesters of field experience, as well as a student teaching apprenticeship, are challenged to explore a wider array of instructional technology tools. The novice teachers are expected to synthesize\ two years of theory and practice to envision possible ways to implement computer-based laboratories and Internet tools in the classroom in order to promote inquiry in mathematics and science.

Field experiences and grants that involve local schools engage in-service teachers in faculty development as well as inclusion in the teacher education process. Analysis of student activities and reflections leads to further research about visualization and teacher development. The entire enterprise of theory, research, and teacher education becomes interwoven, thus creating a model for professional development and lifelong inquiry.

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Implementing Change: Attitudinal Factors
Teaching Middle School Math/Science Teachers to Enhance Curriculum Using Technology
Project ImPACT at Farragut Middle School

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Abstract: As part of a PT3 grant at the University of Tennessee, math and science teachers at Farragut Middle School are thinking about their teaching in new ways. A training model developed under Project ImPACT (Implementing Partnerships Across the Curriculum with Technology) partners interns with mentor teachers. These partnerships receive training that focuses on how technology can be used to support and enhance curriculum concepts in math and science.

The University of Tennessee is a recent recipient of a U.S. Department of Education PT3 (Preparing Tomorrow's Teachers to Use Technology) grant. Project ImPACT (Implementing Partnerships Across the Curriculum with Technology) is designed to work with some of the schools in the Professional Development Program, capitalizing on the partnerships of intern teachers and their mentoring classroom teachers. It has the dual focus of exposing professional teachers to technology that can be used to enhance their curriculum, and preparing preservice teachers to use technology for improved learning in their future classrooms. This paper will focus upon the effect of this technology training, resulting attitudinal changes, and their perceived impact upon the success of the program.

Farragut Middle School is the largest of 14 Knox County middle schools and the only middle school level Professional Development School site included in Project ImPACT. Students at FMS are grouped heterogeneously into teaching "teams" led by teachers who are specialists in language arts, mathematics, science or social studies. Six mentoring teachers, four in math and two in science, together with their intern teachers, participated in Project ImPACT technology training. Mentoring teachers received a stipend for their participation, and intern teachers were issued laptop computers and printers to use throughout the school year.

A major activity of Project ImPACT at Farragut Middle School included the creation of a learning strand model designed to help teachers develop applications of technology in the curriculum areas of math and science, with consideration of special education issues and needs addressed throughout the training. Through Project ImPACT, mentoring teachers, interns, the university faculty supervisor, and the school technology coordinator participated in training consisting of five weekly three-hour sessions, supplemented with matching support sessions of two hours each. Project participants also attend periodic team meetings.

The math and science learning strand was developed and delivered by a doctoral student in the field of Instructional Technology who has seventeen years' classroom experience. The trainer was supported by a staff member who was in the unique position of having served previously as Farragut Middle School's building level technology coordinator. The in-depth knowledge of the facility, equipment and the staff brought by this support person contributed to the effectiveness of the learning strands, team-building, and support at FMS.

An initial self-evaluation revealed that the mentoring teachers felt they had low to moderate technology skills, with most of their experience in electronic grading, word processing and email. All of the intern teachers had participated in at least one technology class as part of their required coursework, and most felt competent in their use of technology. One of the premises of Project ImPACT was that the interns' relative comfort and familiarity with technology, coupled with the mentoring teachers' classroom expertise would provide a fertile medium for infusing technology into the curriculum.

Training began with the introduction of *Inspiration*, software used for a variety of brainstorming and organizational tasks. The instructor modeled the use of the software as the teachers brainstormed their priorities and needs in topics to be covered during the 15 hours of training. Mentors and Interns then worked together to create an instructional unit, using the software as their organization tool. The next session focused on mechanical and technical aspects of setting up a class set of laptop computers, class management, and an exploration of online resources and lesson plans (http://web.utk.edu/~impact/teacherresources). The presentation software, *PowerPoint*, was introduced over the next two sessions, and teachers began creating lessons and resources to elaborate and enhance the curriculum they were covering. In that context, they learned to work with a variety of digital media, from digital cameras, to scanners, to capturing images from the Internet. Another session taught the creation of a webpage, using *Netscape Composer,* and the resulting pages provide another tool for teachers to use to maximize and focus student learning using the Internet. Woven throughout the training was the awareness of special needs students, and methods that could be used to support their learning, such as the use of text to speech, clear visuals, and enlarged text. Teachers also had the opportunity to explore and evaluate a variety of software and other technologies such as digital microscopes.

Perhaps the most powerful change that came about during the two months of training, however, was one of attitude. Teachers who began with an attitude of open skepticism ("I don't have time to do this," or "I don't see why I would use this is my classroom") found themselves eagerly creating PowerPoint presentations to add a visual component to their lessons. One teacher began as an absolute neophyte, very concerned about his lack of technology skills. After just a few sessions, he was not only using the technology, but combining several applications into lessons he will use later in the year. He is also eagerly planning ways for his students to work with classes of previous interns and teachers at other schools through the use of video conferencing. Another teacher observed that she had attended several workshops about PowerPoint and had never been able to use it. After completing her first PowerPoint project during a training session, her sense of accomplishment and empowerment was contagious. Still another's comment, "You know, the only reason anybody is doing this is for the stipend," later became "It's too bad every teacher at the school doesn't have the chance to learn this." Teachers who have worked alone within their own classroom found themselves collaborating and planning lessons together, and sharing units so that one unit could serve double-duty. They are beginning to see themselves as a community of educators, rather than as individuals teaching in isolation.

A key component to the changes coming about at Farragut Middle School is the teachers' sense of empowerment in the use of technology. At the beginning of the project, they were encouraged to identify their training needs and interests, and the training was tailored to meet these needs. This engendered an atmosphere of ownership and began a collaboration among teachers, interns, and Project staff. The competition associated with teaching in isolation is giving way to the trust and mutual support of community and a contagious enthusiasm that continues to grow. The sense of increased competence, coupled with new ideas and options for instructional dynamics have ignited a flame of learning for both the teachers and their students.

Acknowledgements

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Benchmarking Technology Readiness: Results from the CATALISE Technology Assessment Tool (A PT3 Catalyst grant project report)

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Recent studies have indicated that improving the capabilities of preservice teachers to integrate technology into teaching and learning requires systemic change within a teacher preparation institution (Cooper & Bull, 1997; International Society for Technology in Education, 1999; Mehlinger & Powers, 2002; National Center for Education Statistics, 1999; National Council for Accreditation of Teacher Education, 1997; Willis & Mehlinger, 1996). Based on this premise, the CEOForum on Education and Technology (2000) developed the Teacher Preparation StaR chart, an assessment tool designed to help institutions in systematically benchmarking their progress, with indicators ranging from "Early Tech" to "Target Tech."

Since the instrument's release, over 260 deans and directors of education schools and colleges signed a commitment letter indicating their support for assessing their progress and using the StaR chart in that process. The original StaR chart provided a good beginning but needed refinement. As a result, CATALISE (a PT3 catalyst partnership), after getting permission from the CEO Forum, has gone through a rigorous process to evaluate and refine the chart so that it can become a key component in technology planning for all SCDEs.

The PT3 catalyst grant program is designed to implement and improve the StaR chart as part of a larger program, CATALISE is assisting colleges and universities in technology planning, action, and results. CATALISE (Consortium for the Application of Technology and Learning Innovation in Schools of Education), is led by Western Illinois University bringing together four major teacher preparation institutions (Eastern Michigan University, California State University, Los Angeles, University of Alabama-Monticello, and Towson University), the Teacher Education Council of State Colleges and Universities (TECSCU), and partners NCATE, NCREL, the Metiri Group, and Apple Computer.

By working with TECSCU institutions, the project's goal is to significantly impact technology planning and policy for teacher education at participating colleges and universities. The project includes an online assessment tool based on the StaR chart which allows institutions to track their own progress as well as obtain comparisons with other institutions. Support is provided through mentoring, online resources, CD-ROM cases studies, and satellite and video broadcasts to assist participating colleges and universities.

In addition to providing the policy and research context for the new assessment tool, new research results developed through work by CATALISE on key issues facing SCDEs in assessing and improving technology integration will be presented as background. As a result of surveys and focus groups with SCDE leaders, issues identified include the need for standardized concepts, better measurement tools, and "gap" areas that were commonly identified among institutions as requiring assistance. The focus is on providing research results through a pragmatic lens to provide a framework that will benefit participants in their own institutional strategic planning.

The process and issues in creating the revised chart will be presented to illustrate the common concerns that arose through a piloting study of the chart and its features. The areas in which changes have been made will be described along with the rationale for these new features.

The revised chart has additional features that should enhance its usefulness:

- Determine progress in meeting NCATE 2000 technology standards
- Provide data for internal or external reviews
- Produce visual charts that can be used in institutional planning
- Relate institutional progress with other comparable institutions using standardized measures
- Assuring that technology decision-making is data driven

- Providing evidence for needs that can be presented to higher level authorities as a priority for action
- When used for annual assessment, the tool presents a report that shows year-to-year progress.

The revised chart, now available to users on the World Wide Web, not only helps institutions assess their programs but provides feedback on the results in relation to others schools that have completed the questions. These results will be reviewed during the session to help participants understand the range and scope of technology programs among SCDEs. The results reveal the emerging strengths across programs as well as the ongoing issues facing institutions. The results include both quantitative findings as well as responses to open-ended questions that provide additional material that suggest both increasing sophistication and unintended consequences that require additional thought for future improvements to the instruments.

The chart will be distributed so that participants will have the opportunity to test and discuss the new assessment instrument and understand how to implement the chart in their institutional assessments. Test questions will be reviewed in a short interactive format to provide an opportunity for questions and feedback. The session will also introduce the CATALISE clearinghouse, a Web based resource designed to provide examples of program implementations that help illustrate the chart areas.

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A Study of K-6/University Collaboration: Principles and Practices

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Abstract

This paper will discuss the nature of collaboration and how it worked in practice for the participants in a PT3 grant. The collaboration takes the form of development teams consisting of the K-6 classroom teacher, at least one preservice teacher, and a university faculty member. The collaboration is funded through a PT3 grant. These teams gave the K-6 teacher extra support and expertise and the preservice teacher practical experience in integrating information technology into the curriculum. The participants in most teams were able to achieve a sense of equality among themselves. A student consultant protocol is being developed to address areas of concern after one year of experience with the teams.

A Study of K-6/University Collaboration: Principles and Practices

In the fall of 1996, in order to help preservice teachers achieve greater success in transforming education with the power of information technology, Valley City State University (VCSU) became a notebook campus. All faculty and students are issued a notebook computer for 24 hour use. Almost all classrooms are wired for student and faculty use of the internet and with large screen video projection capabilities. Information technology is ubiquitous and a normal part of daily life on the campus. Then, in 2000, the teacher education program developed a collaborative effort with K-6 classrooms. The heart of the effort is two-fold: 1) to provide in-service teachers with technology expertise and support for their efforts to integrate technology into their curriculum, and 2) to give preservice teachers practical classroom experience in integrating technology into the curriculum.

The collaboration takes the form of development teams consisting of the K-6 classroom teacher, at least one preservice teacher, and a university faculty member. The collaboration is funded through a PT3 grant. These teams gave the K-6 teacher extra support and expertise and the preservice teacher practical experience in integrating information technology into the curriculum.

This paper will discuss the nature of collaboration and how it worked in practice for the participants in the PT3 grant.

Principles of Collaboration

Lanier (1980) defined collaboration as "a complex interplay of talents and knowledge that come together at appropriate times to produce a commonly valued end result which no single party could have produced alone"(p. 409). Thomas (1972) described a continuum stretching from conflict through cooperation and coexistence to collaboration as the end point.

Generally, there are two conditions necessary for a successful collaboration. First, the participants should feel that they are equal in status. Second, they should have mutually agreed upon goals. A third quality that also plays an important role is equal participation in the decision-making process (Million and Vare, 1997) Friend and Cook (1996) believe that the necessary characteristics of collaboration are mutually agreed upon goals, voluntary participation, and equally valued professional resources to contribute to the goals. Clevenger (1997) adds another element: the members need to believe that the collaboration serves their individual interests.

The Collaborative Projects

The teams select specific projects to work on and develop. To do this, typically, the university student would visit with the K-6 teacher and discuss what projects the teacher would like to do. The student would then discuss with the university faculty what would be the best way to accomplish the project. The dynamics of how this occurred varied

greatly from project to project but there were always several face-to-face meetings with all three members to coordinate and evaluate.

A Sense of Equality

Successful collaborations involve a sense of equality among the participants. Each member needs to feel that she or he has value and is important to the effort. We were worried about helping the university students feel that they were an equal partner. This might seem difficult to achieve in a setting with one student and two teachers, one of whom would be grading the student. However, the students' reports indicated a sense of equality. This was due in part to the fact that the students usually had much more experience with the technology than the K-6 teacher. Also, the university faculty was involved mostly as a consultant and provided ideas more than direction or evaluation so the students seldom felt the need to "please the teacher." The following are typical comments from the students:

We worked side by side most of the time. After I showed the teacher how to use digital cameras, she took pictures while I helped students insert information into PowerPoint.
I showed the teacher how to use the technology. I also created instructional sheets so students could learn how to use the technology.
We were always working together. I would demonstrate how to use the technology, then we would both do it together.

The K-6 teachers had that same feeling of equality. They were the classroom experts. They knew what would fit into their classroom and what their students were ready to do. They perceived the university students as having valuable expertise in information technology and therefore as vital members of the team. The teachers made comments such as the following:

My practicum student was extremely dedicated and willing to share knowledge about technology.
I enjoyed the opportunity to work more closely with the practicum student—we approached the project as a team.

Initially, the university faculty were to be an integral part of the team. However, due to time restraints and the natural dynamics of the situation, we became outside consultants called in as needed. We usually ended up trouble shooting the problems that the students could not solve. As mentioned above, this turned out to be an advantage in helping the students feel more confidence in their value to the collaboration.

One area in which the projects did not meet the principles of effective collaboration was equal participation in the decision-making process (Million and Vare, 1997). This was by design. Because the ultimate responsibility for the success of the K-6 students rested on the K-6 teacher, so did the authority for the final decision in all matters. We felt that the classroom teacher needed to be comfortable with all activities. All team members had input in the decision making process but the K-6 teacher had the responsibility to make or approve all decisions.

Problems occurred with some teachers who were so unfamiliar with information technology that they did not feel equal or that they could really make the decisions. Also some students did not feel comfortable with going into a classroom and directing activities. To address these issues, we are currently developing a student consultant protocol. The protocol includes a set of interview questions for the student to ask the K-6 teacher about curriculum topics, available technology and software, and any specific needs. There will also be a process for contacting the teacher, gathering the information, consulting with the university teacher for ideas, then arranging a meeting with the three individuals to discuss possibilities and help the teacher make the decisions.

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The Use of Multi-Media, Web-based Technology to Prepare Tomorrow's Teachers
Outline

Willis Copeland, Sarah Hough, David Pratt, Heidi Stevenson-Bagnall. University of California, Santa Barbara.

How can the multimedia and interactive capabilities of the World Wide Web be used to improve the professional preparation of teacher credential candidates? Surely, when a teacher education faculty member posts on a course website a syllabus and even a brief autobiography very little is added to the educational experience of students in that course. Yet such posting is typically the extent of use of the web by most teacher education faculty. What more is possible?

This proposed panel will discuss a series of web supported, multi-media modules that are being used with credential students at the University of California, Santa Barbara, in the context of a U.S. Department of Education-funded PT^3 project. SITE 2002 attendees will have the opportunity to learn about how the thoughtful use of web-supported technology has been implemented in the program, and to hear about and discuss its possible impact on the development of the credential students that the program serves. Members of the panel will represent four perspectives: the Course Professor, the Technical Designer, the Teaching Assistant; and students in the course.

Theoretical Framework

The traditional model of learning assumes that knowledge of practice is easily transmitted from teacher education professor to student, the assumption being that the mind is representational, a mirror of some pre-defined ontologial reality, and that once "transmitted" this knowledge is easily applied to real-life contexts (Cobb, 1994). Under this theory of learning there should be no conflict between what is learned in a lecture hall at the university and its application in a school classroom. A plethora of writings by a host of educational researchers tells us that this is not the case. For example, McDiarmid (1990), reminds us that " beginning teachers tend to believe that they were not taught essential knowledge, such as how to manage a classroom, regardless of whether or not they were exposed to such knowledge." (p12).

The development of credential students' technological expertise in UCSB's Teacher Education Program is largely based on a constructivist view of learning. This view sees knowledge as an *adaptive function* (Glasersfeld, 1990), in which a learner comes to know by responding to experience. According to Savery (1995), "we cannot talk about what is learned separately from how it is learned...rather, what we understand is a function of the content, the context, the activity of the learner" (p 31).

The web-supported materials discussed here have been designed to encourage credential students at UCSB to use their experience as a source of learning.. While engaging in a series of activities which could not be undertaken without taking advantage of particular capabilities offered by the word wide web, credential students analyze and reflect upon their own experiences as they consider a variety of issues related to the use of technology to further educational purposes..

In our work thus far we have developed three types of activities:

Interactive multi-media assignments. We have constructed several web-based modules that require credential students to consider technological and pedagogical issues in light of their own experiences in classrooms. For example, a web page for a child development course presents streamed video recordings of three pupils, who are at different stages of logico-mathematical development, attempting to solve the same geometric problem. After credential students have viewed the videos on line, they are asked to type into the web page their responses to a series of questions designed to encourage their exploration of the differences and similarities that they see across the videos and, thus, to further their understanding of child development in mathematics. The students' responses, once submitted, go to a database that can be viewed through a web-based interface by the course instructor for grading purposes. Further, the instructor can identify interesting or irregular trends in students' responses and raise issues based on these for discussion in the next class meeting.

Online Video Cases. We have developed a series of on-line activities which present, on a course's website, exemplary video cases of technology use in classrooms. Students are first encouraged to view the

cases, repeatedly if necessary, until they feel that they "fully understand" what is occurring in the video. After this examination, students are asked to respond to a series of questions that elicit their analytical thoughts about the segments viewed. The responses of all students in the class are submitted to a database that is used by the course instructor to identify topics that will be used in the following class to challenge students' thinking.

Online examinations. To give prospective teachers experience with a non-traditional testing environment, we have created examinations that offer 'feedback" to the user as well as guided opportunities to correct their answers. This environment utilizes a combination of hypertext and Java programs to "branch" and thereby offer challenges to students' responses that are most appropriate to those responses.

Our Presentation

Samples of the above will be presented and discussed from four perspectives:

Course Professor's Perspective: Educational purposes and pedagogical techniques will be the focus of this part of the presentation. What are we trying to accomplish with these web-based tools? How are they used as part of the course?

Technical Designer's Perspective: The use of video streaming technologies and hypermedia creates a powerful forum for offering working examples of classrooms in which technology is being applied appropriately. What were the technical difficulties that we encountered when attempting this use of the web? How were they overcome?.

Teaching Assistant's Perspective: Implementing interactive web-based learning modules with students enrolled in the technology course has not been flawless. As with implementing any new technology, we have had our share of technical, design, and pedagogical challenges. The perspective of the teaching assistant focuses on development, testing and implementation of the modules themselves, as well as overseeing their use by students. Sharing what went wrong and what can be improved in the creation and implementation of these modules will be valuable information for anyone looking to design and implement similar technology strategies.

Credential Student's Perspective: Credential students have the opportunity to participate in learning activities that are entirely new to them. They cannot complete all requirements of the course without going on-line. The medium is the message. Is examination of video cases easier when one is less rushed, working at home rather than having to be immediately responsive in a live university class? Is the immediate feedback when they take the on-line examines more gratifying and in informing?

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Redesigning Courses to infuse technology in a Pre-Service Teacher Education Program

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In June of 2000, The Educational Technology Department at the University of Northern Colorado (UNC) was awarded a PT3 (Preparing Tomorrow's Teachers to use Technology) grant. The project includes five initiatives that are designed to bring about systematic change within the teacher education programs at UNC. The initiatives are enhance the Required Educational Technology Courses for Students in The Professional Teacher Education Programs, model Appropriate Technology Use and Integrate Technology Utilization Into the Professional Teacher Education Program Courses, Model Appropriate Technology Use and Integrate Technology Utilization in The General Education and Content Area Discipline Courses, Integrate Technology Use by Preservice Teacher Education Students in Partner Schools, Build a Model for the Effective Use of Technology in Preservice Teacher Education Programs.

This paper is solely concerned with initiatives two and three, or the initiatives regarding the modeling of appropriate technology use within courses at UNC. Thus far fifteen faculty members have been chosen from various disciplines within the university to redesign a course so that it incorporates technology in effective and appealing ways. These courses include PTEP (Professional Teacher Education Program) and general education/content courses, chosen each semester (fall, spring, and summer). Proposals are accepted from tenured, tenure track, and longstanding term appointment faculty for PTEP, general education, and content-area courses. The faculty members are selected each semester based on a proposal review process and the probable success of the project. All selected faculty members are already competent users of word processing, email, email attachments, and Internet browsing. The interested faculty member proposes the suggested changes for a particular course by indicating how technology will be used and modeled in the course. These changes may include content-specific materials and activities that utilize technologies such as Web-based learning environments, online forums, multimedia project-based learning activities, multimedia portfolios, modeling, and simulations. The project staff, the College of Education Leadership Council, the Arts & Sciences Administrators, and both college deans review the proposals.

Faculty members who are chosen to participate are released from one course and have access to a small budget, \$500, for the purchase of software. Each faculty member who is accepted to participate redesigns and augments one course they currently teach. Along with the PT3 project staff, they identify appropriate places to infuse technology into the course, develop appropriate technology-based materials to be used in the course, and redesign the course to accommodate technology. Each faculty member is paired with an advanced student in Educational Technology who serves as the technology coach and instructional designer. This support averages four hours a week throughout the entire semester. The released instructors also participate in a faculty development seminar on technology use in the classroom.

A major focus of this effort is modeling by the selected faculty members, appropriate uses of technology in the various courses they teach, including the delivery of instruction, the faculty member's use of technology both in instruction and in course management and their students' use of technology both as a learning tool and as an aid to their future roles as teachers. All course materials are shared with all faculty members who teach the particular augmented course.

To expand on the current redesign efforts, four case studies have been chosen to relate in detail the redesign process. Each case study looks at one of the chosen faculty fellows and relates information regarding the redesign process, the end product, and the possible diffusion of technology integration to other courses and to fellow colleagues.

Faculty Fellow #1 is a Mathematics teacher for the preservice teacher-training program at UNC. Her previous technology experience included knowledge of Word and PowerPoint. Her main goal for becoming involved in the PT3 grant was to create a website for her methods course. Besides creating a website, she learned to use software tools like Dreamweaver, PowerPoint, Excel, Scanning and Photoshop. She also learned to download software from the Internet.

At the end of the semester this faculty fellow was able to create a website that had important components for her students to have an access to online resources, especially when they were out student teaching. The graduate assistant's role in this process was to help her plan her project, make her feel comfortable with learning the software tools and their integration in her math class.

Faculty Fellow #2 was an expert in his technology skills previous to applying for the grant. He had worked as a graduate assistant for 3 years in creating online electronic portfolios at another University. He is well versed with many programming languages as well as HTML and JavaScript. His main goal for being a part of the PT3 grant was to be able to design an online class for the preservice teachers in the principles of scientific inquiry. This is the last class that the students are required to take before they go out for their student teaching. This class uses a multidisciplinary approach i.e., integration of chemistry, physics, earth science, and literature to develop scientific inquiry skills.

This faculty fellow used the Blackboard interface as a supplement for his class, instead of creating a website. This was mainly because UNC's center for Professional development provided all the technical support in creating any class shell on use of Blackboard. The Graduate Assistant's role was that of instructional designer, rather than a technology support person. The Graduate Assistant helped him find many articles related to scientific inquiry and online learning environments, some conceptual units form chemistry and physics that could be integrated in his class. This faculty fellow also decided to use visualization software called "World Watcher" as it is available for free online. Overall, his redesigned class focused on developing scientific inquiry skills using technology in a constructivist learning environment.

Faculty Fellow #3 teaches the Educational Psychology class for secondary pre-service teaching students. The course covers classroom management, theories of learning, etc. She currently uses PowerPoint and Digital Video to illustrate different lessons. However, these are limited to her laptop and cannot be accessed by students outside of the classroom. Once she began the project Fall 2001, she decided that it was imperative to place her materials online so her students could return to them for greater understanding. She also was leaving the University soon and wanted to leave the materials for the other faculty responsible for the course. This led to the creation of a class website, using Dreamweaver. It also put a focus on converting her IMovie's into Quicktime video for use on the website. She found many other areas throughout her course to infuse technology. She enhanced assignments that were used every semester with technology. She also decided to look into websites and chat rooms that adolescents frequent in order to explore what kind of adolescent culture exists online. She hopes to bring this information to her preservice students.

The redesign efforts put forth by this faculty member are already diffusing to her other courses. She is finding that many of her online materials will be of use to the graduate courses she teaches. She is planning on constructing her materials in such a way that they are applicable to a variety of her classes. This faculty member has also already begun to be concerned with collaboration among her fellow colleagues. She is planning on launching a department wide listserv that will be for use among both faculty and graduate students within her department.

Faculty Fellow #4 also redesigned his course Fall 2001. He teaches an educational foundation class that all preservice teaching students are required to take. Course topics include the history of education, multiculturalism, etc. Before the redesign, there was no technology use within his classroom.This professor chose to redesign his course by making the primary project a technology assignment. The primary project is to work collaboratively in groups and create the ideal school. In this case, generally a paper was turned in with information on it. He decided that it would enhance the assignment to have these schools represented virtually. This meant that each group would now create a website for their schools allowing not only the typical written content to be present but to also utilize pictures, graphics, and hyperlinks to give a better representation of those ideal schools.

The course to be redesigned was four credit hours and met four times a week. This allotted time to create a technology component into the course every week that would support their webdesign efforts. This faculty member is also creating the "shell" or interface that will hold all of his student's projects and therefore will gain web development experience including basic graphic design that should lead him in his efforts to technically support his students next semester. Generally, this faculty member teaches at least two, if not more, of this course every semester. He feels that his ability to work with anywhere from 60-100 pre-service teacher candidates will have a wide spread affect. He is very willing to take some course time to ensure this occurs.

Redesigning an educational technology class to place a focus on Integration

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In June of 2000, The Educational Technology Department at the University of Northern Colorado (UNC) was awarded a PT3 (Preparing Tomorrow's Teachers to use Technology) grant. The project includes five initiatives that are designed to bring about systematic change within the teacher education programs at UNC. The initiatives are enhance the Required Educational Technology Courses for Students in The Professional Teacher Education Programs, model Appropriate Technology Use and Integrate Technology Utilization Into the Professional Teacher Education Program Courses, Model Appropriate Technology Use and Integrate Technology Utilization in The General Education and Content Area Discipline Courses, Integrate Technology Use by Preservice Teacher Education Students in Partner Schools, and Build a Model for the Effective Use of Technology in Preservice Teacher Education Programs.

This paper is solely concerned with initiative one, or the initiative regarding the redesign of the preservice educational technology courses at UNC. All elementary, middle grades, and secondary preservice education students are required to take two one credit courses throughout their teacher preparation at UNC. The goal behind the initiative was to redesign these to maximize their benefit to our students. The first year of the grant the PT3 team redesigned the 247, 248, and 249 classes. These courses all had a distinct "tools" focus. Finally, the second year of the grant, we have worked to redesign the 347, 348, and 349 courses. Because of the tools focus in the 200 level courses, we wanted these to have a focus on integration. Between the two courses, the Colorado State Technology Standards and the NETS standards have been met for preservice teacher education students.

The 300 level undergraduate classes focus on the "Technology Integration" aspect. It is very important for the preservice teachers to understand the theory and practice of technology integration in their classrooms. Most students taking the Educational Technology classes associate the field with learning to use computers. This notion is carried over by them in their student teaching experience as well. The redesign of the educational technology classes was to make the students think, "Why are we required to take a Technology class in our curriculum?", What is my philosophy of the use of technology in education?", How can technology utilize different learning

strategies?", "What are some of the classroom management issues surrounding use of technology?", etc.

All the above goals were achieved by redesigning the class that was formally tool based, in which only the different computer programs were taught. The new redesign look will have the following components

1. **Lesson Plans**

A lesson plan is the backbone of a teacher's instruction. Teachers that make time to create a lesson plan will greatly benefit from the process, implementation, and analysis. Students in 300 levels are familiar with the most productivity tools (like Word, Excel, Dreamweaver, and others) that they have learned in their 200 level classes. Students will now create lesson plans to integrate the tools with the content. They will also incorporate the state standards and teaching strategies to develop a lesson plan that effectively integrates technology. The scaffolding for this would be given by discussing the theory of technology integration, instructional design theories, instructional strategies, room design, and classroom management. Differences between the one computer classroom, multi-computer classroom, and utilizing a computer lab will also be discussed.

2. **Case Study**

The final portion of the class will utilize a case study to create a problem-based scenario that is embedded in practice. The case study will last for a total of seven weeks. This case study will be delivered through a flash driven interface virtually. Students will meet every week for discussion regarding the case study and for help from the instructor.

Throughout the case study, a scenario is developed in which the student has just gotten a new job that will fit both their particular age range of interest, i.e. elementary, middle-grades, or secondary. For the elementary preservice students, the content will be focused on literacy. For the secondary and middle-grade students, the content will focus on their particular content area. Within the case study scenario, the classroom the student is taking over was awarded a small technology grant the year before with specific equipment software provided as a result.

The student is given the resources such as standardized test scores, grade reports, and Individualized Education Plans which model what teachers at our partner schools are given yearly. Other data will be presented via text, digitized video, and digitized audio. The students will be asked to create a needs analysis that is data driven from the available resources. They will then produce a lesson plan that seamlessly integrates technology to help solve the "gap" or problem arrived at in the needs analysis. Other "problems" come up throughout the case study such as technology and classroom management issues, room design issues, and equipment failures. This gives the students a place in which to apply the information that was gained at the beginning of the semester to solve a problem within a real world context.

Integrating Technology into Standards-Based Teacher Preparation "Changing the Way We Do Business"

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Abstract: Indiana State University (ISU) is working with students and faculty with support from the Preparing Tomorrow's Teachers to Use Technology (PT3) initiative to create a teacher education program that uses technology as a natural extension of the learning process. As students progress through this program, they will experience technology-enhanced course instruction, develop a technology-rich portfolio document, and engage in technology-rich field based experiences. University faculty members are actively involved in developing the types of technology-enhanced projects required in the professional teacher education courses. Trainings focus on ensuring that the course requirements meet the standards established by ISTE, NCATE 2000, and IPSB Content and Developmental Standards, and the ISU Unit Assessment System.

Introduction

The key facilitator in this learning process and in the infusing of technology in the curriculum is the classroom teacher. He/she affects student achievement by the instructional methods utilized, curriculum presented, assignments given, and performance expectations. As noted in the Report of the National Commission on Teaching and America's Future, "What teachers know and can do is the most important influence on what students learn" (p. 6). Therefore, it is imperative that teachers, with various levels of experience, be prepared to meet the rising standards currently being placed on education.

National associations and organizations have outlined specific standards and performances for teacher preparation. The National Council for Accreditation of Teacher Education (NCATE) developed a series of six standards that will be used to assess the preparation of P-12 educators. According to the NCATE 2000 Board of Examiner's documentation, "The conceptual framework(s) is knowledge-based, articulated, shared, coherent, consistent with the unit and/or institutional mission, and continuously evaluated" (p. 2). Indiana State University (ISU) has embraced the NCATE 2000 goals and aligned the teacher preparation programs with these goals coupled with a commitment to performance-based assessment.

The Indiana Professional Standards Board (IPSB) has charged institutions of higher education in the State of Indiana with creating an individual Unit Assessment System as a vehicle for documenting student performances. This Unit Assessment System includes a series of performance indicators outlined by the IPSB. The IPSB identified portfolio assessment as the key performance-based measure to be used in reporting levels of achievement to the state for initial licensure. ISU and the School of Education (SOE) have decided to use portfolio assessment as the vehicle for preservice teacher evaluation.

In addition to following the standards outlined by the NCATE 2000 and IPSB guidelines, ISU also recognizes the standards prescribed by the International Society for Technology in Education (ISTE). Such standards provide performance-based indicators that are used to assess the technology competencies of teachers and preservice teacher candidates.

Project Implementation

Indiana State University is working with students and faculty with support from the Preparing Tomorrow's Teachers to Use Technology (PT3) initiative to create a teacher education program that uses technology as a natural extension of the learning process. As students progress through this program, they experience technology-enhanced course instruction, develop a technology-rich portfolio document, and engage in technology-rich field based experiences.

University faculty members are actively involved in developing the types of technology-enhanced projects required in the professional teacher education courses. Frequent technology staff development trainings are provided to all faculty members involved in teacher preparation. Training focuses on ensuring that the course requirements meet the standards established by ISTE, NCATE 2000, and IPSB Content and Developmental Standards, and the ISU Unit Assessment System. Specific faculty members are directly responsible for ensuring that these technology standards are infused into the identified course curriculum. Content area faculty members participating in this project are introduced to various technology possibilities that could be used to enhance classroom instruction.

ISU students enrolled in the undergraduate preservice teacher preparation program are currently required to develop a paper portfolio demonstrating competence in the standards-guided program of study. Students are now being required to create and maintain a technology-enhanced portfolio that includes specific performance-based unit assessment requirements. In order to facilitate a common understanding of technology, ISU freshmen and transfer students are required to enroll in an information technology literacy course as part of their general education requirements. During this course students will be instructed on how to construct the portfolio. In addition to developing foundational skills, students enrolled in the teacher preparation program are required to demonstrate technology proficiency by creating various technology assignments. During the portfolio review process, students present and explain each artifact; the faculty members facilitate a reflective discussion regarding the students' choice. This enables the student to verbalize the rationale for his or her selection.

Currently, the ISU teacher preparation program has embedded practicum experiences into each of the methods courses. Students are assigned to various classroom settings where they are responsible for the instruction, assessment, and management of classroom children. Students are expected to demonstrate their use of teaching skills with school-aged children. This experience provides an opportunity for undergraduate students to apply what they have learned in their course work to an authentically rich teaching situation. This is an invaluable experience for students as they are able to develop their own individual teaching style.

As part of the responsibilities of the field-based experience, students are required to develop an elaborate technology-enhanced project that reflects their progress toward becoming a professional educator. Students are assigned a project on such topics as parental involvement, classroom management, or service learning. The students are required to implement the project in his/her classroom setting. These extensive projects will enable the students to integrate technology into areas of teaching that are often missed in daily preparation. Students will then submit documentation of this in their technology-enhanced portfolio.

The ISU faculty member and the classroom teachers act as mentors who assist with the field experience technology project. During the field experience, both mentors will make frequent observations of teaching performance. The student teacher will demonstrate his/her competency in integrating technology into the classroom. The mentor teachers will then assist the student in carefully selecting artifacts and student examples to be used in the project documentation.

The entire field-based component reflects a strong commitment to best practices in education. ISU ensures that the graduates in education are prepared with the most current content knowledge and technology skills available. By integrating technology throughout the ISU teacher preparation program, students are exposed to increasingly complex applications of technology into the classroom.

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Creation of Online Resources for Faculty in Higher Education: A PT3 Project

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The Modeling Instruction with Modern Information and Communications: the MIMIC Project, a U.S. Department of Education Implementation Grant, was designed to prepare pre-service teachers to integrate technology into teaching and learning. One of the goals of the MIMIC project is to create an online community to connect three populations: 1) teacher educators, 2) classroom teachers and 3) preservice teachers with the integration of technology in instruction. To achieve this goal, the MIMIC site was developed by a collaborative team including faculty in Educational Technology and students enrolled in a Master Degree program in Educational Technology at Cleveland State University. Since the Fall of 1999, the MIMIC site has been expanded as a key instructional resource for technology integration in teacher education program beyond a form of dissemination for the project.

The paper describes the findings of an evaluative study that examines the effectiveness of this MIMIC site and the key factors that promote more widespread effective uses of the MIMIC site. The evaluative study has being conducted in three phases: 1) self-evaluation, 2) team-evaluation, and 3) survey and interview to participants. In the self-evaluation phase, the developer reviewed a number of web sites related to PT3 projects and analyzed the strengths and weaknesses on each site. The findings of this inquiry were reflected in the revision process of the MIMIC site. For the team-evaluation, the leadership team provided the developer with comments on components to be updated or added/deleted. For the survey/interview phase, survey data will be collected from approximately 40 participant faculty members and mentors at Cleveland State University and five partner institutions of higher education. The survey questions will find out the following variables: participants' needs, interaction with online resource, access frequency of each component, adoption of online resources in their course, willingness of material submission, personal interests of the site, provision of feedback/suggestions, etc. During the Fall of 2001, semi-structured interviews will be conducted to approximately 10 volunteers who participate in this project.

The aim of this formative evaluation is to improve the usability and effectiveness of the MIMIC site based on participants' needs. The result of this study will produce a successful model of collaborative online resources that can be used as a primary teaching tool in teacher education programs.

PT3: Attitudes and Concerns of Preservice Teachers

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Training future teachers to be tech users has become a priority for education departments in universities and colleges throughout the US. Graduates must be savvy in classroom climates where technology integration is the key. Introducing technology to novice instructors can cause anxiety. This paper explores the attitudes and concerns of pre-service teachers participating in classroom technology integration as part of the Southern Illinois University PT3 grant – Project LIFT-Off. Seventy-five teacher preparation undergraduate students enrolled in their first semester of the Teacher Education Program (TEP) completed pre- and post- surveys measuring concerns about technology and computer attitudes. The students participated in hands on training as well as workshops and in-class discussions of technology throughout the semester. The results showed that ....(The results are pending -December 2001- and will be reported in this paper). The concerns survey data was complemented by pre- and post- focus groups. These focus groups explored student concerns about using technology in instruction. Computer skills were also measured and used to help students choose professional development opportunities that helped to fill a gap in their skills.

Technology delivery using a flex cam to cross the digital divide in rural Tennessee schools

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Tennessee Technological University in Cookeville Tennessee is a recipient of one of the U. S. Department of Education's PT3 (Preparing Tomorrow's Teachers to use Technology) Grants. One of the primary components of the Tennessee Tech grant is to provide funds to place in each of the twenty-two partner schools a multimedia cart for their use. The partner schools, which are located in five sparsely populated rural Tennessee counties, are for the most part the schools where the field experience students and student teachers from the university are placed. The primary purpose of the cart is to provide state of the art technology that can be easily moved from room to room in the schools in order that the university students might have access to the same technology, which they experience in the methods classes they are required to take before they are placed out in the schools. The components of each cart, the total cost of which is approximately $5000, include either an Apple or PC platform desktop computer, a 32-inch TV, a focus box that allows the computer to "talk" to the TV, a VCR and a flex cam. During the course of the nearly three years that the carts have been in the schools, without a doubt, one of the most used and therefore most valuable pieces of technology on the cart has been the flex cam. Our experience with these carts shows that not only the student teachers but also their mentor teachers are using the flex cams more than any of the components on the cart. Many times the flex cam is removed from the cart and taken to a classroom where it is interfaced with the VCR and the TV in the room. A benefit that allows the remainder of the cart technology to be available for use by other teachers. Our presentation will focus on the flex cam as an application of technology that we have found "really does make a difference". The flex cam, more than any of the other cart components makes it possible for even an inexperienced teacher to use technology successfully. Once the teachers experience technology delivery via the flex cam, we have found they immediately begin to plan ways to procure one that they can keep in their classroom all the time.

The flex cam is a relatively uncomplicated piece of technological equipment that is used in conjunction with a VCR and a television to project items that are "seen" by the camera mounted on the end of the flexible neck of the equipment. The flex cam also has audio capability, which allows recoding of a voice, or other audio cues through the use of the VCR. The flex cam as a technology application allows the teacher to effectively demonstrate or illustrate items to an entire class through the use of the VCR, which interfaces with the television.

The objectives of the session are threefold: 1. To highlight a method of technology delivery through the use of a flex cam which we have found to be a very user friendly item for all the teachers who have been introduced to it through our grant; 2. To demonstrate the use of the flex cam to facilitate the integration of technology into sample lessons which have been developed by classroom teachers, student teachers and the PT3 staff; 3. To offer to the audience an opportunity to experience "hands-on" practice with the flex cams.

The audience who would benefit most from this presentation would be teacher education faculty, teacher education administrators, and elementary and secondary teachers. The level of experience necessary to successfully utilize the flex cam would be beginning to intermediate. There are no prerequisites.

We propose to bring with us three flex cams, which we will demonstrate to the audience. As the final part of our presentation the audience as a part of a "hands-on" exercise will then use the flex cams.

The demonstration portion of the presentation will highlight lessons that have been developed by the PT3 staff for use in staff development sessions conducted in our partner schools. One such lesson uses the flex cam to project the pages of a book such as a primary teacher would do when reading to her students thus allowing each student to easily view the pages while not interrupting the flow of the lesson. Another lesson demonstrates the use of the flex cam to show bones of a frog, and other fragile objects, which do not easily lend themselves to handling by little learners but are excellent teaching aids for the elementary teachers. The flex cam allows for the learner to view objects from a multi-dimensional perspective that is useful in math lessons that use manipulatives. Other lessons will highlight areas such as music, physical education, mathematics, history, geography and art. There are an unlimited number of uses of the flex cam in the projection of small objects for ease of the entire class to view. Another use of the flex cam is to utilize the audio functions in conjunction with the camera to allow students to be taped and recorded such as we might do with a video camera. Teachers have used the flex cam in this manner to make video to be used in evaluation or for presentations and programs. The Interns will demonstrate the use of the

flex cam for such projects as student book reports where videotape can be made for the student to take home for the parents to view.
The flex cams that we will demonstrate will not be the models that can be interfaced with a computer. While e have used that model on the carts that we placed in our college level chemistry and biology departments, the higher cost of the software for the computer model flex cam is prohibitive for the carts which we placed in the elementary and secondary schools.
In the audience participation section of our presentation we will use our PT3 Grant Interns to assist those present who wish to experience the use of the flex cam. We will bring four flex cams so that we can offer three stations with flex cams and a fourth where we will demonstrate the connection requirements for the flex cam to the VCR and the TV. At the first station, because we have found that the neck of the flex cam is resistive enough that beginners hesitate to use the necessary force to place the flex cam on the object to be projected, we will assist with that aspect using the flex cam to view the participants and make a videotape which can be projected during the session. At a second station we will instruct the users in the proper way to orient and focus the flex cam for projection of books or other written material. At the third station we will demonstrate the attachments that fit on the head of the flex cam that allows the flex cam to be interfaced with a microscope and the one that will hold the forceps for the projection of very small objects or insects in the "bug box". We will demonstrate the use of the microscope with the flex cam at this station. At a fourth station the Interns will demonstrate the proper method for connecting the flex cam to a VCR that will be then hooked to a TV thus allowing the participants to practice the necessary adjustment to the VCR to cause the image to be projected on the TV.

Project START: Southeast Student Teachers Are Revitalizing Teaching Through Technology

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Abstract: Project START (http://start.miamisci.org), is a PT^3 Catalyst grant that provides higher education arts and science and education faculty in six southeastern states (Alabama, Florida, Georgia, Mississippi, North Carolina, and South Carolina) with tools and training to help prepare tomorrow's teachers to integrate technology-rich learning resources into the science curriculum and coursework. START activities and resources prepare technology-proficient facilitation teams to model technology integration in their teaching practice, facilitate the articulation between Arts and Science and School of Education faculty and school districts, and provide ongoing online and onsite dissemination support.

The Miami Museum of Science and the University of Miami School of Education and College of Arts and Sciences collaborated to adapt the Museum's teacher technology training model and materials. Partners included the Eisenhower Consortium for Mathematics and Science Education @ SERVE and the Smithsonian Institution's National Museum of Natural History.

Project Summary

Project START, a PT^3 Catalyst grant, that provides higher education arts and science and education faculty in six southeastern states (Alabama, Florida, Georgia, Mississippi, North Carolina, and South Carolina) with tools and training to help prepare tomorrow's teachers to integrate technology-rich learning resources into the science curriculum and coursework. START activities and resources prepare technology-proficient facilitation teams to model technology integration in their teaching practice, facilitate the articulation between Arts and Science and School of Education faculty and school districts, and provide ongoing online and onsite dissemination support.

The Miami Museum of Science and the University of Miami School of Education and College of Arts and Sciences collaborated to adapt the Museum's teacher technology training model and materials to use with faculty responsible for preservice teacher preparation. The Eisenhower Consortium for Mathematics and Science Education @ SERVE assisted in the recruitment of cadres of key stakeholders committed to initiating reform in Alabama, Florida, Georgia, Mississippi, North Carolina, South Carolina to serve as START state facilitation teams. Each state team included six or seven three-member teams that consisted of one faculty member of the College of Arts and Sciences, one from the School of Education, and one district official responsible for technology training.

During the first two years of implementation (September 1999 through August 2001), each state team attended a four-day institute in Miami to prepare to adapt and replicate the modules relevant to their local needs. All costs for the Institute were covered by the grant. START Institutes provided participants with the tools to train others to: navigate the World Wide Web and to find science resources using effective search strategies; evaluate web sites that are valuable in addressing National Science Education Standards; discover a variety of available online courses, and how these materials can be used most effectively and the process for developing and applying criteria for evaluating online courses; explore mechanisms, strategies and resources for electronic collaboration ; use videoconferencing to enhance teaching and learning; create professional portfolios using presentation software and web-based tools; create professional educator home pages on the World Wide Web; and replicate the strategies and materials provided at the START Institute.

During the third year, all state teams attended a regional conference, hosted by another project partner, the Smithsonian Institution's National Museum of Natural History (NMNH). Participants shared dissemination progress and challenges within and across states, refined their own state and local replication plans, and learn firsthand how Smithsonian scientists use technology in their work.

Each participant received a Trainer Toolkit that included a comprehensive Trainer Guide, set of Learning Cards, and a CD-ROM containing all presentations and training materials. As an incentive for replication, participants also receive digital cameras to facilitate the web page development workshop as well as to document their replication activities.

Throughout the project, START staff provides ongoing technical assistance, and continually updates the robust START web site - http://start.miamisci.org. The web site includes current data regarding replication activities carried out by the 120 START Master Trainers in the six southeast states.

Project START is funded under The Preparing Tomorrow's Teachers to Use Technology (PT3) Program, a competitive grant program authorized under Title III of the Improving America's Schools Act of 1994. Grants awarded under this program support innovative teacher preparation program improvements developed by the consortia composed of higher education institutions, state agencies, school districts, nonprofit organizations, and others who are joining forces to develop well-prepared, technology-proficient educators.

ACTT Now to Link Pre-service and In-service Teacher Education: A PT3 Panel

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Abstract: Old Dominion University and Brunswick County Public School's PT3 partnership ACTT Now (Aligning Certification with Technology Training) provides technology training for pre-service and in-service teachers, university faculty, and the parents and students of a poverty-stricken rural school district in Southside Virginia. Results from the first year and a half of three grant programs are discussed: an internship program for pre-service teachers, a field-based masters degree program for in-service uncertified teachers, and technology training for university methods faculty. The initial findings from a new project initiative partnering pre-service and in-service teachers for collaborative lesson plan development are highlighted.

Introduction

Aligning Certification with Technology Training Now (ACTT Now) represents a unique partnership between Old Dominion University (ODU), in urban Norfolk, Virginia, and Brunswick County Public Schools (BCPS), a k-12 district in rural Southside Virginia. Over the past year and a half, the ACTT Now project has been working to create technology proficient teachers in both institutions and to counter the effects of the digital divide pervasive in poverty-stricken Brunswick County. ACTT Now's $1.3 million three-year grant is funded through the United States Department of Education's Preparing Tomorrow's Teachers to Use Technology (PT3) initiative and consists of five major components:

(1). An internship program for Old Dominion's pre-service teachers

(2). A field-based masters degree program for Brunswick's uncertified and provisionally certified teachers

(3). Technology Opportunities for Parents and Students (TOPS): an evening technology-training program for Brunswick County community members

(4). Student Technology Assistance Teams (STAT) and

(5). Technology training for Old Dominion's methods faculty

During the summer of 2001, the ACTT Now grant team developed a new project element linking ODU's pre-service and Brunswick's in-service teachers. Starting fall 2001, in-service and pre-service teachers were paired to collaborate in the development of technology-infused lesson plans. This new initiative has dramatically enhanced three grant programs: the internship, the field-based masters program, and the technology training for methods faculty while building synergy within the project as a whole.

Grant Components

Internship

The typical ten-week student teaching placement in the final semester of a pre-service teacher's training provides at best a truncated, incomplete picture of the teaching process and the teaching profession. Student teachers begin their placements after the school year has started and complete their student teaching before the year ends. Student teachers often are not responsible for submitting grades and completing report cards nor do they meet with parents to discuss student progress. Much is left to learn during the first year of teaching. The ACTT Now internship program offers a more complete experience for pre-service teachers while also providing personalized technology training so graduating teachers will be well prepared to meet the needs of 21st century learners.

In lieu of the regular student teaching requirement, ODU pre-service teachers can elect to complete a one-year or one-semester paid internship in Brunswick County Public Schools. Interns begin their placement either during new teacher orientation in August, or during the in-service days at the start of the district's spring semester in January. Interns remain in their position until the end of the semester or year. Interns accept the same responsibilities as regular classroom teachers except that they are only required to teach half time. This leaves ample time for interns to meet with mentors, supervisors and technology specialists, and to observe and assist in other classrooms. Interns attend weekly technology workshops and receive personalized one-on-one technology assistance from Brunswick County's Instructional Technology Specialists.

ACTT Now's partnership with Brunswick County enables ODU to provide a technology rich environment in which to prepare its pre-services teachers. Brunswick County Public Schools has emerged as a leader in technology despite the dismal statistics of its community, including one of the highest illiteracy rates in Virginia. Through the innovative leadership of its technology department, Brunswick County has acquired technology resources parallel to and in many cases often surpassing those in the wealthier districts surrounding the nation's capital. Hardware resources include wireless mobile laptop labs, Intel microscopes, SmartBoards, Palm Pilots and probes, digital cameras, computer labs and projectors at each school and Internet accessible computers in every classroom. A bank of educational software such as the highly acclaimed Inspiration and Kidspiration and the latest Tom Snyder products are also available for teacher use. Four instructional technology specialists and the director of technology work to help teachers integrate these new tools into their classrooms and curricula. These resources provide ODU interns with cutting edge 21st century learning environments.

A unique funding mechanism allows the internship program to operate with minimal external funding. Brunswick County leaves one teaching position vacant for every three ODU interns it accepts. The money allocated to the teaching position is used to pay stipends to three year-long, or six semester-long, interns and their mentor teachers. Brunswick County, in effect, hires three teachers for the price of one.

In addition to a $8000 per year stipend, interns receive a laptop for use while they are involved in the internship program. Because Brunswick County is approximately 100 miles from Norfolk, the interns are provided with free housing or a housing stipend. Full year interns are eligible for health insurance coverage and will start at step two of the salary scale should they be hired the subsequent year. All interns are guaranteed a job interview upon completion of the program.

Dictated by the grant proposal, the goal of each intern is to find new ways to incorporate technology into the planning and preparation of lessons, to design lessons that utilize recent software applications, and to develop project-based lessons that require students to use a variety of technological media for both the construction and presentation of their work. Weekly technology workshops expose the interns to different technologies and model strategies for technology integration. Brunswick's instructional technology specialists work one-on-one in the interns' classrooms helping them transition the skills they learn in workshops into actual classroom implementation.

In the beginning of their internship, interns focus on technology as a tool for planning lessons, creating materials, or as a means to deliver instruction, for example, PowerPoint presentations. In the first semester of the program, most interns did not surpass this basic level. A few interns stall at this initial stage; but most are able to change their focus and embrace technology as a tool for their students to use by mid-way through their placement. At the end of the second semester of the program, the interns reported using technology both as a tool for themselves and their students.

Software applications
• 5th grade class created a timeline of Virginia History using Tom Snyder Timeliner software • Students used Inspiration to make a bubble chart • Teacher used the Magic School Bus (Oceans) software to teach ocean environments
Webquests
• Students completed Virtual Jamestown WebQuest • Students completed teacher made WebQuest on the First Battle of Bull Run
University of Virginia's Etext
• Class read John Smith etext narrative on Virginia Indians • Class examined original maps of Virginia from the 1600's

Internet Resources
• Teacher used BrainPop.com movies and quizzes to teach the earth's structure and plate tectonics • Teacher led students in MayaQuest lessons • Students interacted with digital models of portions of the sea floor • Students viewed prehistoric marine animals • Students manipulated ocean currents • Teacher showed site devoted to runaway slaves—including original documents of advertisements for runaway slaves • Class looked at indentured servants database to see if their relatives were indentured servants during the colonial times
Internet Research
• Students researched the scientific name and habitat of microorganisms • Students researched the answers to photosynthesis and cellular respiration questions • Students researched the geological process which led to the formation of sea floor • Students used Internet to look up information on Vertebrates and invertebrates for a written and oral presentation
Presentations
• Students used the mobile lab to create webpages illustrating the major causes of WWII • Teacher made presentations on a variety of topics: figurative language, prepositions, slavery, Monarch butterflies etc. • Students made PowerPoint presentations on an author they researched
Hardware Applications
• Students observed microorganisms with Intel Computer microscopes and laptops • Teacher used the SmartBoard for discussion/interactive activity on rainforest – students could draw rainforest animals over a picture of the rainforest

Table 1: Classroom activities using technology as reported by interns (spring, 2001)

As of Spring 2002, ACTT Now has had 36 interns participate in the program. Interns have reported beneficial but demanding experiences. They believe that their internship experience gave them a more realistic picture of teaching and thus better prepared them for teaching than a regular student-teaching placement. They felt they were completely immersed in the school culture and developed an authentic sense of the responsibilities a teacher has both inside and outside the classroom. Follow-up surveys and interviews during interns' first year teaching placements will provide additional data on this and the internship's impact generally. Interns indicate increased comfort levels with technology but a desire for more instructional assistance for seamlessly integrating technology into their instruction and more teaching strategies that will enable students to be fully engaged in the learning process.

Field-based Masters Degree Program

Old Dominion University's Darden College of Education has been a leader in distance education for the past decade. Its Teletechnet program brings 4-year degree programs to students in remote areas throughout Virginia and the nation. Previously, its onsite courses served the urban population of Hampton Roads. Through ACTT Now, the Darden College of Education's virtual hand materializes in a remote rural community greatly in need of educational and economic resources. ODU offers a three-year, 33-credit masters degree program in general elementary or general secondary education on-site in Brunswick County. And on the planning block for fall 2002, is an executive doctorate program for Brunswick's interested teachers and administrators envisioned as a combination of on-site and Teletechnet courses.

Nearly one third of Brunswick's teaching staff is currently enrolled in ODU's field-based master's program. Brunswick County has difficultly both recruiting and retaining teachers. Low teacher salaries and the remote location contribute to a near 20% turn-over rate. Brunswick County is able to market ODU's field-based masters degree program as a means to both attract and keep good teachers. Through the use of grant

funding, Brunswick pays the fees, tuition and book costs for all of the teachers enrolled in the program. In return, teachers agree to teach in the district one year for every year they were enrolled in the program.

The main emphasis of the field-based master's program is learning to improve instruction through technology. Teachers already certified complete a core of courses emphasizing curriculum development, instructional strategies, assessment techniques and the use of action research as a vehicle for self-reflection and instructional improvement. Uncertified teachers replace elective courses with state requirements such as Reading in the Content Area but otherwise complete the same core classes. All courses employ technology integration and require teachers to demonstrate the transfer of learned skills into the classroom environment. As with the internship component, the teachers' initial forays into technology are teacher-centered. As teachers gain experience and confidence, the sophistication of their technology use improves. Teachers in the program fall along a continuum from novice to technology award winners. Starting in spring 2002, more experienced FBM teachers will serve as mentors to those less experienced.

An early finding severely altered the overall course content for the FBM. The majority of the teachers lacked a fundamental knowledge of instructional strategies. The most powerful applications of technology require students to be independent learners. A majority of Brunswick's teachers were using teacher-centered lecture-based activities as their modus operandi. In October 2000, 83.3% of uncertified teachers reported that they were more inclined to lead a classroom discussion that was centered around simple questions that cover previously assigned material as opposed to a discussion generated by questions from students where the teacher's role is to point students in directions that can assist them to find the best answers. Also 70.8% of uncertified teachers believe that students prefer to have this type of discussion. Before teachers could begin to use technology in ways that fully engaged the students, they needed to learn student-centered instructional strategies and believe that students can learn in that manner. Hank Becker's research shows that teachers who exhibit more traditional teaching behaviors are far less likely than teachers embracing a constructivist approach to allow students to use new technologies even when the traditional teachers have five or more networked computers in their classroom (McKenzie, 2001). Instruction in the FBM program has since centered on student-centered instructional strategies and implementation.

Instructional Technology Specialists in Brunswick County Public Schools work directly with teachers including those individuals enrolled in the field-based masters degree program. They have several duties assigned to them but the most important is to assist teachers in the development of lessons and activities that infuse technology. Instructional technology specialists first help teachers learn to use hardware and software resources. Teachers select a resource to explore and then either schedule a series of appointments with an instructional technology specialist for one-on-one mini-workshops or attend an after-school professional development workshop. Following the skill development workshops, teachers collaborate with an instructional technology specialist to create a lesson, project, or activity in which the selected resource is infused into a classroom lesson. Brunswick County Instructional Technology Specialists spend the majority of their time in classrooms: modeling and co-teaching lessons using technology, observing lessons, and giving feedback to teachers. Brunswick's four instructional technology specialists act as assistants in the field-based master's class sessions and ensure tools and strategies introduced in class are implemented in teachers' classrooms.

Technology Training for ODU Methods Faculty

An obvious method of producing technology proficient teachers is to provide teachers with technology training while they are enrolled in a teacher education program. The Preparing Tomorrow's Teachers to use Technology (PT3) initiative was created to do just that. ACTT Now is fairly unique among PT3 projects in that many of its programs take place outside a school of education. The internship program offers intense technology training for pre-service teachers willing to live and teach in Brunswick County for at least a semester. The field-based masters program provides technology training and certification for Brunswick's in-service teachers who lack licensure. The majority of Old Dominion's pre-service teachers are not affected by these two initiatives. They receive technology instruction through one mandatory technology course and prior to ACTT Now, received little in the way of instruction for actually using technology in the classroom. Within the college of education, ACTT Now is providing training, resources and support to methods faculty. Members

of the methods faculty are encouraged to model technology-infused instruction in their courses so pre-service teachers learn not only learn to use technology, but learn how to teach with it.

A serious barrier to this goal was the lack of resources within the college. Methods faculty had limited access to computer labs and no access to recent software programs or small hardware devises such as PDAs, Palm Pilots, microscopes, and digital cameras. The purchase of a wireless mobile laptop lab allowed methods faculty to bring the technology into their regular classrooms. Faculty attended workshops using the mobile labs and were then able to use the same equipment and programs in their own classrooms. Brunswick County lends software and equipment not available at ODU. Graduate students and instructional technology specialists from Brunswick provide group and individual follow-up training sessions for faculty based on their expressed interests. An incentive program encourages participation among the staff: faculty who complete the two-part training sessions earn software packages of their choice.

Linking Pre-Service and In-Service Teachers

While the internship program, the field-based masters degree program and the technology training for the methods faculty were improving the proficiency of the teachers involved in the programs, the project as a whole lacked synergy. Nothing seemed to strongly link the separate components of the grant. In the summer of 2001, a new project element was conceived by Cathy Cheely, Brunswick's Director of Technology. Cheely's idea was to link the disparate elements in a manner not previously considered. ODU pre-service teachers enrolled in methods courses onsite at ODU would be paired with in-service teachers enrolled in Brunswick's field-based master's degree program. Together, the pre-service teachers and the in-service teachers would plan a technology-infused lesson.

Pre-service teachers are required to plan a lesson or a lesson unit in their methods classes. Normally, these lessons are designed for a hypothetical class and are never implemented. Symptomatic of the disconnect between higher education and secondary education, pre-service teachers plan lessons for ideal students in ideal classrooms that do not exist in real schools. Rarely do pre-service teachers consider SOL pacing guides, special education students, students who work at different rates or students performing dramatically above or below grade level when developing these lessons. By partnering with an in-service teacher, the pre-service teacher is provided with a real context in which to plan a realistic lesson. The Brunswick field-based masters teachers provide relevant information on their classrooms and curricula to the pre-service teachers via a monitored discussion board. The pre-service teachers then begin to develop lessons as assigned by their methods instructors. The collaborative process begins as the pre-service and in-service teachers negotiate the details of the lesson over the discussion board. When both parties are satisfied, the pre-service teacher submits the final lesson plan to be taught by the Brunswick teacher in his/her classroom. The lesson is videotaped and sent back to the pre-service teacher along with a written analysis. The videotaped lessons provide a wealth of instructional material for the individual methods students and for the methods classes at large.

The tool for collaboration during the first semester was a free online bulletin board service called EZBoard. A "community" was created for the field-based masters program which included a "forum" for the collaboration process. Within the collaboration forum, there was a "topic" area for each FBM student. All discussion between an ODU methods student and their FBM partner took place within the "topic" area for the FBM partner. Each participant had an individual login and password to enter the area but the dialogs could be viewed by all participants. This way the FBM instructors and the methods course instructors could monitor the online collaboration. During the second semester, grant staff member and FBM instructor, Patrick O'Shea, created a specialized database program to serve as the discussion board. This allowed all communication to be stored on Brunswick County's servers and eliminated the commercial advertisements ubiquitous in EZBoard.

First Semester Results

The first semester of the collaboration project was completed in December 2001. Over one thousand communications were posted on the discussion board. There were sixty-three partnerships between sixty Brunswick field-based masters teachers and interns and seventy-seven ODU methods students. Forty-seven

lesson plans were delivered, performed and videotaped. These partnership was deemed successful. Sixteen partnerships did not yield a lesson plan and were therefore termed unsuccessful.

	Total Partnerships	Successful	Unsuccessful
Number	63	47	16
Percentage	--	74.6%	25.4%

Table 2: First semester pre-service/in-service collaboration partnerships (December, 2001)

In successful partnerships, field-based masters teachers reported very positive experiences. Many said that they either learned a new idea or were reminded of a technique they had long forgotten. "It is always refreshing to read another teacher's ideas. Sharing ideas is an excellent way to grow in our profession!" (Denise Painter, field-based master's student).

Another student explained the benefit of "being open to creative teaching and learning, and the willingness to try something different - even if I thought it wasn't going to work. Overall, I enjoyed the experience. It gave me a chance to, not only 'think outside the box,' but to actually 'teach outside the box.'"(Ronald Thornhill, field-based master's student).

Nearly all FBM teachers expressed a desire for their pre-service partners to come to Brunswick and teach or assist in the lesson personally. One FBM teachers indicated that she felt her partner was "cheated" out of the most important part of the lesson planning process: implementation.

The amount of collaboration varied even among successful partnerships. In some cases a partnership was labeled successful because it resulted in an implemented lesson plan, but the collaboration between the partners was minimal. In these cases, the field-based masters students reported experiencing frustration with the project. Many of their online postings went answered for weeks. Subsequent discussion with pre-service teachers revealed that some methods course students felt pressured to respond to postings and adhere to schedules dictated by their partner teachers.

Unsuccessful partnerships were victim to similar circumstances. In most cases, the fault was attributed to inconsistent expectations between ODU methods students and FBM collaboration partners or inconsistent expectations between ODU methods faculty and FBM instructional staff. In very few instances, "bad" matches between FBM and ODU students were made where pre-service teachers could not create lessons appropriate to their partner teacher's subject or grade area. Additionally, both pre-service and in-service teachers identified concerns arising from asynchronous communication. The electronic environment prevented some partnerships from reaching a personalized level. Some partners used email or telephone conversations to establish initial rapport and used the electronic tools only after they had developed a relationship with their partner.

Other obstacles that hindered partnerships were variations in the lesson plan format used by the Brunswick teachers and those used by the methods faculty and students, the field-based masters teachers inexperience with peer-coaching techniques, and a general lack of understanding of the collaboration process by both parties. These issues are being addressed in the second semester of the project.

Impact on Grant Components

The ODU pre-service teachers who serve as interns also participate in the collaboration project. Because they recently completed methods courses themselves, they are natural partners for the current methods students. Interns give presentations in methods courses and provide written feedback to methods instructors on the preparation they received in their methods courses as part of their internship responsibilities. So, interns already serve as a gateway between the two institutions. Involving them in the collaboration project intensifies the link and provides the grant leaders with a unique perspective. Since the interns are ODU students, they are privy to the pre-service teachers perspective yet, because they are immersed in Brunswick schools, they

understand the mentality of Brunswick teachers. This gives them the unique position of seeing the project from both sides.

Just as the interns are enhancing the collaboration project, thc collaboration project is enhancing the internship program. All the methods students are either required to or have the option to participate in the collaboration project with Brunswick yielding increased visibility for ACTT Now. The collaboration project ensures all education students learn about the Internship option and thus serves as an automatic recruiting mechanism. Pre-service teachers involved in the collaboration project have several opportunities to visit their partner teachers in Brunswick County, and at the same time, observe the interns in action.

There are numerous benefits to participating field-based masters teachers. The collaboration project established peer coaching and peer review professional practices. Many teachers had not previously collaborated with other teachers, nor had they acted in a mentoring or peer-coaching role. Within these new roles, the teachers tutor their partners on instructional strategies and technology applications learned in class thereby strengthening their own understanding. They gain a new perspective on the teaching process and incorporate fresh ideas into their instruction. They are held accountable for their instruction via the videotaping process. And finally, they are required to thoroughly analyze the lessons prepared by the pre-service teachers forcing citing evidence for its success or failure. This analytical process helps the teachers learn to analyze the merits of their own lessons.

The collaboration project has direct benefits for both the methods students and the methods faculty. As a result of their one-on-one collaboration with in-service teachers, methods students will be more cognizant of the many issues involved in the lesson planning process and will have more realistic expectations when planning subsequent lessons. They will *see* first hand through the videotapes where their lessons succeeded and where they fell short, and they will receive the teachers' take on the lessons' strengths and weaknesses. Brunswick teachers help pre-service teachers plan lessons utilizing technological resources. A resource library including the instructional and technological resources available in Brunswick has been created at ODU so the pre-service teachers can peruse materials and experiment with hardware and software tools they may want to include in their lessons.

The collaboration project provides methods faculty with a reality check. Higher education has a reputation for being out of touch with current k-12 classrooms. The collaboration project ensures methods faculty are abreast of the realities facing today's teachers and are preparing their students adequately for the classrooms they will enter. Methods instructors are invited to visit Brunswick County to serve as guest lecturers in the field-based masters courses to share their expertise and model the methods they advocate for the pre-service teachers. While in Brunswick, they can observe first hand how Brunswick Instructional Technology Specialists are coaching teachers to use the latest technology resources. These resources can, in most cases, be borrowed so ODU faculty can receive individualized training on specific software programs and hardware devises they see in Brunswick. ACTT Now provides motivation for methods faculty to visit Brunswick and to use technology. Methods instructors who visit Brunswick receive a stipend and those who participate in the collaboration project earn a visit to a technology conference of their choice.

Conclusions

The ACTT Now project continues to impact both the pre-service teachers at Old Dominion University and the in-service teachers in Brunswick County. As more data is collected through the grant's external evaluation process, the extent of the impact will become clear. Already it is evident that the latest initiative of ACTT Now, the collaboration project, has had significant effect on three components of the grant project: the internship, the field-based masters degree program and the technology training for methods faculty. The partnering of pre-service teachers from an urban university and in-service teachers in a rural school district has led to increased technology proficiency for both groups.

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PT3 Implementation at the University of North Texas

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The Millennium II consortium is implementing seven preservice teacher initiatives in the north Texas area. Technology-infusion activities are designed to continue the expansion of services to meet educator preparation needs of the state and nation. The emphasis for this three-year project is closing the digital divide. The key areas of quantity, quality and equity are addressed in the preparation of technology competent and confident new teachers. Major objectives in progress include:

- Increasing the quality and quantity of preservice technology integrating educators
- Expanding technology-infusing methods courses and instructor modeling of technology

- Providing technology enriched assignments and assessment for special education preservice teachers
- Establishing technology enhanced academic content courses for preservice teachers
- Establishing fast track credentialing for technology aides to be degreed teachers
- Developing Internet-based quality resources for preservice teacher courses
- Recruiting new millennium teacher educators from technology infusing classroom teachers to work as technology fellows in the project.

The University of North Texas (UNT), seven K-12 school units, a multi-campus community college, and two professional associations have joined forces to implement project goals and objectives to achieve intended outcomes. The Millennium II consortium was awarded a U.S. Department of Education Preparing Tomorrow's Teachers to Use Technology Grant (PT3). The lead partner, the University of North Texas, contributed Higher Education Assistance Funds for in-kind hardware/software purchases for this effort, adding to the time and effort contributed by other partners. Approximately 700 new technology-infusing educators are targeted to be produced by the project over three years.

UNT includes one of the largest teacher education programs in Texas, preparing approximately 750 teachers each year in a variety of K-12 programs and all discipline areas including special education. The Professional Development School (PDS) model requires that the education of teachers be linked directly to learner-centered schools. Through alliances with schools throughout the Dallas-Fort Worth Metroplex, preservice teachers work directly with children for at least two semesters. From the beginning of the PDS efforts at UNT, technology has been a tool for acquiring information, increasing instructional options, individualizing assessment, accessing resources, and promoting communication. Both the College of Education and PD schools continue these efforts.

Full realization of learner-centered teacher education intertwined with learner-centered schools in which technology is being applied effectively and interactively requires three elements that are not fully in place. First, modeling and effective use of technology by faculty and students throughout their university and teacher education experience is required so that students "live with technology" rather than being told that they should integrate and infuse it in their teaching. As technology and its possibilities for improving education continue to change, faculty need time and support to learn to use the technologies and to demonstrate applications in the classroom.

The second needed element is continuous application of technology during preservice internship and practicum experiences. UNT works with schools, teachers, faculty and intern supervisors so that preservice teachers become leaders in modeling and using technology for assessment, instruction and equity. Third, the university needs vehicles for extending technology training to new groups of teacher candidates beyond those served directly on campus. By extending the opportunities for technological competence and confidence beyond the traditional boundaries of the campus, the College of Education seeks to bridge the digital divide in teacher education to rural and urban settings.

Each of these elements addresses the need for teachers who are better prepared in content, pedagogy, and technology. In addition, each of these elements requires that the College of Education faculty in teacher education and technology work with partners to achieve these goals: partners within the University who provide the content coursework for new teachers and partners who provide schools as living laboratories for students to develop their teaching skills.

Teaching Transformation Teams: Providing Face-to-Face and Virtual Teacher Preparation Experiences

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Abstract: Faculty in The Graduate School of Teacher Preparation and Special Education at The George Washington University have benefited from participation in a Preparing Tomorrow's Teachers to use Technology (PT3) grant. Expanding beyond workshops and course releases to improve technology skills, faculty are teaming with public school teachers and graduate students as they redesign courses in the Master's degree program to reflect technology standards. This collaborative approach has complemented existing graduate school and public school partnerships and facilitated change in instructional practices and course content and modes of delivery.

Introduction

George Washington University's (GWU) vision for preparing tomorrow's teachers to be better users of technology in their teaching has not changed. However, its approach to making this happen has. The goal of GWU's PT3 Implementation Grant continues to be facilitating faculty members' improvement of their technology skills and their use of technology tools and strategies as a natural part of their methods and foundations courses. The project, *Teacher Technology Leaders* (TTL), is intent on keeping the focus on the course content and the ways in which technology use can enrich the curriculum. A study by Di, Dunn and Lee (2000) reveals that an integrated approach to instructional technology in foundations courses positively influences students' perceptions of technology use and enhances their abilities to use advanced technology for their teaching and learning. Through the TTL Project staff's support of faculty in changing instructional practices to utilize technology in meaningful ways, students in the teacher preparation programs are developing technology competencies. Additionally, the project has paved the way for faculty, graduate students and P12 teachers to work collaboratively in redesigning courses to better apply technology tools. Connections between the professional development of pre-service teachers, experienced teachers, and university faculty provide for what Lieberman and Miller (2000) refer to as the "rub between theory and practice" that is essential in educating professionals.

This paper describes two TTL Project components that demonstrate GWU's commitment to collaborative partnerships that focus on integrating technology in the teacher preparation programs. The aim of the first project was to utilize technology to expand and improve content in one of the foundations courses. The second was to create a "virtual space" to foster and support collaboration.

Teaching Transformation Teams

One of the greatest strengths of the PT3 grant program is its encouragement of grant recipients to make changes in their approaches as experience and collaboration with other grantees suggest. The TTL Project staff learned from the experiences of other grantees that having faculty work on teams is far more productive than providing them with course releases and expecting them to attend group workshops and other training opportunities. As a result, TTL reorganized its faculty involvement in project activities by encouraging faculty members to form *Teaching Transformation Teams*. Each team works together over the course of a semester and develops a final "product."

Each *Teaching Transformation Team* is made up of a faculty member, a P-12 classroom teacher, and a graduate student. This 3-person team works on a course development project to culminate in either a new course or a major redesign of an existing course with increased emphasis on the integration of the use of technology to deliver the course and the use of technology by participating students to complete course assignments. This work might, for example, result in the conversion of a course so it can be offered online. The team develops a detailed work plan delineating milestones to be met throughout the semester. Team members meet at least once a month with a member of the TTL project staff to discuss tasks and identify project/partner or University resources. The development team is also expected to meet at least once or more between its meetings with the TTL staff member. Weekly status reports are entered into an online reporting system maintained in the TTL Prometheus (GWU's online course management tool) course set up to be used by all teams to share information. In our first semester (Fall 2001) not all teams were pure,

that is, some consisted of a faculty member and a classroom teacher, who also was enrolled in a GWU graduate program. One team was made up of two faculty members from a program and a graduate student from the program.

The faculty member is the lead member of the *Teaching Transformation Team* and responsible for planning team member assignments to achieve the desired outcomes of team activities. He/she is responsible for successful completion of all planned tasks and has total oversight responsibility of the participating P-12 teacher and graduate student. He/she sees that team meetings with the TTL staff are scheduled and that all reporting of team activities using the TTL online reporting tools is completed weekly. The participating faculty member receives supplemental compensation in a lump sum at the end of the semester of the team's work.

The P-12 classroom teacher serves as a mentor on the *Teaching Transformation Team* to assist the faculty member with technology skill building and the development of meaningful technology-related activities related to the team's content area. The teacher then assists the faculty member and the graduate student in the incorporation of these activities into the presentations or course on which the team is working. The graduate student provides clerical, research, and technology support to the team's lead faculty member. The graduate student works with the classroom teacher to develop technology-related activities related to the team's content area. The faculty member may direct the part-time graduate student to complete weekly reports using the TTL reporting tools. The participating classroom teacher and the graduate student are paid as part-time employees of GWU throughout the semester.

Six faculty members formed teams during the fall semester of 2001. One team worked collaboratively to redesign a foundations course in the teacher preparation program. This survey course addresses all issues of diversity including special education as well as human development. The team redesigned this course to utilize technology to facilitate opportunities for students to access credible web-based resources in the form of research, organizations, and teaching materials and to use those resources to expand their knowledge of development and diversity issues. All course materials were put online using Prometheus. Because team members felt the special education components of the course were not sufficiently addressed during class time, the team created webquests for seven special education topics. The idea was to a) increase students' knowledge of particular disabilities, b) engage students in practically applying what they'd learn, c) encourage collaboration in conducting research and, d) increase discourse about the disability being studied. Webquests can be viewed at http://home.gwu.edu/~karenkor/tred208.

The Virtual Curriculum Laboratory

The TTL Project staff began using GWU's online course management tool, Prometheus, during the first year of the Implementation grant to provide an easily accessible virtual space where participating faculty could share ideas and materials. Using Prometheus served three purposes: 1) to provide a necessary anytime/anywhere virtual space for sharing, 2) to encourage faculty to become familiar with this online tool that is freely available to them, and, 3) to serve as a model of how Prometheus could be used for a purpose other than a normal class. Although Prometheus was easy to use to facilitate online faculty dialog and resource sharing, project staff decided that some of its "course" features were unnecessary for our project purposes. In addition, work on another component of the TTL Project to be developed with one of its school district partners, Alexandria, Virginia, needed to begin. The main purpose of the component, *Virtual Curriculum Laboratory*, was to provide a collaborative workspace, so it was a natural tool to build for use with the project's *Teaching Transformation Teams*.

The Ultimatc VCL

The GWU/Alexandria City Public Schools *Virtual Curriculum Laboratory* component of the TTL Project is intended to serve as a community-building tool, as well as a resource development tool. It is a web site that provides access to built-in collaborative tools for small teams or "Labs." The VCL differs from other such online collaborative spaces (e.g., University of Missouri's Shadow netWorkspace, TAPPED IN, and MimerDesk) not only in the toolset it will ultimately provide, but also in its focus. In the initial development phase, VCL provides virtual collaborative workspace for teacher-to-teacher, IHE faculty-to-teacher, and in-service teacher-to-pre-service teacher-to-IHE faculty cooperation. In later phases, virtual workspace for some portion of the 6-12 population will be added.

The scope of the *Virtual Curriculum Laboratory's* features originally defined by TTL Project partner Alexandria City Public Schools (Virginia) includes:

- A Collaborative planning "place"
- A library with
    - teaching resources
    - streaming video and data
    - actual resources or links to other sites' resources
- Online professional development "place" with access to
    - lesson plans, electronic texts, graphics
    - video library of "best practices"

- what are now "normal" components of any online course delivery system
- An online course delivery and assessment tool for teachers to "teach" classes

The VCL Reality

One prerequisite that has stood out in discussions about what the TTL Project's VCL should look like is that the VCL interface should be uncluttered with limited items and choices. The VCL is public, however, all who want to use it must have an account to identify them and allow for differing levels of access. In doing this, the TTL Project staff rolled plans for a password-protected, database-driven intranet site into the VCL web site. The *Virtual Curriculum Laboratory* web site is a dynamic, database-driven site. A user's access level and group assignments determine what the user is able to see and do. For example, faculty level access means the faculty user will see a link to the TTL Project's equipment check-out page that other users will not see. Information in each user's database account record is used to determine to which Labs a logged-in user has access. Likewise, information in a group's ("Lab") database record allows members of that LAB to make the LAB private to only its members or public to others in the *Virtual Curriculum Laboratory* community.

Therefore, armed with an account ID and password, one logs into the *Virtual Curriculum Laboratory* web site and is immediately taken to a page that displays the threaded discussion of the user's default Lab. Each user can create or be a member of multiple Labs ("Lab" here is used to mean a "team" or "group"), but thc user must identify one Lab to be his/her default. This default home page illustrates the development team's belief about the main purpose of the Lab: it is a place where two or more people work collaboratively and communicate primarily by posting messages to each other in a threaded discussion. So, that is what users will first see when they log in. One can switch to other Labs, to which one belongs, through a dropdown menu. Likewise, one can post to the discussion or send e-mail to individual Lab "partners" by clicking on the corresponding name on the left of the screen, or to the whole (current) group by clicking on "Lab Partners" heading. Menu links on the user's home page allow users to move to screens where they can collect URL links to share and look at as they develop their "product" (new course, course unit, presentation, etc.), post files to share with other Lab members (private team or "global"), or post research or idea notes to share with team members. The Reports feature of VCL allows participants to collaborate on the development of one or more reports of their work on their product. These ideas fit perfectly with what we see happening when several teachers collaborate on a project, as well as with the tasks of our *Teaching Transformation* Teams.

Conclusion

The team approach supported by a virtual workspace was highly effective in furthering the development of faculty members' technology skills. Team members commented that the collaborative approach of the transformation teams led to higher quality products and provided a supportive structure for achieving team goals. Each member increased her technology skills and sharpened her understanding of specific disabilities that impede learning. The evaluation of numerous web sites for possible inclusion in the webquests resulted in the creation of a databank of credible online sources now available to students. An added bonus to redesign of the course is that students will experience firsthand an instructional method that puts technology to good use in the classroom.

The work of the teams was greatly enhanced by the opportunity to communicate and share via the Virtual Curriculum Lab. Discussions occurred regularly but did not require face-to-face interactions. Works-in-progress were posted to a common space so that all team members could evaluate, comment and advise. Opportunities for cross-team communication encouraged participants to share what they were learning. The monthly face-to-face team meetings with a TTL Project staff member(s) helped to keep the team focused and the work on schedule. Overall, we find this supportive, collaborative approach to faculty development to be very promising.

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Mentoring: Support and Reinforce Technology Infusion through Building Relationships

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Abstract:

The University of Alabama PT3 team proposes a Panel Presentation to discuss lessons learned and best practices in establishing and fostering mentoring relationships as a mechanism in successful technology infusion in preparing future teachers. Drawn from our experience working with five higher education institutions and eleven P-12 school districts in the Birmingham area, the presentation will include 1) a brief introduction to the various mentoring initiatives; 2) the objectives and activities of each mentorship initiative; 3) positive outcomes as well as problems and solutions in building relationships for professional growth; and 4) management challenges. The panelists will discuss both theory and practice, and compare their experiences with each other and with interested audiences.

Mentoring: An Operational Definition

Mentorship is a label for a concept that connotes a "philetic" association, a relationship based on teaching through brotherly or sisterly love and dialogue (Broudy, 1972). The concept of mentoring has its root in the epic Greek myth, The Odyssey. In our project, this metaphor serves as an example for an ideal professional affiliation occurring among members of the university faculty and between university faculty and P-12 teachers, to provide each other with support, counsel, friendship, reinforcement and constructive models, for effective technology use in teacher development (Christensen, 1992).

Mentoring as a Mechanism for Technology Infusion

One of the problems associated with using technology is that, because it changes so quickly, one-shot development sessions are never sufficient (ISTE, 1998). A long-term solution is to develop self-sustaining users of technology. This is best accomplished through the development of learning communities. Through mentoring initiatives, the UAB PT3 project provides technological training as well as on-going support for teacher education faculty to infuse technology systematically throughout the curriculum. As an outcome of the mentorship, in a three-year period, the Mentors and Mentees reach a significant number to form a critical mass within the Partnership organizations. This critical mass will become the basis for the paradigm shift we have envisaged to support and sustain the significant technology infusion efforts.

The UAB PT3 Project

Led by the University of Alabama at Birmingham, the PT3 project is now well into its second year of operation. The project aims at infusing technology into the entire teaching/learning experiences of all prospective teachers in the Greater Birmingham Area Holmes Partnership organizations, composed of five colleges/universities and eleven P-12 school districts. Participating higher education institutions include public and private, small liberal arts colleges, a historically black institution, and a large comprehensive, research university. Participating school districts include urban and suburban, affluent as well as economically disadvantaged schools.

Central to our project is training and mentoring for faculty members to infuse technology into content/pedagogical courses and learning activities. Three mentorship groups have been formed to achieve the project goal: 1) The Technology Infusion Program (TIP), a mentorship initiative among higher education faculty; 2) Teaching + Technology Program (TTP), a mentorship initiative between P-12 teachers and higher education faculty; and 3) Assistive Technology Mentorship.

The Technology Infusion Program (TIP)

The Technology Infusion Program (TIP) is designed to build a learning community among higher education faculty. TIP focuses on 1) expanding the knowledge-base through incorporating dynamic and multimedia materials into the content area of learning; 2) empowering teaching and learning through introducing new paradigms made available by technology (e.g., visual learning, simulations, synchronized and asynchronized communications, etc.), and 3) enabling faculty to restructure their practice to reflect the successful application of National Educational Technology Standards and Alabama Courses of Study guidelines.

Teaching + Technology Program (TTP)

As research indicates, one of the significant problems in teacher education is the gap between theory and practice. For obvious reasons that most teacher education faculty went through their formal training without adequate exposure to and experience in technology (It did not exist at the time!). Yet some P-12 teachers, because of their professional belief, the need of the classroom, or pressure from society, peers, or home, have found ways to incorporate technology effectively into their teaching. The Teaching + Technology Program (TTP) has paired higher education and cooperating P-12 faculty together to model the use of technology. This includes, but is not limited to, practicum, field experiences, and student teaching.

Assistive Technology: Each One Teach One Model

The number of students with disabilities educated in inclusive classroom settings continues to grow. The education of these students is a collaborative effort and responsibility of regular and special educators. Assistive technology is a relatively new field to the vast majority of faculty in university settings. Very few teachers involved have experience or training in this area. As a result, very few students have had the opportunity to benefit from its potential. Currently, UAB offers the only course in assistive technology among the Partnership institutions.

The mentorship initiative for assistive technology connects together higher education faculty and P-12 teachers to explore options for field-based learning regarding assistive technology. The mentorship employs the Each-One-Teach-One Model to support the goal of disseminating knowledge of assistive technology. Training modules for assistive technology specific hardware/software have been developed and made available online. In addition, a webliography of assistive technology resources has been posted on the project web site.

Facilitating and Managing Mentoring Relationships

As with any complex endeavor, the success requires hard work from all parties, starting with the leadership. The leadership team of the PT3 project is composed of a Project Director, who, together with other members of the leadership team, sets the vision for the project. Mentorship is our means to successful project implementation. Each mentorship initiative is directed by an Activity Director, who communicates the vision of the project to participants, encourages and inspires innovation, and enables meaningful interactions among participants, groups, and between the participants and the project leadership team. In addition, a project coordinator provides essential administrative assistance to the mentorship, allowing activity directors to focus on fostering and nurturing the mentoring relationships without the burden of management details.

It is challenging to manage mentorship relationships across sixteen organizations with about a hundred participants. One of the lessons we have learned is that clear communication of expectations from the project to participants and vice versa is absolutely essential. To bring everyone, mentors, mentees, and activity directors and other project staff, on the same page, we have developed thoughtful and user-friendly management tools, e.g., learning agreement, checklist, project calendar, etc. At the presentation, we will share these tools with our audience and discuss their uses. Through the mentorship initiatives, we strive to cultivate groups of dedicated teacher educators who are not only instructional leaders in their respective discipline, but also confident and self-sustaining technology users.

What You See is What You Get: Virtual Field Trips and Pre-Service Teachers

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Abstract: In June 2000, the Department of Education at Stetson University received notification of a grant awarded by the U.S. Department of Education to support the integration of technology into pre-service teacher education a part of the national PT3 initiative. Located in central Florida, the T3 project is a consortia of five key partners: Stetson University (the fiscal agent), Bethune-Cookman College (an historically black college), Volusia County Public Schools, the Florida Independent College Fund, and Time Warner Communications. The purpose of the T3 project is to prepare pre-service teachers to effectively infuse technology across the curriculum to enhance teaching, learning, and student achievement. The focus of this presentation will be to describe the use of two-way interactive videoconferencing to enhance pre-service teacher education, to share preliminary results of our efforts, and to present lessons learned during the implementation process.

T3 and Virtual Field Trips

Virtual field trips were designed to enable pre-service teachers at B-CC and Stetson to "peer into" an elementary classroom in order to unobtrusively observe real-time teaching. If the videoconference was held during normal school hours, the teacher education professor would facilitate discussion on methodologies, curriculum, classroom management, etc. If timed carefully so as not to interrupt the normal school day, pre-service students would also be able to ask questions of the classroom teacher. In this way, anyone at Stetson or Bethune-Cookman could take a virtual field trip to this classroom anytime during school hours.

Infrastructure, Support, and Costs

In order to implement virtual field trips for our pre-service students, a great deal of infrastructure had to be created and/or tapped into through grant partners. To put things simply: *the PT3 grant enabled us to do things we could not possibly have done without external funding.* Grant money was used to purchase a portable two-way interactive videoconferencing station with a SVHS video recorder and a tracking camera for SU, B-CC, and one of the grant's partner schools, Bonner Elementary. Bonner is an inner city school located in Daytona Beach, Florida, about 27 miles from Stetson and approximately 1 mile from Bethune-Cookman College. Bonner was chosen as the target school because most of our pre-service teachers are elementary majors and because Bonner is working hard to integrate technology effectively to improve student achievement.

Implementation

One of the T3 summer boot camp teachers, Ms. Carol Collucci, volunteered to be the videoconferencing queen at Bonner, and the equipment became a part of her tiny 4th grade classroom. The children in the class were so excited about "being on TV"! Ms. Collucci told me on numerous occasions that she was not going to sugarcoat *anything*. What our pre-service teachers would see would be the regular stuff of everyday classroom teaching--the good, bad, and indifferent.

Initially, the videoconferencing sessions were scheduled to coincide with elementary methods courses at SU and B-CC and were coordinated with Ms. Collucci, the project director, and the university tech support people. In the beginning, the project director facilitated the videoconferences at Bonner while the tech support people at Stetson and B-CC were in the room with the pre-service teachers and their professors. After a few successful videoconferences, the tech support people were no longer required in the room at the university and college, but were always on call during the scheduled videoconferencing sessions. The use of the equipment eventually became fairly transparent for both SU and B-CC, and Ms. Collucci and the children became accustomed to both literal and virtual visitors in their classroom. Much of the video transmitted during the videoconferences was recorded on SVHS tape to be compiled and edited during year 2 and 3 of the project to create case studies of technology integration.

The videoconferences began at the end of the fall 2001 term and continued throughout the school year. One of the project director's goals during the implementation phase was for the systems to be used often in order to justify the tremendous costs involved. In most cases, we scheduled a virtual field trip at a specific time to view a specific lesson in a specific content area. Occasionally, we simply decided to "take a look" at what was happening with Ms. Collucci and her students.

Lessons Learned

The impact on pre-service teachers is still in the review stage, but some preliminary trends have been observed:

- Virtual field trips are pedagogically useful for pre-service teachers, and the model used here could be replicated at other universities, given the infrastructure required.
- Professors had to be led. They did not typically choose to videoconference unless the project director set it up. Professors, however, did respond positively to videoconferencing.
- Pre-service teachers were fascinated by the interpersonal communication that went on between students and teachers during class time. On the whole, comments and discussions tended to center around classroom management and the affective aspects of teaching more than on the content and teaching methodologies. Some typical reactions:
    - "I had no idea how much of the teaching day is spent managing behavior--at the expense of teaching content and/or skills."
    - "Teaching is exhausting work."
    - "Ms. Collucci is so patient."
    - "How will I ever be able to manage so many children with so many needs?"
- While pre-service teachers found the videoconferencing interesting and informative, they felt that they gained more when visiting/observing a classroom face-to-face. The project director theorizes that the "gestalt" of interpersonal dynamics in classroom interactions is more easily observed in person that in 2 dimensions.
- The equipment worked very well once everything was finally set up and tested. It was not, however, used as frequently as the project director would have liked.
- Many of the pre-service teachers wanted to meet Ms. Collucci and her students in person. Being relatively close geographically was a distinct advantage in that respect.
- The children responded positively to the school-wide attention they achieved on campus.

Virtual field trips have proven to be an interesting, but expensive way to examine and critique classroom teaching and to collect vast amounts of video data on teaching and learning. We believe that this highly collaborative technology shows a great deal of promise in teacher education.

Acknowledgements

The T3 project is funded by the U.S. Department of Education as part of Preparing Tomorrow's Teachers to Use Technology Initiative (PT3). The project will receive $967,263 over three years, which is 42% of the total cost of the project. The T3 consortium will contribute $1,343,060 (58%) of the total project costs over three years.

Preparing Tomorrows Teachers To Use Technology Implementation Grant 2000 – 2003

Preparing Tomorrows Teachers To Use Technology Implementation Grant 2000 - 2003

Energizing Teaching to Empower Students through Emerging Technologies across the Education and Liberal Arts Curriculum

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Abstract: Clarke College, in partnership with the Catholic Archdiocesan Schools of Dubuque, is implementing a program to raise the technology learning curve of pre-service teachers, college faculty, and K-12 teachers and students. Our project aims to create a "school" environment in virtual space where teaching is transformed through technology. At this poster session project outcomes of PT3 grant goals are presented. These goals are to create: 1) innovative improvements in our existing liberal arts and teacher preparation program by enhancing coursework and student activities through transparent use of technology resources; 2) a learning exchange to facilitate digital connections between and among Clarke College faculty and K-12 teachers in our Archdiocesan Catholic Schools, and 3) an online graduate Alternative Teacher Preparation Program for re-entry teachers, mid-career adults and out-of field teachers. Exemplary faculty/student projects are showcased to demonstrate learning outcomes resulting from integration of technology across the liberal arts and education curriculum.

Clarke College, a campus of 1250 students in Dubuque, Iowa, in partnership with the Catholic Schools of the Archdiocese and the Iowa College Foundation, is implementing a program to raise the technology learning curve of teacher education students, college faculty, and K-12 teachers and students in the Catholic Archdiocesan Schools of Dubuque, Iowa.

The goal of our project is to create a "school" environment in real and/or virtual space where students and teachers explore, discover, and create new knowledge as a community of learners. The aim of our grant is to create innovative improvements in our existing teacher preparation program by enhancing coursework and student activities through transparent use of technology resources.

Throughout the two years of our grant, achievement of performance objectives have sustained a climate for Clarke College faculty, students, K-12 teachers and students to facilitate building collaborative models for exploring "learning how to learn" together through transparent use of information technologies. This poster session presents implementation strategies of PT3 program goals. Exemplary faculty and student learning projects and projects are showcased.

Grant goals to implement activities, training, and support for transforming teaching and learning environments are: 1) to create innovative improvements in our existing liberal arts and teacher preparation program by enhancing coursework and student activities through transparent use of technology resources, 2) to create a learning exchange to facilitate digital connections between and among Clarke College faculty and K-12 teachers in our Archdiocesan Catholic Schools, and 3) to create an online graduate Alternative Licensure Teacher preparation program for preparation of re-entry teachers, mid-career adults and out-of field teachers.

Project activities include the following:

1. providing a Technology Education Center equipped with state of the art technology tools for teaching and learning
2. providing a Technology Integration Specialist to offer one-to-many and one-to-one workshops for developing technology rich course projects
3. developing a Student Teaching Assistants Plus+ Program to provide students with technical training to support to faculty
4. strategizing support for liberal arts and education faculty to integrate technology into coursework through WebCT
5. providing training for integration of ISTE/NETS standards into course syllabi of teacher education courses to promote a seamless integration of technology into course objectives and activities
6. creating an online community where students and teachers share technology rich best practices with our K-12 Archdiocesan Partner schools
7. creating a telementoring program to support first-year teachers in the field
8. developing an online Alternative Teacher Preparation Program to meet the critical shortage of K-12 teachers in Iowa
9. developing a "telementoring program" as a vehicle to sustain support for first-year teachers during their critical first year of teaching
10. infusing Palm technologies and training into pre-service coursework, K-8 curriculum and teacher field observation experiences
11. redesigning of the current Master's Program in Educational Technology to include ISTE/NETS standards as well as the Technology School Standards for Administrators (TSSA), and
12. creating a Digital Learning Exchange website to facilitate connections between and among Clarke College faculty and K-12 teachers and students in our Archdiocesan Catholic Partner Schools, the Internet, and Clarke's Intranet.

A "change of mindset" toward new and emerging technology integration is evident throughout the Clarke College culture. As a result of this grant, technology tools have been placed in the hands of users, hardware and software is available for transparent infusion into class environments, and training is available "Anytime, Anywhere". These three components add up to an overall increase of powerful uses of technology contributing to increased achievement in learning extending to all communities involved in our PT3 Implementation grant.

Throughout the two years of our grant, achievement of performance objectives has sustained a climate for Clarke College faculty, students, K-12 teachers and students to facilitate building collaborative models for exploring "learning how to learn" together through transparent use of information technologies. This poster session showcases best learning outcomes resulting from implementation of our PT3 grant goals.

Links to the Future: A PT3 Implementation Project

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Abstract

Abstract: Links to the Future is designed to increase our ability to address systematically our use of technology in the teaching/learning process. We are primarily committed to issues of educational equity: we see the digital divide as part of a much larger social justice issue that results from socio-economic differences. We address the integration of technology along multiple strands: 1) the redesign of the education curriculum to meet national technology standards, 2) the integration of technology into core and education courses, and 3) the development of technology-enhanced partnerships with K-12 faculty.

Introduction

Links to the Future begins with several key beliefs. The primary belief driving our project is the importance of addressing educational equity issues. We see the digital divide as part of a much larger social justice issue that results from socio-economic differences. We strive to achieve the goals of our project in such a way that it enhances educational equity for those students who frequently are on the short end of the educational receiving line. Because of this, we find that our technology resources are limited—so we need to do more with less. In addition to limited hardware resources, we often work with limited human resources, i.e., tech support. Therefore, we have to seriously address the issue of expertise—who knows what we need to know and how can we find them? Since we don't have large numbers of "techies" to help us meet the goals of the project, we need to work in active learning communities where expertise is shared and leadership roles shift according to the task at hand. This "limitation" thus works to support participant (including student) ownership of the project, as well as another key belief that we hold: that the infusion of technology is only of value if it supports effective teaching practices. Therefore, we emphasize the use of active learning, student collaboration, and project-based teaching and learning. In addition, we believe that technology is best used when it increases students' engagement and success with intellectually complex tasks. Finally, we recognize that students usually teach in the ways that they have been taught, so Links to the Future takes a systematic approach to the preparation of tomorrow's teachers to use technology through three strands: 1) the redesign of the education curriculum to meet national technology standards, 2) the integration of technology into core and education courses, and 3) the development of technology-enhanced partnerships with K-12 faculty.

Redesigning the Education Curriculum—Linda Lisowski & Diana Bohl

Links to the Future has responded to the evidence showing that new teachers are not being adequately prepared to use technology by initiating a revision of our Teacher Education curriculum at Mercyhurst, ensuring that ISTE/NCATE standards for teachers are demonstrated through our preservice teachers' coursework, field experiences, and portfolio. We recognize that stand-alone courses on computer applications will not give our students the capacity to integrate technology into their teaching; it is necessary to increase the level of technology integration in college education courses. Preservice teachers need to see and experience models of teaching with technology in order to use it effectively in their own classrooms.

At the start of the project, a faculty self-assessment (using the Teacher Preparation STaR Chart, http://www.ceoforum.org/scde.cfm) indicated that our technology integration status was highly inconsistent. Because technology is a strand that runs throughout the curriculum, we found that most courses included some use of or instruction in technology. However, the extent to which technology was an integral tool supporting higher-order thinking and learning tasks varied. When we examined the ISTE/NCATE standards alongside course syllabi, we found that we already had in place the courses and learning outcomes necessary for our graduates to minimally meet the standards. What was missing was the consistent application of technology in the field. Our concerns now focus on exceeding the minimum standards and on providing high-quality field experiences where preservice teachers use technology not only to support their own productivity, but more importantly, to enhance the learning of their K-12 students.

We see several possible routes for exceeding the minimum competencies: 1) strengthening the technology component in *all* education courses; 2) strengthening the technology component in several key courses only, 3) encouraging that web-based course support be available for all education methods courses (e.g., BlackBoard); 4) requiring that students use e-mail and other electronic communications for all courses; and 5) requiring or supporting student completion of electronic portfolios. Each of these routes makes different demands on education faculty. A critical concern in the redesign of the curriculum is the capacity and willingness of faculty, who were hired for their very different areas of expertise, to provide high-quality instruction in technology and/or utilizing technology. Another issue here is the institutional capacity of a small, liberal arts college to handle significantly increased demands on the technology infrastructure. These are precisely the difficulties that face us as we focus on preservice teacher field experiences. The availability of mentoring teachers with pedagogical expertise is limited. When we also demand that mentoring teachers work in schools with an adequate technology infrastructure *and* demonstrate expertise in the integration of technology into the curriculum, we further limit the number of potential mentoring teachers to unacceptably low levels. In addition, we may limit ourselves to working with K-12 faculty in relatively well-off schools, rather than in the high-poverty schools that define our mission. Access to not only technological resources, but virtually all educational resources are impacted by ethnicity and class membership (Kozol 1991, Leigh 1999).

One way the project is addressing these concerns is through the development of active K-12 partnerships. Through project funds, K-12 teachers have the opportunity to take graduate courses in technology integration, borrow portable computers and peripheral equipment, receive mentoring support in their own classrooms from graduate assistants, and develop and participate in school-based technology seminars. Teachers who participate in the project agree to mentor preservice teachers in field experiences. IN addition, *Links to the Future* addresses the computer competence of college faculty through the provision of training and supports, including stipends for redesigning courses to incorporate the use of technology. Five core and education faculty members have been awarded stipends this winter; 5 more will be awarded stipends in the spring. All stipend award winners teach courses taken by preservice teachers. It is the expectation of the curriculum redesign committee that project work in these areas will help us to make better decisions regarding routes to curricular redesign.

Effectively Integrating Technology into Courses—Joanne Carney

Improving the Computer Competency of All Faculty

We consider three aspects of our program to improve the computer competency of all faculty to be worthy of note. First, we have linked our efforts with two other on-going College initiatives, a faculty professional development committee that presents monthly seminars and a program of computer skills training sponsored by the director of information technology at the College. Second, we have set out to create "pockets of change" within as many departments as possible through our use of stipends and release time for faculty to revise course syllabi and infuse technology. Michael Fullan (1994) has pointed out that pockets of change reflecting new behaviors are what eventually

lead to more widespread change. We hope to make our new technology users models for other faculty in their departments. Finally, we are targeting faculty who are novices in technology use for particular assistance and inducements for change—for example, the core faculty representative on our management team is a self-described "Luddite."

Because we have focused upon faculty who have limited technology skills and real anxiety about using computers, we have had to devise special project features to support them. These supports include a personal technology mentor assigned to each faculty member and efforts to promote networking among the target group members. I will elaborate upon these features of the program and give some anecdotal evidence that testifies as to the effectiveness of our approach.

Technology Mentors

The one feature that has proven most effective in supporting target faculty as they learn new technologies is the Graduate Assistant (GA) mentor assigned to each. The GA-mentor can provide private tutorials or assistance in the classroom when the technology-enhanced lesson is implemented. Though faculty may arrange for meeting time with their mentor whenever they wish—most of the first group of five faculty stipend winners are meeting with their GA's on a regular basis, at least once a week. This regular meeting time has the effect of keeping the faculty member from forgetting what he or she has learned and minimizes the tendency for a busy professor to put all the technology work aside in the press of other responsibilities.

How effective has this GA technology mentoring been? In the words of one of our target faculty members: "You can keep the stipend money; I just want Chris!" For technology novices, the personal assistance and support of the GA mentor is crucial for learning. All of the faculty in our first target group have participated in various college technology workshops in the past; none were able to develop significant computer competencies on that basis alone. They need more personal assistance. Our Graduate Assistant mentors provide the support faculty technology novices need.

Networking

Another feature of our program is an active effort to promote networking among the five faculty members in our first group of stipend winners. Our core faculty representative (the "Luddite"), is one of the five; she is able to keep us informed about the needs of these neophytes and assist the others in a non-threatening way. Regular monthly meetings of the group give the stipend winners the opportunity both to share what they have learned with the others and get assistance from their peers.

Preliminary Results

How effective has our faculty development program been? Although this target group of faculty has only been engaged in course syllabi revision and technology instruction for two months, we already see signs of change in how these faculty members teach—technology is prompting a more student-centered, active learning pedagogy. In our last group meeting one faculty member shared what she termed a "marvelous experience.":

> I did not want to give them a traditional exam; I had instituted at the beginning of the term, a little 'techy' innovation I wanted to try. I gave them a list of about 10 different web sites...each day one of them was assigned to report something they learned ...from the website; the websites gave them broader knowledge of both issues ...and became for several a catalyst to "go deeper" so to speak. They even tracked some of these websites to help them respond creatively (i.e. two students wrote short stories dealing with justice issues; one wrote a poem)...Then they had to give a 5-7 minute (which usually went longer!) presentation on what they had discovered or created. I also gave them the option of working alone or with others; some chose the latter; others the former...It was a rich experience for them and for me. They knew it would be more work and they said they didn't care because they were learning so much and because they had the freedom to choose and shape how they expressed what they were learning.

Conclusion

Marjorie H. Dewert, former president of ISTE's SIG for Teacher Education spoke of the importance of providing professional development and support to *all* faculty who teach prospective teachers: "If I had to pick the area of work I believe to be most crucial to our success in ensuring that all new teachers are able to use technology effectively in their practice, it would be professional development and support for the teachers who teach the teachers (1999, p. 4). Mercyhurst College's *Links to the Future* has incorporated that work into our project.

The Pilot Year Project: Student Work—Joseph Lisowski & Linda Lisowski

In 1999, Mercyhurst College received a one-year PT3 capacity-building grant. The goals of that project were similar to the current *Links to the Future* goals. Education and core college faculty, and participating K-12 faculty worked together to effectively integrate technology into curriculum, using project-based learning to support intellectually complex learning and creating artifacts of student work. Two specific examples of student work completed during the pilot year include PowerPoint presentations created by students in a College Writing course who researched a component of local life; and barrier-free multi-media instructional units on CD-ROM created by graduate students in a special education methods course.

College Writing II

The first author worked to meet the project goals in his College Writing II course, taught at the branch campus. College policy requires all students who take College Writing II to complete several argumentative essays and an individual research paper. Whether a student matriculates at the main or the branch campus, the same standards and requirements apply. The differences between groups of students, however, are significant. On the main campus, students are "traditional," that is, young men and women from fairly affluent families, coming to college directly from high school. Their high school grades, rank in class, and SAT scores are above average. At the branch campus, on the other hand, are those students whose scores were not sufficiently high enough to win them admission to the main campus. These include many single-parent adult students, minorities, and re-entry women. In many cases, they have not done well in a "traditional" learning environment and harbor a distrust for the process of education. Significant attitudinal problems must be overcome; finding new, reliable learning strategies must be undertaken. In this regard, we considered what Paulo Freire (1999) has said: "to teach is *not to transfer knowledge* but to create the possibilities for the production or construction of knowledge." (p. 30)

After a high level of trust was established, the class turned its attention to research. Five groups of students were to research some very specific aspect of life in the college town. As is appropriate in constructivist classrooms, the students' interests and needs would be of primary concern in the development and evaluation of the project (Brooks & Brooks, 1993). Each group would decide what they wanted to know, how they would go about finding the information, how they would divide up the workload. The professor required that each group would publicly present their findings in a PowerPoint presentation utilizing graphics, sound, and text. After about ten minutes of distress, the class began to address the project constructively. Five students who had done PowerPoint previously felt comfortable being group leaders. Students determined to which group they wanted to belong with the stipulation that all groups needed 5-7 members. Class time was used to decide upon research topics.

Through PT3 grant resources, each group was able to borrow a digital camera for a "one day rental." The groups could "renew" the rental, if there wasn't a "hold" on it. Each week, groups reported their progress and used ten minutes of each scheduled class for group meetings. Although the computers on campus were inadequate for the tasks, in each group there was at least one student who had access to a computer adequate for the project needs. Within a month, each group was well on its way to producing a finished product; each was enthusiastic about what they were doing; and members of various groups often shared their "expertise" with others if they needed it. The class set a presentation date.

What remained was the determination of criteria to evaluate the end result. What specific items would be assessed? As a large group they brainstormed, coming up with about fifteen categories. Unanimous consent was required. No item would be part of the rubric unless everyone agreed on it. The class discussed and agreed upon 5 criteria—Clarity of Main Point (Focus); Composition—(Balance of text, graphics, & sound); Organization and Flow; Creativity; and Fitting Conclusion—to be accompanied by half a page of verbal comments. The two suggestions the professor made and put on the board for discussion were not accepted. Clearly, the students had taken full ownership of their work. To enhance their critical evaluation skills, all students would evaluate the other group presentations.

Student evaluations were used to determine a group project grade; however, the professor maintained final responsibility for the grading process.

As it turned out, the students' presentations were outstanding. The immediate effect of the project was that now each member of the class addressed the issue of research in a more personal and dynamic way. They had not been overcome by fear. They had used technology to take ownership of their learning, to commit themselves to an intellectually demanding and frustrating task, and to take justifiable pride in their efforts. They then were able to use this vital and interactive approach for the remaining classroom tasks.

Teaching Students with Physical Disabilities

The second author worked to meet the project goals in a required methods course for graduate special education and dual certification students. Teaching Students with Physical Disabilities is a course designed to insure that students who receive Pennsylvania's non-categorical special education certificate have experience and skills related to the needs of students with orthopedic and health impairments. The course uses Blackboard for posting course information and documents, linking to critical readings, and communicating among class members. At the time of this pilot project, the first author had a graduate assistant with a rare form of muscular dystrophy who served as a teaching assistant for the course. Because of her high level of independence and her limited movement abilities (she has use of 2 fingers in her right hand, along with adequate head control), this graduate assistant also provided the class members with a powerful example of the need for them to develop advanced computer skills if they were to teach young students with serious orthopedic impairments.

Students in the graduate program have widely varied backgrounds. They include certified special educators, certified elementary teachers, uncertified paraprofessionals in education and mental health fields, younger students straight from their undergraduate programs, and re-entry women with family and other work experiences. Planning and delivering instruction so that all students' strengths are utilized and all students' needs are met is often a significant challenge. Collaborative, project-based learning can be a way to utilize strengths and meet needs in this kind of diverse setting.

For their final project of the course, students were asked to work in self-selected small groups to develop either a web-based or PowerPoint instructional unit saved on a CD-ROM, and designed to meet the needs of students with average cognitive skills utilizing the principles of universal design. That is, the instructional unit needed to be barrier-free to meet the needs of students with physical impairments, but still had to be of interest to students with no visual, hearing, or physical impairments. The grading rubric included six areas upon which students work would be graded: 1) Learning objectives are clear, appropriate to the grade level and content area, and identified within the first two "pages" of the presentation; 2) Content is accurate and appropriately challenging; 3) Users can choose whether to access the unit visually and/or auditorily, and the unit is clear and cohesive in either modality; 4) There are at least 3-4 high-quality Internet links embedded in the unit; 5) The unit includes an assessment component that precisely matches learning objectives and content; and 6) The appearance and appeal of the unit are high. Students were free to select the grade level and content area of the unit. They were encouraged to work in groups in which at least one member had technological self-confidence and access to a good computer. However, *Links to the Future* provided two laptops for students to borrow (one PC and one Mac), if they needed. Students could also borrow portable zip drives (to facilitate working between computers), digital cameras and video cameras, microphones, and a rewritable CD burner. In addition, graduate assistants staffed a small lab that had two high performance computers, a scanner, and other peripheral equipment. The graduate assistants and professor were available to meet with students and provide technological support.

The major barrier to the successful completion of this project was attitudinal. It would not be too strong a statement to say that many students were horrified and angry when they first received the assignment. They had strong misgivings about their ability to complete the task, and many felt that it was an inappropriate task to be given in a non-computer course. However, they could clearly perceive that students with physical disabilities need excellent technology skills if they are to have access to educational resources and learning. The professor and graduate assistants listened carefully to student concerns and provided technological assistance. Nonetheless, during the time students were working on the assignment, there were many expressions of frustration and resistance; there were far fewer expressions of excitement and enthusiasm.

Students presented their projects during the final week of classes. They ranged from a simple math fact unit for first graders to an interactive intermediate grade unit on the Bill of Rights to a richly informative unit on Chinese life and culture. Some of the presentations were of outstanding quality—class members were astounded by the interesting presentations that the groups developed. In spite of the anxiety and dread the project engendered while students were

working on it, the end result was unquestionably positive. Students who had complained the loudest commented on what a powerful and positive learning exp erience this assignment had provided them.

Evaluation of the Links to the Future Project's Effectiveness—Dawn Blasko, Kim Skarupski, & Michael Drabik

Penn State Erie's Center for Organizational Research & Evaluation (CORE) is serving as the independent evaluator for this project. Researchers at CORE are conducting both formative and summative evaluations of the project objectives. A formative evaluation examines how a program is being implemented with the purpose of providing feedback for program improvement (Rossi, Freeman & Lipsey, 1999). The formative phases of this evaluation are on-going via CORE's continuous involvement on the executive team throughout the duration of the project. Summative evaluations are done at the conclusion of a project to determine its overall effectiveness (Rossi, et al., 1999). The first year project needs assessment will provide the baseline data to which subsequent improvements and project impacts will be compared. We used a combination of quantitative and qualitative methodologies to improve the validity and usefulness of our results (Berg, 1998).

The first step in meeting our objective was the development and implementation of a set of technology questionnaires for the three populations targeted in the grant: 1) K-12 teachers enrolled in a *Links to the Future* sponsored technology training course, 2) Mercyhurst College core faculty, and 3) Mercyhurst College education students. The instruments were designed to assess current technology utilization, technology knowledge, teaching characteristics, attitudes about computers, and other demographic characteristics. We decided to target the second-year students as the target student population, because they would be students during the entire three year PT3 project. CORE created an instrument tailored to each population and implemented it on a web site to simplify data collection and to enhance project sustainability in the future. The web site went on-line in October. Students were randomly assigned to receive either the online version or the paper and pencil version of the survey. Using a modified Dillman survey technique (Dillman, 2000) faculty and students received campus mail and e-mail reminders to improve response rates. Response rates for the K-12 teachers (100%), and students (87%), were quite high and the response rate for the faculty group was moderate (57%).

The surveys showed that the college faculty ranged widely in their use of technology. The percent of faculty who reported having computers at home was 90%. Twenty-four percent of faculty reported owning a Mackintosh computer verses 76% who owned a Window's based PC. Relatively few faculty (10%) reported the use of complex technologies in their teaching (e.g., creating websites or multimedia development), and most of these were in technical fields such as computer science. Many more faculty reported using e-mail (67%) and word processing software (92%) on at least a weekly basis. Faculty also reported several barriers to the use of technology college-wide. The major barrier that they reported was having sufficient time, followed by obtaining sufficient software, and getting instructional technology support.

The education students surveyed were second-year students involved in the education program at Mercyhurst. Students were recruited during second term registration and via e-mail and campus mail. Many students (96%) reported owning a computer and the vast majority (97%) of those owned a Windows based PC. Over 94% of students reported having E-mail at home. Overall, most students report some familiarity with computers and nearly all realized that technology was vital to a career in education.

Turning now to the K-12 teachers, we found that most used e-mail frequently and 91% reported having a computer at home. As frequently noted (e.g., Anastasi, 1988), self-report measures can have limited validity, especially in cases where there appears to be an evaluative component. Therefore, in addition to the self-report survey, we have developed an observational coding scheme to assess the current use of technology in the K-12 classrooms. Observers were trained using COR (Courseware for Observational Research), software developed at Penn State Erie to teach observational research techniques, including coding methods, sampling techniques, and reliability analyses (Blasko et al 1998) All of the teachers that were observed were enrolled in the Links to the Future sponsored seminar, EDSP31, Technology in the Curriculum. This course includes three 2-credit courses that take place across a total of 30 weeks. We have now collected observational data in all 17 classrooms for a minimum of 60 minutes per classroom. After the observations, teachers completed a post-observation form that provided an opportunity via open-ended questions for them to add qualitative information about the class and their experience using technology.

Initial results suggest that, with a few exceptions, the self-report survey generally mirrors the teacher's actual behavior. Most teachers reported positive attitudes about computers and relatively high innovativeness scores. This is not surprising, given the considerable commitment that the course required. Even at this early stage of the project, technology was used 51% of the total time in the classrooms. For this group of teachers, technology use was primarily restricted to using educational software, searching the Internet for information, and using word processing software to

type assignments. The most frequently reported barriers to the use of technology included time for training and development and the lack of sufficient available hardware and software for teaching. Several teachers also mentioned that technical support in the schools was sometimes lacking. In some cases, the self-report survey did seem to over-estimate the frequency of use of technology, for example teachers self-reported that they made heavy use of the Internet in their classes, but the classroom observations showed only 4% of the technology time was actually spent using the Internet, compared to the 16% of the time they used canned educational software. These data will serve as important baseline information for comparison to the observations collected in Spring 2002 at the end of the training course.

Another project objective was to redesign the education curriculum to integrate technology. At this point in the project, five faculty have been chosen to redesign courses and an additional five are being selected for the spring term. The faculty received funds that could be used for a course release or supplemental salary. Faculty were provided with consulting and technical support from the project team. Two weeks after the term, each faculty member will complete a project portfolio that will be the main source of evaluation data. It will include five sections: 1) New and old course syllabi, 2) Training efforts- What training have you gone to in the project period, on and off campus? 3) Sample project- a description and or demonstration of one learning project that you developed in the period of your course redesign. This can be on a CD, disk, video or the web, but must be available to the team to view. 4) Dissemination efforts- How have you shared your knowledge and skills with others, for example, though peer mentoring, conference presentations and publications, 5) Self-assessment- What did you learn? What do you still need to learn? What barriers did you identify to your integration of technology into your course? How might you overcome or cope with these barriers? How might we help and support your efforts? As a follow-up to the portfolio evaluation, classroom observations will be conducted the first time that the new course is offered.

The evaluation team is now planning for several upcoming project activities. We are fine-tuning our classroom observation techniques to simplify the criterion and improve reliability. We are developing an evaluation of the graduate students that were hired by the executive team to support the college faculty and K-12 teachers. Finally, plans are also underway for the development of a PT3 sponsored Links to the Future summer technology seminar.

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Building a National PT3 Online Learning Community

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Background

PT3 has the distinction of touching most major teacher education programs across the country. PT3's national web site will serve a dissemination function, to share the wealth of research, program designs, evaluation findings, resources, and tools that are strengthening preservice teacher education through PT3 funds. To support the synergistic exchange between grantees, PT3 implemented a new intranet in August 2001 called the Electronic Learning Community (ELC), developed at Johns Hopkins University. This secure web space currently has over 800 registered members from the national teacher education community.

The ELC acts as a professional development resource for teacher educators by providing convenient channels of communication and increasing the opportunities for collaborative exchange of information and resources, improving the quality of interaction among community members. The structure of the ELC supports community involvement by integrating a decentralized approach to the development of site content, resulting in a web site that reflects the multitude of skills and expertise of the PT3 participant group. The ELC facilitates communication across geographic and professional boundaries, promoting continuous improvement and the generation of new knowledge. This web-based system enhances the learning and cohesiveness of the PT3 community by providing an open forum for the timely sharing of successes and a vehicle for "just in time, just for me" solutions.

Through a community-centered set of web-based tools and a strategic facilitation process, the ELC is being applied to meet the following needs identified by the PT3 community:

User Control

- Allow projects to contribute information regularly to the PT3 web site so that the increasing volume, depth, and sophistication of the program become evident over time.
- Provide a mechanism for all projects to share their products on the web site as they become available, with information about how the products can be accessed.
- Increase the opportunities for personal participation on the web site.
- Add an "upload" feature to allow all projects to continuously add new files and web sites ("artifacts") to share with the larger PT3 community.
- Provide web-based interaction tools that can be user-controlled to allow any configuration of participants to meet online as needed. Provide facilitation support or mentoring for these groups as needed.

Community Building Processes

- Provide projects an opportunity to participate in identifying "best" or "promising" practices, models, and innovations within the PT3 community, and highlight what is selected on the web site in a searchable format. Allow projects to see the ongoing evaluative feedback, and provide a forum for public recognition of product development and other achievements.
- Build the PT3 community by providing a forum that allows projects to make ideas and accomplishments visible, and to receive validation from their peer group. Create a sense that this is an important place to be "seen."
- Establish a mechanism to learn about learning communities from grantees who are doing work in this area.
- Establish a deliberate and effective mechanism for gathering information on the needs and wants of the PT3 community and other PT3 online presence clients continually.

Technical Integration

- Ensure that all interactive web-based systems that are a part of the PT3 program are smoothly integrated and seamless for users.
- Provide micro and macro spaces on the web for internal project work, for projects to move easily into larger program activities, and for cross-project collaboration.
- Provide a dynamic web-based calendar for users to record all project and program-related activities.
- Provide a mechanism for users to see what new content has been added to the site since their last visit.
- Offer an email alert system to draw users to the PT3 site when new content is added.

<u>Purpose of the Poster Session</u>

Multiple purposes will be achieved in this poster session:

1) PT3 grantees will have an opportunity to learn more about the Electronic Learning Community application, resources available through the ELC, its purposes and functions, and personal applicability. In addition, we can register anyone who has not yet become a member of the community.
2) We can use this face-to-face forum to foster collaborative exchange between and among PT3 grantees, and to encourage community members to participate in national PT3 initiatives currently facilitated through the ELC.
3) We can solicit feedback and input from PT3 grantees regarding the facilitation approaches used to grow and sustain this community, and effective strategies to make online community work.
4) Beyond the PT3 program we can discuss the role of online community in teacher education, sharing our experiences in applying this ELC web space and our facilitation strategies to over 50 communities of educators, and to three university-based preservice programs.

<u>Comments Box on the Application:</u>

We are supporting and facilitating the online community of all PT3 projects. A poster session will provide an opportunity to share the resources available on the Electronic Learning Community, discuss effective strategies for building and sustaining the community, and extend discussion to the role of online community in teacher education programs. However, it would be particularly beneficial to have a poster session type of presence throughout the conference, to engage more PT3 grantees in the discussion. We also want to ensure that all grantee participants are registered in the Electronic Learning Community. Is this a possibility?

Evaluating the Importance of Integrated Technology for Teaching and Learning Among Preservice Teachers

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Abstract

A valid and reliable instrument that measures the growing motivation to use integrated technology applications among preservice teachers was developed. Expectancy value theory provided the framework, for understanding the level of technology skill self-efficacy and value beliefs among preservice teachers.

Introduction

One major problem teacher educators face in an attempt to address the technology integration capability of preservice teachers, is measuring the level of motivation future teachers have to integrate technology in their future classrooms. Teacher educators want to know if the training and experiences they provide preservice teachers are ample enough to develop needed skills and a desire to use integrated technology as full-fledged teachers.

Preservice teachers experience a variety of opportunities to practice technology integrative activities in varying amounts. Given all the variables that occur in educating and training pre-service teachers, no two preservice teachers experience the same examples and practice associated with technology integration. By what method should preservice teachers be evaluated to give ample feedback to teacher educators, indicating success in the level of preparation to integrate technology given all the variation? Are preservice teachers motivated to use technology as teachers when they in fact graduate?

Instrument

The Technology Self-Assessment (Lynch, 2001) was developed to assist teacher development programs attempting to meet ISTE NETS standards to develop technology-using teachers. This valid and reliable instrument employs two meaningful constructs to demonstrate that preservice teachers are developing the motivation to use technology for learning and future teaching: technology skill self-efficacy and technology value beliefs. According to the expectancy value theory, motivation to take action is a result of the combination of skill self-efficacy and value-beliefs for the object of the motivation (Bandura,1996).

The Technology Self-Assessment features the 13 technology applications that are described in the ISTE NETS literature. Each application explores four graduated levels of skill self-efficacy and value for each of the 13 applications. Additionally the instrument includes items that explore the effects of past experience, and integrated usage in project-based situations on skill self-efficacy and value-beliefs for each technology application.

Some of the proposed advantages of using this instrument over other known instruments are:

- Specifically designed to represent the ISTE NETS standards for preservice teachers
- Supported by meaningful theories that are particularly valuable to demonstrate motivation to use various integrated technology applications preservice teachers
- Measure detailed technology skill self-efficacy of preservice teachers for a number of technology innovations
- Measures past experience and integrated usage of each technology application which is known to have affects on technology skill self-efficacy in preservice teachers
- Instrument was valid and reliable when used with two groups of preservice teachers

- Instrument is well suited for longitudinal studies
- Instrument is well suited to provide information to assist teacher development programs in their self-evaluation
- Instrument is easy to administer.

Conclusion

It is important that preservice teacher institutions assist their graduates in acquiring needed skills, methods and motivation to use integrated technology in their learning and future classrooms upon graduating as teachers. Accurately measuring elevating technology skill self-efficacy and value-beliefs with a reliable instrument is also important to preservice teacher institutions who are developing future technology using teachers. The Technology Self-Assessment measures technology skill self-efficacy and value-beliefs, and should be a valuable aid in demonstrating the growing motivation to use integrated technology among future teachers.

Teaching with Technology

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Abstract: "Are we going to use the computer?" This is what my students ask me all of the time. I am currently a senior elementary education major at St. Bonaventure University and concluding my student teaching. I am student teaching in a STTS -- Student Teaching Technology Site -- where I am required to incorporate technology into lesson plans and daily activities. This presentation will describe my efforts and successes. I will discuss the effects this program has on student teachers, children and K-12 cooperating teachers.

"This is great!"
"Wonderful!"
"Are we going to use the computer?"

These are just some of the quotes that I hear daily from second graders in my class and my cooperating teacher at Allegany Elementary School.

I am currently a senior elementary education major at St. Bonaventure University and concluding my student teaching. In conjunction with St. Bonaventure Unversity, Allegany Elementary School has a special program, which enables (and requires) student teachers to incorporate technology into lesson plans and daily activities. This is part of a new program at St. Bonaventure in which student teachers were selected to be placed in schools that have "technology tools" available and accessible. As the use of technology increases in schools, I could not miss the opportunity. As I finish my professional semester as a student teacher, I feel that being placed in this position is one of the best opportunities that an aspiring professional teacher can have.

I am currently teaching a unit on communities and neighborhoods. Throughout this unit, I have incorporated different types of technology to enhance student learning. One example of technology that I have utilized is a program called *Inspiration*. This program allows users to create a graphic organizer with colorful graphics and pictures. The particular *Inspiration* web that the students in my second grade class created was one that focused on "things that you may find in a neighborhood." I think that this was a really great way for the students to begin to grasp the concepts of communities and neighborhoods. Instead of just discussing the topic, it was interesting to have the students come up with suggestions and insert them into the *Inspiration* web. This was one of the very first technology projects that I introduced to the second graders and their faces just "lit up" as soon as they realized they were using the computer. Often, just setting up the computer and projector is an anticipatory set in itself. It "grabs the student's attention" and that is so very important in creating a classroom atmosphere that is effective and creative.

Another very effective use of technology that I have used in my teaching experience is the use of educational software. Educational software can be a very powerful and interactive tool that brings learning to children in a different way. Software allows children to explore opportunities and become familiar with current technology trends. In the communities and neighborhoods unit, I thought that it would be a positive learning experience to have the students create their own map of a neighborhood. With the technology equipment available, I chose to use a software program called *Neighborhood Map Machine*. This program

allows students to create and design their own neighborhoods. As a class, the students developed their own neighborhood incorporating various aspects of neighborhoods and communities that we explored throughout the unit. The students really became interested and involved with the lesson and were learning while having fun at the same time. Each student participated in developing the neighborhood and as a result of teaching this lesson, the students were always eager to find out when they will be using the computer again and what other activities they can do with other technological equipment.

In conjunction with my cooperating teacher, I am in the process of developing a computer center in the classroom. Before I arrived at Allegany Elementary School the computers located in the classroom were not being used. Due to the fact that the students took such great interest in the technology that I have started incorporating into my teaching, I'm confident that it will be very beneficial for the students to have access to technology in the classroom everyday. In order to make this a success, I will choose software programs appropriate for my students. This will increase their development in technological skills as well as the subject matter.

With the help of St. Bonaventure University and Allegany Elementary School, I have been able to incorporate different types of technology to enhance student learning. I should also note that not only has the use of technology in the schools enhanced student learning, but also it has affected the student teachers and professional teachers that I have been working with. It is not uncommon for other teachers in the building to ask *me* how to use technology in different situations. Thus far, I have truly enjoyed using technology in a classroom situation and I feel that my abilities will be very effective and beneficial in future classes that I teach.

The Tech Mentor Project: Technology and the Student Teaching Experience

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Abstract: This presentation will share the results of three semesters of the Tech Mentor Project, one of the activities of USM's PT3 Initiative. Selected Tech Mentors work with student teacher volunteers on focused technology-related projects during the student teaching placement, connected through WebCT to a virtual community of other Tech Mentor teams and the PT3 team.

Introduction

As part of USM's PT3 project, student teachers are placed with trained Tech Mentors who have agreed to collaborate with the student teacher on technology projects during their placements. Tech Mentor teams participate in a virtual community supported by WebCT and collaborate to create a model lesson plan based on the NETS for Teachers and the NETS for Students, as well as appropriate state curriculum standards. Tech Mentors are recruited from among our regular pool of mentor teachers, focusing on those teachers who are already doing exemplary things with technology in their classroom or on teachers who are interested in learning more about using technology. For this second group, a special summer training session improves their technology skills and prepares them for their roles as Tech Mentors. Student teachers apply for the special designation of Tech Student Teacher. In the first year of the program, ten of our school district partners were involved in the Tech Mentor program; during the second year, we have expanded to include fourteen districts; next year, we will incorporate all nineteen of our PT3 consortium school district partners. In addition to working together on the model lesson plan and communicating regularly with other Tech Mentor teams on the WebCT bulletin board, Tech Mentor pairs work with the PT3 team to help develop strategies for extending the expectations of NETS for Teachers compliance to all student teacher placements at our University. Also, in Fall '01 we added an additional requirement for select teams who will develop and submit a portfolio of all the technology-related activities they completed during the placement. This presentation will share some of the results of the last three semesters of the Tech Mentor project. Student teachers and mentor teachers who have participated agree that the experience has improved their ability to use technology in their instruction and increased their students' learning. We will also share some of the challenges we have faced in developing and supporting this virtual community, which covers half of our state.

Over the three semesters we have conducted the Tech Mentor Project, 52 teams have participated, representing nine of our school district consortium partners. Our goal was to place Tech Mentor teams in ten districts during the first year of the project, in fourteen districts during the second year, and in all nineteen districts in our final year, with one elementary and one secondary team in the targeted districts each semester. Because of the difficulties involved in coordinating student teacher placements with our Office of Educational Field Experiences, their district contacts for student teaching placements, our district contacts for PT3 activities, student teacher applicants for the Tech Student Teacher slots, and the relatively short list of trained Tech Mentors, we have not always reached these target numbers. We hope to involve enough regular mentor teachers over the life of the three-year project to build up the pool of technologically-proficient mentors so that all student teachers will eventually have an opportunity to work with one during their placements.

Tech Mentors and Tech Student Teachers sign commitment forms agreeing to do the following: (1) attend two required meetings during the semester; (2) make weekly postings to the WebCT bulletin board discussions; (3) develop a model lesson plan correlated to the NETS for Students and Teachers and to the appropriate state content standards; (4) complete required surveys (two Profiler surveys on their perceived technology skill level and one end-of-term feedback survey); (5) work with the PT3 team to develop ways the

new ISTE NETS for Teachers can be used in evaluating student teachers; and (6) after participation in the project, serve as district resources/trainers for other mentor teachers on the role of the NETS in student teacher evaluation.

Challenges of the Virtual Community

We use several of the WebCT tools to support this project. In the Course Content section, we provide links to extensive online resources, including relevant standards, ideas for using particular software (Inspiration, PowerPoint), support for the one-computer classroom, netiquette resources, software evaluation resources, web evaluation resources, free online tools (Filamentality, TrackStar, RubiStar, QuizStar, etc.), project-based learning resources, and web quest resources. We also provide project-specific information and forms, including the lesson plan template, the contract and commitment forms, reflection guidelines, and portfolio guidelines. We provide a direct link to our Profiler surveys, to make them easier for participants to access; we post specific discussion prompts, assignments, milestones, and due dates on the calendar tool, to help participants stay on track; and we use the private email and bulletin board tools.

Even though participants sign a contract saying they will participate regularly in the bulletin board discussions, we find that they often do not follow through on this. For most of the teachers, this is their first experience with WebCT, though more of the student teachers have been exposed to it. They have never participated in a virtual community like the one we have tried to develop and have difficulty making it a part of their routine. Based on the end-of-semester survey, 11% of the respondents said they never knew they were expected to post regularly (despite the contract and the discussion at the first meeting); only about 32% did regularly join in the conversation; 39% said they didn't have time; 11% said they didn't know what to say; and 7% said they forgot about that commitment. Most of us on the PT3 team have had great success using the WebCT bulletin board as supplements to our university classes; however, the participants in the Tech Mentor project meet each other only once, at the beginning of the semester, and do not have time to develop relationships that make the online discussions comfortable for them -- they never really feel like they are in conversation or in community. When asked if they would have preferred more face-to-face meetings, 89% said yes, suggesting they are more comfortable with the more familiar setting.

Tech Mentor Successes

Despite some disappointment in the online virtual community, our Tech Mentor project has proved successful. Though 40% said they would have used just as much technology in their instruction even if they had not participated in the project, 60% said they used more than they would have had they not been involved. Though a few (7%) participants reported that they had to strain to find ways to use technology, 74% found a natural fit between technology tools and the objectives of their curricula; 77% believed that their new technology lesson more effectively supported student learning than what they had done in the past (none thought it was less effective), and 95% said the use of technology improved students' motivation and engagement. District support and expectations regarding technology use will determine how likely 23% of the participants are to continue to use the strategies they developed during the project, but 77% reported that they were very likely to continue with their use of technology, because it had become integral to the way they think about teaching their subject matter.

Acknowledgements

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Integrating Technology Into Teacher Education Methods Courses: A Case Study

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Abstract: This paper describes a project integrating technology into a reading methods course. Part of a faculty development program of a PT3 grant, this was a cooperative effort, where the class was co-taught by the Reading Faculty instructor and an Instructional Designer working with the grant. WebQuests were integrated into the regular curriculum, with groups of students creating a WebQuest as their major class project. The genesis, planning, implementation, and evaluation of this project are discussed. Successes included large percentages of participants approving of the integration of technology into the course and students who felt the technology was well integrated into the course. Many students saw limitations in this connection, and the time involved in the project was also seen as a negative by some students. Suggestions are offered for those working to integrate technology into the content and methods courses of their teacher education programs.

Introduction

Over the last 15 years, as computers and the Internet have become a greater part of schooling, criticism has been leveled at teacher education programs for failing to educate new teachers effectively in technology use (CEO Forum, 2000; Office of Technology Assessment, 1995). The continuing failure of our K-12 schools to use technology to increase student performance in a widespread way is one result of this failure. While much attention has been paid to the role of instructional technology classes in alleviating this problem, a much more problematic issue is the integration of technology into content area and methods courses. Until technology is an integrated and natural part of the whole teacher education program, it is likely to continue to be viewed as an add-on or separate subject. This paper looks at a recent effort to integrate technology into a reading methods course.

This effort came about as a result of several factors. The Department of Education at Eastern Washington University (EWU) received a PT3 grant in 2000. Part of this grant provides for faculty development in technology. The focus of the grant in this, its second year, is one-on-one mentoring for faculty, with stipends available for those with specific plans for integrating technology into their classes. This gave the co-author of this paper the incentive to begin integrating technology into one of her courses in the Fall of 2000, something she had been thinking about, but hadn't felt the support or self-skills to do so prior to that quarter.

The author was hired by the College of Education and Human Development, of which the Department of Education is a part, to help coordinate the various technology efforts of the college. A major aspect of his position was intended to assist faculty to be more effective users of technology both for themselves and in their courses. Serendipitously, more money became available through the PT3 grant for the year, and the author was formally assigned to work with the PT3 grant, assisting with their various efforts. As the author and co-author are husband and wife, it was natural for them to work together on these already existing plans.

Course Background

During the summer of 2001 the reading faculty at Eastern spent a week revisiting and updating the first three required classes for Reading majors in the department. While discussing the needs of the students, community and state requirements, it became clear that few of the faculty were integrating technology into these three courses. While two professors were using Blackboard to support class projects, when the co-author brought up the need for students to use technology for curriculum design, the general consensus was the classes had too much to cover, and that adding technology would be impossible.

Education 410, Student Centered Reading, the course which the authors selected to use for integration of technology, is the third core reading methods course for the reading major at EWU. This class was seen as a good place to try to integrate technology for several reasons. First, students majoring in reading compromise the largest group of students enrolled in the department, and as this is a required course, a large number of students could be introduced to the use of technology in the classroom in a hands-on way. Second, as EDUC 410 is the third core class, the students enrolled will already have been exposed to the broad range of topics offered in the first two readings methods courses. This background would give them a grounding in reading development, methods and materials as well as lesson planning and some field work in public school classrooms. Third, as the title of the course suggests, the content of the EDUC 410 focuses on student centered learning techniques. These techniques include such things as Literature Focus Groups, Literature Circles and Cooperative Learning. Thus, the development and use of WebQuests as discussed below, with their focus on the participatory nature of the students involved, worked well with the goals of this course.

Rationale for the use of Technology in Education 410

As we began planning the best way to integrate a technology component into the course, we had to look at several factors. These included a desire for technology to be an integrated component of the course and not an add-on, making the technology student-centered, and having the university students actively participate in using the technology as they or their students might in a K-12 classroom. Looking at these and other factors, we decided WebQuests would be a good and valuable way to integrate technology into the course.

WebQuests are an inquiry-orient, student-centered activity invented by Bernie Dodge and Tom March at San Diego State University (for more information on WebQuests see the San Diego State University WebQuest page at http://edweb.sdsu.edu/webquest/webquest.html). They are designed to use students' time well when they are on the Internet, rather than just having them spend unguided, and often unproductive, time surfing the web trying to find useful information. When designing a WebQuest, teachers find the appropriate web sites first, and design an activity using those sites and other resources. A well designed WebQuest enables students who use it to be active participants in their learning by making choices, working cooperatively and often creating one or more products as a result of their WebQuest activities.

WebQuests appeared to be a good technology project for this reading methods course for several reasons. First, the students would be active participants in designing a WebQuest. As a result of this course activity, they would learn web page creation skills in the context of developing reading curriculum rather than as separate skills. Second, WebQuests are focused on both content and process, thus modeling good classroom technology use rather than simply reading and talking about such use as is often seen in teacher preparation courses. Third, WebQuests encourage cooperative group work, again providing an opportunity for modeling in the university classroom the types of activities and behaviors we hope the future teachers will implement in the K-12 classroom. Finally, because the teaching of cooperative learning techniques was already a component of the course in which the WebQuest project was planned, this could be seen as an incorporation of technology into the course, rather than a time consuming add-on.

The Planning Phase

Once we had decided on WebQuests as our means of integrating technology into this course, we then needed to determine how best to implement the use of this technology into the existing course structure. While we had originally thought to focus on WebQuests during the second half of the class, we decided it made more sense to try and integrate the activities throughout the course. This was partly motivated by the knowledge that the students in the program, almost all elementary reading majors, had received little or no technology use in the

classroom to this point in their program. Thus we planned to integrate technology activities and demonstrations into the class from the start. By using this approach, we hopped the students would not only get paced instruction in this area (alleviating 'technology frustration'), but would also come to understand that technology can and should be integrated into the curriculum. Therefore, we also planned whenever possible, for the technology activities to have connections to the other activities being done in class on any given week.

By following the outcomes of the course as mentioned in the *Course Background* section above, we maintained the objectives of the class while still being able to integrate, rather than 'add on' another component, thus avoiding a common complaint of university faculty: that the integration of technology into existing courses is too difficult, time consuming and results in the need to drop some course content in order to accommodate the technology component.

Before discussing the implementation and results of this project, some information on the setup of the classroom is important. This course was a night class which met once a week for four hours at the university's off campus downtown education center. No technology is available in the classrooms, although each has an Ethernet port for Internet access. The building also has an open lab available for student use. However, this lab cannot be used for teaching, thus without bringing in some outside technology, this project would have been difficult or impossible.

Fortunately, the Department of Education has a set of iBooks®, and we were able to check out six of them for the quarter. To maximize the available technology, a wireless Airport® network was set up in the classroom; each group had one iBook®, and all groups were able to share the single network connection and be online together. Additionally, a digital projector was brought in for teaching and student presentations. While the technology limitations presented some problems, (discussed later), this setup did allow at least the minimum necessary access for groups to work on their projects, and might be considered a reasonable model of what teachers might face in attempting a similar project in a K-12 setting.

Implementation of the Project

The technology activities in this class started the first night, with a brief introduction to WebQuests. The students were shown the San Diego State WebQuest site, given a handout with URLs designed to help them get started finding out about WebQuests, and a WebQuest treasure hunt worksheet. Finally, we went to the lab and our students were given basic instructions on lab use. Two weeks later, we went over the first assignment and began the next, which was having the students plan the outline of their WebQuests.

Because we had a large classroom with a divider, we were easily able to split the class into two groups for separate activities. On this evening, one half of the class worked on a hands-on book-making activity, based on the text reading for that week, while the other half began their WebQuest plan. By dividing the class in this way, more individualized assistance was provided that third week at the beginning of the planning phase. Final plans were evaluated and adjusted the next week. We reasoned that with a solid plan in place, groups would be able to work on their own WebQuests with an understanding of the basic parts of a WebQuest and the responsibilities of each group member.

In the fifth week, again splitting the class in two, students were able to not only work at various learning stations based on the text reading, but were able to devote half of the class time to learning the rudiments of web page creation. This included the fundamentals of creating and saving pages, putting graphics and links on the pages, and design issues such as use of color, white space, and the appropriate use and crediting of graphics. Because of the overwhelming amount of information in this one session, additional time was spent the next week on some of these components. After that, in-class WebQuest time was mostly devoted to having groups work on their projects, sometimes as a whole class, sometimes split and always with a chance for groups to work on their own. Finished WebQuests were upload to the College server and presented during the last two class sessions.

Data & Analysis

To determine the effectiveness of integrating technology into this course, we gave the students a separate evaluation in addition to the department course assessment. We asked how useful they found the technology component to be, whether they felt it connected well with the reading curriculum, and the relevance of the

project to the reading program and their future teaching. They were also asked to discuss their other technology experiences at the university and whether they would like to see other classes implement similar technology projects. These questions were asked anonymously in an open-ended format, allowing students to raise other factors they felt to be relevant. Nineteen out of twenty-two students (86%) filled out the survey, given during the final class (two students were absent the final class night).

Coding of the surveys was done one respondent at a time, question by question. After a first reading when no coding was done, and initial set of codes was created and applied during the second reading. These codes were further refined and reapplied where appropriate, until all data were coded with one set of codes. Results were then put in a spreadsheet so the data could be viewed both by respondent and by question, to look for overall trends and to ensure that each individual's line of codes reflected their answers.

The first question asked students how well they felt the WebQuest project fit the course curriculum. Responses were coded into five categories ranging from a good fit to not fitting and students not liking the projects. Table 1 shows the results from this coding, with 8 of 18 (44%) students who responded saying the fit was good or moderate, 6 (33%) saying they liked the project but didn't see a good fit, and 4 (22%) students seeing no fit. The responses to Question 2, on whether the students felt the technology was a valuable addition to the course, sheds some additional light on this issue of the technology fit.

Question 1: Technology/Curriculum Fit	
Fit	3
Medium Fit	5
Liked but didn't fit	6
No fit	3
Didn't like, no fit	1
Total	18

Table 1: Technology/Curriculum Fit

Sixteen out of 19 (84%) students responded that they felt the technology was a valuable addition to the course. This included three students who felt there was no fit in Question 1. In responding to why they felt the technology was valuable, 8 students felt the skills they learned or were learning about WebQuests gave them valuable resources for the K-12 classroom. Five additional students saw learning and using the technology more generally as important for teachers. On the negative side, four students felt that the time spent on the WebQuests took away from time they would have preferred to spend on the reading curriculum. Thus while many students may not have seen the connection between the reading curriculum and the technology, an overwhelming majority did think the technology was a valuable addition to the class.

Question 3 asked students if they would like to see similar technology projects integrated into their other courses. Thirteen out of 19 (68 %) said yes, with one additional student answering both yes and no, with reasons given on each side. Three of the six students who answered no mentioned a lack of experience or skills with the computer as a factor in not wanting to see similar projects in other classes. Five students said that if similar projects were done, they should be better connected to the curriculum, echoing results from Question 1.

Question 5 asked students about their other technology experiences. This question was added because we knew that the university in general and the Education department specifically are somewhat weak in this area. Twelve out of 19 (63%) students said they had had few or no technology experiences at EWU, they had had a bad technology class or two, or they had a lack of computer experience. Again, this mirrored what we suspected, and implications of this will be discussed below.

Other comments that came up in Question 4 or throughout the survey included 5 students mentioning the use of iBooks® instead of PCs as an inhibiting factor, and 7 mentioning time as a factor making the integration of the technology difficult. The relatively low number of students complaining about the iBooks® was something of a surprise for us, as this was an issue that came up repeatedly in class.

Recommendations & Conclusions

We were frustrated with the number of students who saw little or no connection between the technology and the curriculum. Several possible factors may account for this. Responses indicated that two of

the students may not have understood the purpose of the course as stated in the course objectives in the syllabus. Additionally, some students who liked the technology but saw no fit, gave responses that indicated that they did see some connection, if not in the course, at least in their future classroom practice.

But finally we must conclude that one suggestion for those integrating technology projects into methods courses is to make this connection explicit. In EDUC 410, student-centered reading methods were read about, discussed and modeled. While we would prefer to leave the students free to choose their own WebQuest topic, in the future we may instead require one of these methods be incorporated into their WebQuest plan.

In contrast to the responses to Question 1, we were heartened that so many students felt the technology was a valuable addition and would like to see similar projects integrated into other courses. However, for those instructors who know their students may be lacking in technology skills and experience, less intensive projects may be a better way to start. A WebQuest requires considerable time: learning about them, planning, researching appropriate sites, and learning web page creation skills. This is quite a lot to ask of students who may be barely computer literate.

Regarding time, a factor specific to this class was the quarter system that the university follows. Classes are only eleven weeks, and because of vacation and weather there were only 9 required meetings. In this light, the accomplishments of the students are even more impressive. We felt this was a valid project that related directly to the course goals and content, and feel the resulting WebQuests were in large measure very good first efforts given the time and technology constraints. However, student concerns over the time involved and the dominance this project took during the last part of the course must be taken into account in future planning.

While the students had mixed opinions on how well the technology fit with the course content, the authors felt this connection was made. Suggestions for others interested in implementing similar projects include gaining knowledge of the technology abilities of students, being aware of the time required for intensive, innovative technology projects, and making explicit connections between the course curriculum and the technology project.

Teacher education programs need to do a better job of preparing new teachers who can use technology in effective, innovative ways in their classrooms. For this to happen, the technology must be integrated into the methods courses teacher candidates take, so that they have practice using technology with the subject matter they will be teaching. By integrating the use and design of WebQuests into a reading methods course for elementary reading majors, the students in this class had the opportunity to learn technology, use technology for a specific educational purpose, and make a technology-based product that may be useful to them in the K-12 classroom.

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Change Continues as UAA School of Education Moves Forward

Ann McCoy, University of Alaska Anchorage, US

During the second year of a PT3 Implementation Grant, we are continuing our work with integration of technology into our teacher preparation programs. In addition, as a result of our Title II Partnership for Teacher Enhancement grant we have been redesigning our teacher education program. The PT3 grant support this effort. Big changes are occurring including the addition of new faculty, the development of several new teacher education programs, and the restructuring of our school.

Our PT3 grant addresses four specific goal areas: Program Development, Faculty Development, Student Development, and K-12 Partnerships. They are part of a systemic change in teacher education and linked to each other and to other projects and programs within the SOE. These are the goals of the PT3 grant.

STUDENT DEVELOPMENT: SOE GRADUATES will be well prepared, technology proficient educators.
FACULTY DEVELOPMENT: SCHOOL OF EDUCATION AND CONTENT AREA FACULTY will be knowledgeable about current practice related to the use of computers and technology and integrate them in their teaching and scholarship.
PROGRAM DEVELOPMENT: SCHOOL OF EDUCATION PRESERVICE TEACHER EDUCATION PROGRAMS will reflect best practice including the integration and modeling of technology in all courses, using distance technologies to erase the differences between urban campus-based and rural programs.
K-12 PARTNERSHIPS: SCHOOL DISTRICTS WILL BECOME FULL PARTNERS in new teacher preparation through mentor teachers modeling best practice supporting pre-service year-long internships and shared training activities.

Changes continue to occur at our university. New faculty are joining our ranks and new programs are being developed and implemented. A panel of university faculty will interact with the audience as they share their experiences on lessons learned and the continuous assessment that is occurring during this period of change.

Tech•Connect: Learning About and With Technology

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Abstract. The University of Texas at San Antonio's Preparing Tomorrow's Teachers to Use Technology (PT3) project uses a collaborative approach designed to achieve systemic change resulting in an improved teacher preparation program. The Tech*Connect Project engages university faculty, pre-service teachers, and field-based supervisors in joint activities that deliberate issues related to teaching with and about technology. Most members of the target population are below the level of "early technology" proficiency. The project goal is to establish a fundamental level of understanding about appropriate practices in technology use across learning populations. This model program aligns the teacher certification curriculum with state-mandated content and technology standards and infuses technology into field-based experiences in partnership with local schools.

The increasingly presence and use of technology in PK-12 classrooms is in contradiction with teacher preparation programs that have historically provided insufficient training to enable practitioners to use technology effectively. Many teacher education programs tend to teach **about** technology rather than **with** technology. Such programs seldom provide many examples of faculty modeling how to teach with technology and give pre-service teachers little variety of technology experiences in their field experience classes. Often there is little quality control over the experiences they have because strategic planning for technology infusion has not occurred.

In response to these conditions, a recent study by the International Society for Technology in Education (ISTE), commissioned by the Milken Exchange (Moursand & Bielfeldt, 1999), recommends that: (1) technology should be integrated across the teacher preparation curriculum rather than limited to stand-alone courses; (2) institutional planning is required to integrate educational technology into teaching and learning; (3) increased opportunities should be provided for student teachers to use technology during field experiences; and (4) faculty should be given support and training so that they can model appropriate technology uses in their courses.

At the same time, evidence indicates that many university faculty members involved in teacher preparation have little proficiency in technology use themselves. Moore (1991) believes that a critical difference in the ability to adopt technology exists between those who know what technology can do and use it and those who do not like to take risks, but are willing to have someone or something prove to them that the risk is worthwhile. The "chasm" between these two groups, as Moore calls it, accurately describes differences in attitude expressed by many University of Texas at San Antonio (UTSA) teacher education faculty. Although they may acknowledge that they need to incorporate technology into their teaching, models for its use and incentives to use it have not been readily available. In addition, many faculty members are unaware of resources available to them and, given their busy schedules, do not find time to seek them out. The way to achieve successful technology adoption, according to Moore, is to combine faculty and pre-service teachers in situations designed to create an irresistible reason to adopt technology. He suggests that such situations should make learning easier, more productive, or more enjoyable.

Other studies show that getting faculty to use technology not only takes access, but also involves developing a variety of strategies to offer support for faculty while they are training to use it. Brown, Demao, Forsyth, Godwin-Jones, Keller, Pelfrey, Price, and Shumard have identified five components of successful professional development to achieve technology infusion, including:

- **Collaborative mentoring:** coordinating the development of small, cooperative learning networks centered around "early adopters" who will act as mentors;

- **Networking:** creating a network of interconnected faculty interested in teaching and technology through email and other technologies;
- **Structured training:** offering faculty specialized learning experiences that are carefully designed to fit their unique needs as learners;
- **Model projects:** supporting projects by faculty that will encourage the dissemination of technology innovations to less-skilled faculty;
- **Consultation:** offering specialized technical support to faculty on demand

Cooley and Johnson (2000) indicate that successful professional development must overcome barriers such as lack of support, incentives and rewards, and just-in-time training, as well as respond to faculty perceptions of infringement on academic freedom. The dynamic nature of technology development necessitates a culture that supports continual learning and provides immediate access to resources for improvement and a greater likelihood of success.

The 21st Century Workforce Commission concludes that the current and future health of America's 21st Century Economy depends directly on how broadly and deeply Americans reach a new level of literacy that includes strong academic skills, thinking, reasoning, teamwork skills, *and* proficiency in using technology. Both university faculty and pre-service teachers acknowledge the lack of systemic requirements to demonstrate technology proficiencies in teacher preparation programs. Willis (2001) notes that in efforts to reform programs effectively, all stakeholders must be engaged in determining needs and processes and strategies must reflect the nature of the populations to be served. In response to this need, the UTSA Tech•Connect project represents a systemic response to the national call by the U.S. Department of Education for increased technology training in teacher preparation programs.

Project Overview

The Tech*Connect project represents the combined resources of UTSA, corporate and nonprofit educational institutions, and three local school districts and will target pre-service teachers, and UTSA teacher education faculty members. The project seeks to help participants acquire the skills to build effective technology applications in PK-8 learning environments and model technology practices that augment learning.

Tech•Connect activities were derived from a needs assessment that indicated what the service populations both wanted and needed. Program activities are divided into four components: program improvement, training, support and communication and dissemination.

Program Improvement is a major project activity and is on-going. To ensure that all teachers certified through UTSA leave the program with appropriate technology skills, successful technology infusion must occur in all teacher preparation program areas. This process will be implemented by making structural changes to incorporate technology standards, beginning with the courses in the certification programs used to prepare teachers for positions in Early Childhood through grade 8 (monolingual and bilingual). The process of program improvement involves systematic analysis of existing course syllabi for (a) current applications of technology and (b) logical infusion of the Texas State Board of Educator Certification beginning teacher technology standards. Tech•Connect consultants who are knowledgeable in technology-based pedagogy work with each of the teacher preparation program areas: early childhood/elementary; instructional technology, secondary, and special education. The consultants analyze syllabi, interview instructors and make a variety of suggestions about how standards can most appropriately be integrated into specific courses. Program area facilitators then work with course instructors to devise most appropriate activities for content. Once standards have been assigned to all course and activities finalized, Tech•Connect staff work with individual faculty for one-on-one training and support as well as make themselves available for demonstrating and modeling technology in actual class meetings.

Training is the second and most pervasive project activity. Faculty profiles serve as a baseline for individual faculty development over the grant period and serve as a map for Tech•Connect initiatives. Training is offered in a variety of venues to provide a smorgasbord of choices that can best meet the needs and wants of the population being served.

A main training activity involves cohorts of preservice teachers, faculty and field-based supervisors as they participate in a year-long course based on Southwest Educational Laboratory's *Active Learning with Technology* curriculum. Preservice teachers are placed with field-based teachers for one year in their last semester of coursework followed by a semester of student teaching. Training is conducted in district computer labs and technology-supported classrooms to provide an authentic learning environment and trainees will be allowed to use campus equipment for the training. Since the training spans two semesters, participants have the opportunity to reflect upon, practice, and master the skills they have acquired in actual classroom situations.

There are many other opportunities for the project community to participate in training. Cutting edge technologies are demonstrated from sole source vendors such as Apple, Casio, LeapFrog, and Lexia. Additionally, project participants may attend videoconferences sessions on topics of relevance to courses, attend small group training sessions, or utilize Star Online tutorials. The UTSA Teaching and Learning Center offers sessions in which faculty from across the university demonstrate technology-assisted lessons, allowing COEHD faculty to experience what it is like to be learners in college level courses in which technology is effectively used. The session presenters are recruited from non-education disciplines, including art, math, science, humanities, and business.

A third program activity is Mentoring and Support. Tech•Connect provides just-in-time learning and optional support services to UTSA faculty and field-based supervisors. We know that without supports that provide one-on-one and timely services, educators are less likely to adopt technology into their practice. These activities will include: technology mentoring by undergraduate students, just-in-time support, inter-district activities and demonstrations, specialized training upon request, and Tech•Connect Technology Kits that can be checked out for use by project partners.

The final project activity is Communication and Dissemination. To support individualized learning through anywhere, anytime access to resources, the project provides 1) videoconferencing, and 2) a Web site designed to meet the specific needs of consortium members. The Tech*Connect Web Site is being developed in stages beginning with focus groups to discuss needs and wants for online resources and tools. Eventually, online resources will include a comprehensive database that will facilitate the location of resources of interest to preservice teachers, UTSA faculty, and field-based supervisors.

The first year of the Tech•Connect implementation has inspired much support and excitement in the project community. The project activities evolve when initial plans do not work out in reality as they were intended and with reflection and determination new strategies are uncovered. For example, project consultants "adopt-a-class" and work with faculty to analyze their current practices and devise effective ways to integrate technology supported student activities. Consultants and graduate students then attend class sessions and support technology activities or model appropriate practices. In this way, preservice teachers get hands-on experiences while faculty learn how and when to use technology within the context of their own classroom. Approaching technology training from the needs and wants of target populations promises success and sustained momentum for the continued development of a technology savvy group of educators.

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PT3 on the Move

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Abstract: Currently, the main focus of PT3 funded projects across the country is the meaningful integration of technology into the teacher preparation classroom settings. One component of the PT3 grant project at the University of Houston is that pre-service teachers experience educational applications of technology through a series of three educational technology courses prior to entering the classroom. While we recognize that this step is necessary, we know we must look further to enrich our students' learning experiences. Allowing the PT3 team to use technology tools to bring the school experience to our on-campus students is a continuing building process. As part of this process, the PT3 team has established a Virtual Classroom (VC) committee. The sole purpose of the committee is to come up with various ways in which video cameras can be used to enhance learning.

Introduction

Pre-service teachers at University of Houston have many opportunities to utilize technology while they are completing their coursework; however it is difficult for these students to obtain a full understanding of how technology can realistically assist them in a classroom environment. An idea that piqued our interest was to videotape actual educators demonstrating exemplary integration of technology, using the applications that are included in the undergraduate educational technology courses. These are the same applications that the pre-service teachers are expected to explore as classroom tools. This idea is being explored by the PT3 Virtual Classroomcommittee at both the local and community level.

Local Beginnings

Before approaching the learning community outside the PT3 grant, the Virtual Classroom committee decided to take advantage of the resources already available on campus. While not representative of the k-12 student populations, the preservice technology classes provide a valid educational setting for exploring the potential of videotaped technology-rich lessons. In this learning-conducive environment, the VC committee set out to videotape technological interaction in our own pre-service classrooms. Technology -enhanced lessons were prepared by the tech fellows for each content area and demonstrated to the preservice students during the videotaping. Team members collaborated in the planning, videotaping, and final editing. The purpose of taping our own team was twofold: to create technology rich demonstration videotapes, and to go prototype the entire process before moving into local schools. We plan on extending the number of these university classroom examples as well as continuing with the plan for k-12 campus lessons to show exemplary integration to future pre-service teachers.

Community Plans

The main goal of this project is to provide students with a model of how to teach specific content area with technology rather than just how to use technology (Francis-Pelton, Farragher, & Riecken 2000). The first step is to acquire the assistance of community educators who are willing to demonstrate classroom techniques for videotaping. The VC team will conduct the videotaping in the teacher's regular classroom to preserve normal interaction, as much as possible. Teacher demonstration and student response will be included in the videotaping.

When all of the shooting for the video is completed on location in the schools, the VC team will then edit the video to an appropriate presentation length and format. Once they are integrated into our method courses, the videos will allow pre-service students to observe how integration of technological applications is actually being utilized by educators. In addition, pre-service teachers will note the difference between teachers who use computers in traditional ways and those that use it as a tool to solve problems or improve students' critical thinking (Yildirim, 2000). It will give the students a sense that they can make technology work when they move into the classroom.

Videotaping exemplary use of technological integration in a classroom setting will also provide a chance for pre-service students to examine samples of student involvement and reaction. Pre-service teachers will have an opportunity to view multiple tapes and can compare and contrast the differences that they see regarding student behavior. In addition, Preservice teachers also need opportunities to examine learning under different instructional conditions if they are to understand the relationships among teaching and learning (Neiderhauser, Salem, & Fields, 1999). Again, the videotapes will provide an opportunity for pre-service teachers to observe circumstances where students are engaged and learning is enhanced due to technology integration.

Conclusion

Through observations, students may be able to acquire some excellent strategies for use within their own classrooms when it is time for them to make the transition. The opportunity to view a variety of classroom integration techniques will provide a foundation for the effective use of technology in the classroom.

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PT3 - Project MIMIC Dissemination - Collaboration of the Americas

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Abstract: This session describes the dissemination of PT3 Grant – Project Mimic on the Baldwin-Wallace College campus. The Collaboration of the Americas expands the MIMIC model through the use of desktop videoconferencing as well as into Internet 2 for distance mentoring....whether that is from within US (university to university) and/or in collaboration with foreign colleges and universities, (Argentina and Chile). This session will discuss the progressed made in the use of desktop videoconferencing, streaming of musical concerts, tutoring and the use of Internte2 for videoconferencing.

Introduction

The Collaboration of the Americas grew out of the original PT3 Project MIMIC grant. Project MIMIC's addresses the problem that only a small number of higher education faculty in this country actually model good practice integration of technology for pre-service teacher education. Few education students encounter experiences and role models that will prepare them to create and support technology-rich classrooms. To address this, the MIMIC Project provides technology mentoring for higher education faculty so faculty can, in-turn, and appropriately model current educational technology.

The Collaboration of the Americas expands the MIMIC model through the use of desktop videoconferencing as well as into Internet 2 for distance mentoring....whether that is from within US (university to university) and/or in collaboration with foreign colleges and universities, (Argentina and Chile).

Collaboration of the America's Project

The project has expanded into three sub-projects:

- One education faculty member is a MIMIC participant working in the area of early childhood teacher preparation. She will have a mentor who is a current 3rd grade teacher in a local school district. Her mentor is also finishing her Master's Degree in Educational Technology this spring. In addition to these two folks working together, a third tutor is being arranged at a distant University and the plan is to connect these people via Internet2 with distance videoconferencing. This professor works in the area of educational technology but is also interested in early childhood computer literacy. Most of this project will be involved with the software iVisit and NetMeeting.
- Two professors from the Instituto Superior de Formacion in Patagonia, Argentina, have formed a collaboration with Baldwin-Wallace College for Spanish audio files in exchange for technology skills for their teachers in training. Where videoconferencing will take place with this project the use of the software iVisit and NetMeeting will the software of choice. The goals of this project are:
    - to actively collaborate with other teachers in a distant environment via email, discussion board, virtual classroom and hopefully live teleconference (iVISIT and NetMeeting) on various teacher classroom methods. In the past the professors have used chatrooms with their students located throughout the country. We are planning the extension of these chatrooms to both audio and video (conferencing and streaming) file exchange.
    - to receive, from Argentina, Spanish audio files (male, female, teenager, different dialects) to assist our Spanish Department on the Baldwin-Wallace College campus in helping future Spanish K-12 teachers. (This is a problem we are experiencing on our campus with the PRAXIS II language test).
    - to actively assist the Argentina teachers in the English as a Second language classes in developing comfort in the use of educational technology in their classroom environment. This will include the use of all parts of Blackboard as well as some CALL (Computer Assisted Language Learning).
    - to achieve cross-cultural pollination of teaching methods and ideas as well as other cultural variations between our two countries.

- A BW music education faculty member has been fortunate to be involved in three Artist Residencies sponsored through the Ohio Arts Council and the Chilean North American Cultural Institute in Chile, South America. Her target projects have been focused in the Chilean cities of Copiapo and La Serena.
  - Her work in Copiapo has been at the Liceo Experimental de Musica de Copiapo which is a grade three through twelve school of the arts in the middle of the Atacama Desert. The Chilean government has declared this Liceo as the model arts school for the country in the development of curriculum, scheduling and programming. Her residencies there have been multifaceted. In addition to guest conducting the bands, orchestras and choirs, she have been charged with assessing and evaluating all perspectives of the school from teacher and student performance in the classroom to scheduling, materials, teacher education, inventory and the coordination of the writing of the National Chilean Music Education Curriculum. It is her hope that the development of her technology skills will enable her to develop a web site that will support sharing web stream broadcasts of quality teaching and performance examples and professional development information. Through the use of video conferencing, she hopes to be able to maintain an ongoing dialogue throughout the year so that she is able to support her Chilean colleagues on a daily basis as they work to further music education in their country.
  - Her second project is in La Serena, Chile, at the Universidad de La Serena and Escuela Experimental de Musica "Jorge Pena Hen." This past August, she spent a week at the University de La Serena leading the "Encuentro de Directores de Bandes de Concierto Escuelas Artistics del Norte Chileno." This was a weeklong convention for all of the band directors in the north of Chile. She presented clinics on numerous subjects such as conducting, rehearsal techniques, repertoire, and singing in the instrumental classroom. This was the first time that an event of this type had been presented in Chile and the first time that these thirty music educators had ever met! It was an extraordinarily successful event that ended with a commitment on the part of the teachers to attend every year. The opportunity presented itself to start the very first Chilean Music Education Association. She is committed to working with these dedicated music educators to help them continue their professional growth through the year. She hopes to experiment with distance learning through the use of Internet2, video conferencing and web stream broadcasting to share what she can with her new colleagues.
  - Time during the visitation to the BW campus in January by the Universidad de La Serena and Escuela Experimental de Musica participants will be used to train them in desktop video teleconferencing software as well as in Real Producer and file transfer for streaming their future concerts. On Feb. 22nd BW will stream a live concert especially for these two intuitions. This is in preparation for their institution doing a stream back to BW. This maintains the dialogue of the instructors involved in the collaboration from the conferencing and the performance level.
  - Final exchange of dialogue and conferencing will take place this academic year over Internet 2. On October 2, 2001 the authors and this music educator participated in the Internet 2 Megaconference where we explained how Baldwin-Wallace would be using this technology to further enhance this cultural exchange experience. Questions we fielded from colleges and universities around the world on the approach to our campus wide approach to experimental foreign study.

We at Baldwin-Wallace College, Division of Education have attempted to disseminate the goals and object of Project MIMIC beyond the scope of the original grant. Our purpose is to further experiment with the new frontiers of Internet 2 and the use of desktop videoconferencing to enhance the tutorial process.

Supplemental Suggested Resources

IVisit

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Direction, Magnitude, and Constructive Chaos: Identifying the Vectors of Technological Change in a College of Education

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Abstract: The faculty of the NC State College of Education (CED) is in the process of transforming its organizational culture to better support educators as they deal with a changing technological landscape. We are developing and refining a model for change that will help twenty-first century teachers understand both the use and the potential of instructional technologies. Our panel (comprised of the CED Dean, the IT Director, and four CED faculty members) will describe the creation of a fertile landscape for change within our college that has resulted, in part, from our PT3 Grant, *MentorNet*. We believe there is a direct

relationship between identifying the force vectors of our model and building order out of what, at times, appears to be organizational chaos.

Introduction

Twenty-first century teachers face challenges that stretch beyond what was expected of their counterparts only a few decades ago. It is now necessary for teachers to develop a critical understanding of the use and potential of instructional technologies along with a lifelong capacity to refine that understanding in the face of ongoing technological innovations. Simultaneously, today's teachers must blend these innovations with rapidly changing class content. Finally, and perhaps most importantly, they must cultivate a similar capacity to accommodate to change in their students. With all of this in mind, the faculty of the NC State College of Education is transforming its organizational culture to better support teachers as they grapple with education's changing technological landscape. As we articulate our evolving model for change, we hope to turn a lens on ourselves to better examine what we are about so that we can provide experiential information to colleagues attempting similar transformations. We believe there is a direct relationship between identifying the force vectors of our model and building order out of what, at times, appears to be organizational chaos (Fullan, 2001). These vectors include relationships and collaborations, autonomy and individual degrees of freedom for programs and faculty in approaching our vision, participatory information interpretation and creation or the organization members, and openness to energy changes.

In an effort to describe the creation of a fertile landscape for change within the NC State College of Education (CED), we present the perspectives of the CED College Dean, the CED IT Director, and four of our CED faculty members. The creation of our new landscape is, in part, a result of our PT3 grant, *MentorNet* (Preparing Tomorrow's Teachers to Use Technology, U.S. Department of Education).

Leadership through Collaboration

The administration of a college of education must make choices about the leadership framework it will use. At NC State's CED, we have chosen a culture of collaboration that includes visioning, building organizational capacity, and sustaining strong yet flexible programs. First, we identified relationships as a force vector in our change model to be a source of strength in the midst of change. It is important to examine the structures that support these relationships. Relationships between faculty in the same departments, across departments, and within the wider university are key factors in the implementation of change. Collaboration releases excitement and energy that can be a primary source of creativity for new work. Our PT3 grant pushed us to work in teams of faculty from three of our college departments. Arts and science faculty joined with teacher preparation faculty from neighboring institutions to forge new ways of teaching in technology-enabled environments. For these partnerships and relationships to work and make sense we need information and interpretations to come from a wide group of constituents. These include recognized experts in technology and learning, research support, publications by our faculty, and invited presentations from professional associations (Berger, Casey, Belzer, & Voss, 1994; National Middle School Association, 2001).

Our second identified force vector is degrees of freedom in approaching the organization's vision. The vision for an organization focused on such relationships needs to involve everyone and be a strand (or force vector) that works throughout the college. The NC State CED vision states: "The College of Education is committed to being a leader and innovator in research, application and dissemination of effective strategies for teaching and learning through technology-enabled environments with the ultimate aim of preparing educators who foster high achievement for all students." This vision is aligned with issues facing both our state and our nation as we prepare for the opportunities inherent in an emerging knowledge-age economy. This vision must be available to everyone in our college, whether they are in Adult and Community College Education, Educational Research and Leadership and Counselor Education, Mathematics, Science and Technology Education, or Curriculum and Instruction. When we allow for individual freedom in ways of approaching the vision, the overall identity of our organization will be sustained.

Our change model includes a third force vector, information interpretation and creation. To build ownership of our vision and its implications for future practice, we must share the information creation process with the people who will implement the vision. We firmly believe that the best way to prepare our students, tomorrow's classroom teachers,

is to create a climate that includes exemplary teaching with a variety of technologies and materials they will be expected to use when they graduate (Quinn & Valentine, 2001; Weller, 1996). This is a source of energy for doing work towards having all our faculty routinely work with cutting-edge technologies in their teaching and research.

The fourth force vector is openness to energy changes. We believe we have an opportunity to focus the power of current and emerging technologies to transform the way we teach and learn. But as Margaret Wheatley reminds us, the issues that trouble organizations most are chaos, order, control, autonomy, structure, information, participation, planning, and prediction (Wheatley, 1992). A college of education is not exempt from these issues. The NC State College of Education is setting forth on a path of change and transformation that will give our faculty the opportunity to innovate in the face of educational issues and challenges. By taking this opportunity to change, grow and remain open to energy changes, we plan to be a viable and dynamic system that will welcome the challenges of the future.

Capacity Building through Adaptation and Adoption

The introduction of technology into any organization -- whether it is business or education -- is directed in part by the dynamic forces of the potential of change through technology and the inertia of established practices (Bruce, 1993; Cuban, 1986). Successful integration of any new technology involves a number of changes (Casson et al., 1997). The process usually starts with a few early adopters who are willing to work on changing larger organizational attitudes towards the technology (Rogers, 1995). Change needs to happen in a number of ways to make this conversion successful. It means changes budgetary policy to make way for purchasing of the technology and setting up the infrastructure. It means budgetary and organizational change to make way for adequate service and support staff. And it means changes in work habits so that the technology is adapted and integrated into the mainstream activities of the organization. While businesses and educational institutions share this same basic evolutionary process, primary, secondary, and higher education all have unique characteristics that shape and influence the introduction of new technologies.

Through a slow evolution during the 1980's and 1990's, the College of Education at NC State University has grown from a single small lab of Apple IIe's to five labs each having between 15-25 student computers, computer-interfaced ('smart') marker boards, an instructor's computer, and a projector. These desktop computers -- both Macintosh and PCs -- are arranged in a variety of row configurations, with the instructor's computer at the front of the room. These labs are reserved for classes and otherwise available for open lab use. This computer resource model is not only typical of undergraduate education, it is also reflects the model used by many of the elementary and secondary schools in NC and the rest of the nation: classrooms with minimal computer infrastructure and a few (or one) fixed computer labs and media center.

Growth in computer facilities at the College of Education was hampered for many years by the lack of a continuing budget for computing resources. With computers treated as a capital expense, funding was low, uneven, and unreliable. The instituting of a university-wide student fee for computing meant both the establishment of a steady revenue stream and a larger change in organizational attitude that led to the funding of infrastructure improvements and paid support staff from other budgetary sources. Public schools in NC, however, continue to lack reliable funding sources in many counties, leading to uneven support for continued upgrades of computing technology and paid staff to maintain it.

Even with a generous level of funding for computer technology in the College of Education, integration into the core activities of the College continues to be an ongoing challenge. While administrative and research activities readily moved to the use of desktop computers for word processing, spreadsheet, and database management, integration into instructional activities has been slower. In institutions of higher education, the traditional lack of central authority means that this conversion typically happens one on one with individual faculty. There is the added fact that for most faculty there is no compelling and obvious reason why desktop computers would be particularly useful in a traditional classroom setting. Not surprisingly, the biggest use of the computer labs is by those instructors and curricula that were already heavily lab-based and teach activities centered on the development of computing skills. These same patterns can be seen played out in public schools for many of the same reasons.

Rapid advances in mobile computing technology has meant that laptop computers no longer are substantially more expensive with less computing power. Larger, higher quality screens, large hard drives and plug and play capabilities with numerous peripherals have made laptops near equal in quality to similarly priced desktop computers. Better battery life and wireless networking technology means that mobility no longer has significant disadvantages in these areas. While the technological hurdles for mobile computing has largely been overcome, the organizational barriers mentioned earlier are still there. Effective use of mobile computing means shifting from College-owned, fixed computer labs to student-owned, mobile computing. This shift means a change in budgeting that requires students to

come to school owning their own computers. Current College funding would then go into increased staff support, enhanced wireless networking, and more specialized computing peripherals. While the technical barriers for bringing computers into a traditional classroom setting have been largely removed, there is still the need to develop compelling models for how computing can be used in instructional settings other than traditional labs (e.g., Griffioen, Seales & Lummp Jr., 1999). Public schools, which has never been able to fully fund traditional computer labs and an adequately trained staff, face stiff hurdles in adopting new mobile computing technologies. Unlike institutions of higher education, they cannot mandate that students purchase laptop computers. They also have weaker networking infrastructure to build upon and less paid technical staff available for support.

Many of these issues came into play in a pilot project with sophomore and senior science education students the author participated in. These classes made use of wireless networked laptop computers owned by the College and brought into the class on a daily basis on a specially designed cart. The students were instructed on how animated graphics could be used to support science instruction. Students then created their own animations using Flash software for use in clinical teaching experiences out in secondary schools.

Because the students did not own their own laptops, the process of bringing the laptop cart down to the classroom, setting it up and having students take and set up their computers used up valuable time in the classroom. The use of laptops without a full range of removable media options also added to the difficulties of transferring files to the computers at the beginning of class. While the instructors of the class had considerable experience in teaching in traditional computer labs, there were many lessons learned about the instructional possibilities when computers are no longer rigidly fixed and dominating the classroom environment. These changes altered the ebb and flow between whole class instruction and individual work and the interactions between instructors and individual students and pairs and triads of students working together.

When it came time for students to take their projects out to their sponsoring secondary school, there were a number of factors that complicated their novice teaching experiences (Parkinson, 1998). The lack of computing infrastructure at the sponsoring schools made it mandatory students bring the College's laptops out to the schools for their lesson. While many schools had a projector the students were supposed to be able to use, access issues often made it difficult for the sponsoring teacher to borrow the projector for the presentation. Students who were already nervous about teaching their lesson now had the added burden of setting up and troubleshooting a laptop and projector in a classroom where the sponsoring teacher often had little experience with this equipment. In some classrooms, there was the added difficulty that the sponsoring teacher was either indifferent or mildly hostile to the use of computing technology in his or her classroom.

As with desktop computing, the integration of mobile computing into institutions of higher education will be a long-term evolution (Carlson, 2001). While computing is well established in many aspects of college and university life, faculty will need to be convinced on a one-on-one basis that mobile computing can be an effective tool in both the classroom and the lab. Colleges of education have the added burden of helping to facilitate the integration and coordination of this technology into both its institution and in the primary and secondary schools. Reflection and lessons learned from the integration of desktop computing into organizations will provide valuable guidance as we move through the integration of this new generation of technology.

Creating a Collective Faculty Research Agenda

Research initiatives within the CED faculty are varied, reflecting a wide range of professional contributions and interests. Currently, approximately 35% of the faculty are engaged in research involving some aspect of the impact of instructional technology on education. These CED research agendas are aligned predominantly with specific discipline areas; however, collaborative, interdisciplinary research teams are emerging. For example, a team of faculty from three discipline areas, (i.e., social studies, science, and IT) within the College are studying the use of GIS on student learning. Additionally, a team of educators from three separate schools, (i.e., Computer Science, Design, and Education) are teaming to examine the effects of animated pedagogical agents on science and literacy learning. As our research agenda evolves and as we continue to build our College infrastructure for external funding, we anticipate that our capacity to support more complex interdisciplinary research agendas will increase.

In an attempt to recognize existing research on instructional technology within our College, we have synthesized particular lines of inquiry into the following broad-based questions.

- How can instructional technologies lead to students' understandings of math and science concepts? (Specific lines of inquiry include: scientific visualization, geometric and algebraic transformations, probability software, web tutorials for environmental science, animated pedagogical agents for botany concepts, technology beliefs and practices of math educators (Berger, et al, 1994; Weller, 1996).)

- How can instructional technologies enhance reading and language arts teaching and learning? (Specific lines of inquiry include: developing phonological awareness through computer software, technology infusion in LA methods classes and teacher prep programs, literacy and web-based instruction, animated pedagogical agents for narrative learning.)
- How can instructional technologies enhance the school counseling process? (Specific lines of inquiry include: research and development on *Career Key*, a web-based career counseling tool [English and Chinese translation]; IT and elementary and middle school counseling.)
- How do new IT pedagogies enhance the learning of culturally, economically, and academically diverse students?
- How can GIS affect student learning in social studies, science and IT?
- How can instructional technologies enhance Technology Education? (Specific lines of inquiry include: Internet learning systems, spatial visualizations, and computer-aided drawing and assessment.)
- How can middle school teaching and learning be augmented through a technology-enabled curriculum integration model (National Middle School Association, 2001)?

Synthesizing the current research within our College serves a twofold purpose: 1) to recognize, articulate, and validate strands of current and projected research interests, and 2) to use this existing research platform as a catalyst for developing a more synergistic community of researchers. We believe that moving from disparate, individual lines of inquiry to a unified, college-wide research agenda has the potential to enact a sense of collective human agency. Such agency through community building can create what Sergiovanni (1994) refers to as "a community mind," which exists when people feel connected to each other and work together for common goals.

Our goal is to create research-based models that lead to instructional practices that address both the efficacy of technology-enabled environments for teaching and learning and critically examine the impact of emerging technologies on contemporary educational practice. Ultimately, such a goal has the potential to yield a more equitable and excellent education for all children.

Facilitating Technological Change in the Classroom

Two CED faculty members have been caught up in the transformations that go along with technological innovations, changing class content, and change in students. We present their stories as examplars of reflective practice by faculty members within our changing organizational climate.

Middle School Teacher Preparation

At times my efforts to integrate technology in my own teaching career, infuse it in the courses that I teach in middle grades teacher education and balance its use with what I know to be good teaching and learning practices for students, has me flying by the seat of my pants. I seem to be always in a state of development, designing and implementing lessons and projects with my colleagues and students that finish with a BANG, after having grown like Topsy during implementation.

Teacher education in a technology enabled environment is dynamic, exciting and places you in a continuous state of flux. When you are in the thick of discovery you and the students move from one "Ah ha" moment to the next. Like any good teaching, you learn as much as you teach, that is if you can stop the action research long enough to do the necessary follow-up reflection. Ask me where I am going with my curriculum development and the signpost on the MASH television show springs to mind, arrows pointing in every direction. Recently, I paused to examine what my students, colleagues and I had accomplished. I knew we weren't off course, but we needed to determine which of the many courses we were on was proving to be the most valuable for our teaching and learning. Here's what I found:

- an early case study using my undergraduate Foundations of Middle Level Education class showed that students felt better about learning and using technology if a risk free environment existed in the classroom, if there was an abundance of user friendly technology support staff to trouble-shoot and help students and if the project in which they engaged was meaningful and allowed them to work in partner teams to develop collaborative websites.

- a service learning curriculum integration project replete with GIS, PowerPoint, internet research, spread sheets, streaming video and digital photography that was undertaken with preservice teachers and a team of eighth

graders and their teachers was rich beyond belief because of the opportunities technology enabled. Students addressed important community issues, researched environmental problems, all while teachers orchestrated differentiated instruction opportunities that were a click away with the mouse. The project was showcased at a university symposium. Spit and polished eighth graders who were dressed for success "taught" an audience of doctorates and Deans how the bonds of class-bound lessons can be broken with the use of technology. Later, the project became a "how-to"model for using curriculu m integration in a technology enabled environment. It was featured in a website built by graduate education students to promote curriculum integration as a teaching and learning approach that best meets the needs of early adolescents. Amazingly, by logging on to technology we had spiraled our curriculum work across two semesters and 130 learners.

- a virtual field trip lesson that started small as an after-the-fact website about a real trip to Russia, actually prompted a return trip during which student teachers journaled back in real time from Russia to their students and colleagues. This follow-up trip activity was so popular with scores of teachers and students, that the project has now grown into a technology enhanced year-long study of Russia. The project, dubbed Russia NC-6, will culminate with a virtual field trip for thousands who will be able to participate because technology will enable them to make the trip to Russia with us. Our traveling university research team will interview and gather research about questions asked by the sixth graders. We will send back information and digital pictures to supplement the sixth graders home-based research efforts. The research team will be examining the effectiveness of teaching using curriculum integration in a technology enabled environment.

These are a few of the examples that show that some of the best teaching and learning in a technology enabled environment demands flexibility, imagination and the ability to be a risk taker. My colleagues and I have found that you might not be able to always chart a straight course, but with technology you can go anywhere.

Social Studies Teacher Preparation

Driven by a new technology portfolio requirement for initial teacher licensure, methods classes for social studies—already pressed for time—now expanded to include a computer lab component.Over the three years that the requirement has been in effect, we have responded by creating a computer lab component in Social Studies Methods. Based in an undergraduate fall course divided into two main components; the first eight weeks of Methods and the second eight weeks of full time student teaching, a Friday computer lab has become an exciting component. I do not use the term exciting lightly—students are happily attending a 3:30-5:30 computer lab session. The hours are strange, but that was originally when the lab was free, and oddly enough, it's a time that has stuck and become very workable.

We designed modules and tutorials to set students onto tasks that were directly related to their student teaching practica. As a former Social Studies teacher who often used the computer lab (even in the 80s), this was not a foreign concept, and for future Social Studies teachers, computer integration cannot be. I describe this approach as expanding the landscapes of learning; that is, expanding to other parts of the school building, of the world (virtually) and into the greater community. The landscapes of teaching Social Studies should be broad, not isolated. The Internet helps to facilitate that expansion.

While I am expanding the landscapes, however, the time constraints remain the same, so the labs I designed had to be extremely time efficient. The syllabus includes: searching for lesson plans, WebQuests, Power Point, constructing class Web sites, and building a technology teaching portfolio. After the second week of the computer lab sessions, I asked students to reflect on their learning about instructional technology integration. Some of their comments are very telling about the level at which they had ever considered integrating technology into their teaching practice. This should be prefaced by the fact that this particular undergraduate program is housed not in the College of Education, but in the College of Humanities and Social Science. Students take their 'professional' education classes in our college, but for the most part are educated as History department majors. These comments come from a group of thirteen students, ten of whom were placed in practicum settings. Most of the students were unfamiliar with the concept of a Boolean search. Our first lesson was how to find teaching resources on the web to support Social Studies topics.

"Prior to this class I was still somewhat [computer] illiterate...I have learned how to set up a webquest, which is pretty amazing to me and is baffling to my parents...I have not seen a lesson that directly brought the kids into a lab [at my practicum site]"*

" I found out about lesson plans, student activities, role plays, simulations and webquests in my two lab sessions."

"I've only had one lab session so far, but already I came out of it with a little more confidence about where on the web I can find SS lesson plans, info, databases, etc...It's nice to know with google, PBS, etc that I can pull up

opinion pieces or factual info ad nauseam. I also learned how to pull up two pages at the same time and how to cut and paste websites [URLs into a webquest]."

"I had no training in incorporating technology into a class...what have I learned? How to build a web page for a class."

"I've learned several good methods of searching for good activities & lesson plans on the net...The webquest using Filamentality really helped me get a strong idea of how to build a web page that will contain several web pages with the same major content area ... The only SSIT that I have seen in my setting is the showing of a video." [x 6 students]*

"I feel I have learned so much about technology in the few sessions we have had so far. First, I never knew lesson plans could be found on the internet...The webquest was a new animal to me as well...This is wonderful because teachers can construct such great assignments using new technology."

These comments typify those from the remainder of the group. The two respondents * asterisked presented technology portfolio products to a group of professional IT educators in a partnership (MentorNet, PT3) workshop after five weeks of computer lab sessions. All of the students presented their technology portfolios at a reception at the end of their eight weeks of student teaching and each had implemented at least one of the products into their practice during those eight weeks.

Conclusion

We have explored solutions to complex challenges related to organizational and technological changes. This exploration and examination is an ongoing process. The vectors for technological change include the relationships and collaboration between faculty, the autonomy and individual degrees of freedom for programs and faculty in approaching our vision, participatory information and interpretation of the organization members, and openness to energy changes. Our leadership framework is based on a culture of collaboration that includes visioning, building organizational capacity, and sustaining strong yet flexible programs. We are continuing to build technological capacity through adaptation and adoption. Creating a collective research agenda will help create community and enhance the participatory nature of information in our organization. All of this cultural change will require faculty members who are open to energy changes in the system and will do the reflecting and growing necessary to build from the chaos.

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Electronic Mentoring of Career-change, Adult Learners in Pre-service Teacher Training

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Abstract: This paper discusses whether electronic mentoring is a viable method of providing collegial support and guided reflection for career-change, adult learners during their pre-service teacher training internships. These interns spend the majority of their time isolated from their peers, their supervisors and their faculty as a result of program design and geography of the region.
The paper covers literature review, methodology, obstacles encountered, and project results.

Introduction

The Upper Valley Teacher Institute (UVTI) specializes in preparing mature, well-educated people from other professions to teach, and develops strong collegial support for teachers so that they will remain in the profession. UVTI reverses the percentage of time typically allotted to academic theory and classroom practice. In the pre-service training program, each intern works full-time in a classroom under the supervision of a 'best practice' professional teacher chosen from several states. This practical experience is reinforced by weekly seminars and support from UVTI supervisors, who are highly, experienced educators. At the end of the 10-month training period, graduates have demonstrated competency in all of the areas covered in conventional academic programs, and they have also acquired a full year of teaching experience. UVTI's geographical location and unique weather patterns make it very difficult for supervisors to meet with interns more than once every 10 days. Also, the internships are conducted at schools that span three states. The purpose of this study was to determine if electronic mentoring by supervisors and peers improves the practicum experience of career-change adult learners during their pre-service teacher training.

The literature review focused on three ma in areas: computer-mediated communication and email, teacher isolation and adult learning, and mentoring pre-service teachers. The conclusion was that technology now exists to facilitate communication across geographical distances. Even though adults may be intimidated initially, many are eager to learn these new methods of communication.

The methodology section covers how the supervisors were trained prior to being expected to use technology. It also covers some of the obstacles that needed to be overcome before a successful implementation could take place.

The results section focuses on positive aspects and developmental opportunities from the supervisor/mentor and the intern/mentee perspectives. This is followed by recommendations for next steps and overall conclusions regarding the appropriateness of technology use for teacher preparation.

Computer-mediated Communication and E-mail

According to Gresham (1994), the invisible college is a social network that operates informally through traditional methods of telephone conversations, postal mail, and print within an area of specialization, with contacts made through conferences and other forums. The informal network provides a forum for sharing new ideas and research through discussion and feedback. As a result of delays caused by publication processes in the formal presentation of ideas, these invisible colleges are frequently on the cutting edge of information in a given area of specialization. With the emergence of computers and the ease of networking, the invisible college moved to cyberspace through computer-mediated communication.

Computer mediated communication brings us a step closer to the interactivity of face-to-face communication with the added benefit of permanency through textual communication. Gresham (1994) noted that the textual basis for e-conferencing coupled with the speed and interactivity of electronic communication created a hybrid form of communication known as *media communication*. Email is an asynchronous form of computer conferencing in which messages are transmitted instantaneously but recipients can read and respond to the message at their convenience. Scholars participating in electronic conferences care most about the content of the discussion, and are less concerned with the technology that supports it. However; it is the computer technology that makes this type of communication possible.

Teacher Isolation and Adult Learning

Teachers have been the primary information source and the solitary supervisors of their classrooms. They usually work alone behind the closed doors of their classrooms with little interaction with other teachers to plan, teach or evaluate together. Very little time is allowed during the day for such activities. Even during pre - and in-service teacher training, the emphasis is on bringing new content and/or pedagogy to individual teachers, which tends to reinforce a main factor in resistance to change, teacher isolation (Tye, 1999). For hundreds of years, the school organization has been hierarchical by design. Those at the top of the pyramid are the privileged, with power, prestige and access to information; while those at the bottom, traditionally teachers, have low pay, little prestige, and no formal autonomy. Once they accept a position, teachers are relegated to their classroom where they are expected to conform to directives given by central offices and be content to use the tools of their trade. Common to most classrooms are the blackboard, the overhead projector, and the duplicating machine which help the teacher maintain their position as an information authority while alleviating writing to allow time for class management, arbitration and supervision (Hodas, 1993).

Cultural changes are causing changes in classroom practice. Until recently, there has been little incentive to change. Unlike most bureaucracies, school systems reward time-in-grade and academic credentials rather than performance. Teachers and administrators with a need for authority feel they must appear competent to their students, and in the case of administrators, to their subordinates (Hodas, 1993). The widespread student use of home Personal Computers (PCs) and the Internet is forcing teachers to be interested in the technology. Students who have been weaned on technology expect their teachers to be comfortable using computers, networks, and databases with the same facility as they now use textbooks, chalk and blackboards (Hodas, 1993). Other factors are also operating to bring about change.

In response to national and state initiatives regarding standards and technology integration, the roles of teachers are changing. In order to raise the perception of teacher from nonprofessional, bureaucratic worker to 'professional' status, the teacher is now expected to function as a member of a team (McGee & Boyd, 1995). New behaviors involving collaboration, problem-solving, inquiry and general sharing are required, and a different type of professional development is needed to promote these behaviors. There is much more information that needs to be grasped and shared. Working across disciplines, like combining math and science, is becoming the norm. Many of these changes require the implementation of technology as an integral part of the teacher's toolkit. However, many entry-level teachers are not comfortable using technology because they fear either their own or their students' inability to correct errors (Rein, 1995).

Adult learners have different needs and learning styles than children. Malcolm Knowles popularized the term 'androgogy' and presented the basic principles for teaching adults. His model included:

1. Setting the climate so the environment is conducive to learning;
2. Involving the learner in the following tasks: planning the course design and learning activities, diagnosing their own learning needs, formulating their own learning objectives, designing their learning plans, and evaluating their learning (Lee, 1998, p. 47).

Knowles felt that the major distinction between adult learners and children was that life experiences, not teachers, were the main resource for learning (Lee, 1998). To elaborate on this view and further define how adults learn, Mezirow (1997) described transformative learning as the process of changing one's frame of reference. In order to achieve that type of transformation, educators must establish objectives that promote critical reflection and provide opportunity for discourse. Experiences that meet those requirements and involve group deliberation and problem-solving are described as "learner-centered, participatory and interactive " (Mezirow, 1997, p.8). Computer technology, including the internet and computer-mediated communication, are conducive to these types of learning and experiences.

Research regarding technology use by older learners indicates that first and foremost, they need experiences that will help them build their self-confidence and feel good about the experience (Timmermann, 1998). Some barriers that need to be considered, but are often easily remedied, include computer anxiety, embarrassment, slower response time, dexterity and physical discomfort. Once these hurdles are overcome and the basics have been mastered, the adult learners become empowered, partially because they have conquered a domain thought to belong only to the young (Timmermann, 1998). The opportunity to bridge two wide gaps: intergenerational and geographical distance, is a great motivator for older learners to use technology. According to Timmermann (1998), using electronic forms of

communication like e-mail allows contact with family and friends as frequently as the older adult learner would like, in their own time and at their own pace, without having to travel or incur large phone bills.

Mentoring Pre-service Teachers

Mentoring has successfully been used as an organizational and professional development tool to orient people to systems or cultures, provide leadership opportunities and support individual development. The origins of mentoring lie in Greek mythology, when Odysseus left his son's education to a friend and advisor named Mentor. Since that event over three thousand years ago, the concept has grown and flourished within academia (Janas, 1996). Mentoring in the United States has been used for quality improvement in both business and education for many years. Janas (1996) and Luna & Cullen (1995) indicate the all-around benefits that can be derived from successful mentoring programs. Mentors, proteges, staff developers and the organization benefit in many ways, both directly and indirectly, from successful mentoring programs.

Key to a program's success is planning, with the overall process resembling the model described by Knowles. According to Janas (1996), the physical environment and scheduling provide the foundation for supporting mentors and reducing isolation, as well as determining formal and informal contacts, identifying common tasks to be worked on and allowing for group interaction. The hallmark of effective mentoring programs is often the emotional and social aspects of the process, with the staff developer serving as the pathfinder on a personal and professional journey of discovery. An example of a successful program is the Peer Assistance and Review (PAR) mentoring program in Columbus, Ohio (Stedman & Stroot, 1998). The program purpose is to help the interns become effective teachers, and all interns are required to participate and pass the one-year program to have their contract renewed. Interns rate the program highly, citing emotional support, teaching guidance and professional development as indicators for the program's success. Through this program, the school district has been able to retain talented, enthusiastic and dedicated teachers (Stedman & Stroot, 1998).

Students in teacher preparation courses in many institutions of higher education are now required to integrate technology into their lesson plans, but many faculty members are still not technologically literate. Smith & O'Bannon (1999) cite many successful research projects that provided both technology training and mentor support to faculty during and following their training. Sometimes the mentors were faculty members, other times they were graduate students. Common elements of successful programs used the model: multiple session, demonstration, practice, critical feedback. Mentors provided the teachers/interns with ongoing support. Surprisingly, technical competency of the mentors was less important than the regularity of weekly contact and the collaborative environment where software was explored together (Smith & O'Bannon, 1999). Teaching the faculty with a demonstration-practice model provided them competence, self-confidence and an additional tool to use with their students.

Mentor teachers must reflect the ways of thinking and acting associated with new kinds of teaching, either leading reform or developing collaborative experiences where mentors and novices can explore new approaches together (Feiman-Nemser, 1996). Mentor teachers, as facilitators of learning, must have their own teaching characterized by practicing reflection, active learning and inquiry, in order to assist students in becoming active participants in their own intellectual growth (Wigle & White, 1998). In this way, they are more prepared to mentor collaboratively versus supportively. According to Evertson & Smithey (2000), mentors need to help new teachers more systematically, through dialogue and reflection, moving beyond merely providing emotional support.

When faculty focus on learning outcomes and presenting the learner with many opportunities to practice and improve, then encourage student reflection and self-evaluation, their role changes from coach to mentor. Mullen (2000) describes her model of collaborative mentoring as different from traditional mentoring. Typically, when dealing with university faculty and school faculty, the former is grounded in theory and the latter in practice. The collaborative model provided a process to integrate educational theory and practice by providing for secondary and peer mentors and facilitating team-oriented projects. Participants in general felt their lives had been enhanced; they learned from others, found their attitudes improved, and benefited from the continued professional development the project provided. In addition, they experienced an increased ability to rethink and solve classroom problems.

Methodology

Introduction

During the 2000/2001 school year, the supervisors at UVTI participated with other Preparing Tomorrow's Teachers in Technology (PT3) grant participants in several integration sessions sponsored by the New Hampshire Department of Education and Apple Computer. A typical session consisted of an

introduction and demo of some technology piece, either software or hardware, followed by a practice period. Participants were often asked to work on a problem or situation typical of one they might encounter back in their schools. A representative from Apple would offer hands-on assistance, make recommendations and provide immediate feedback. The sessions started with simple presentations like an introduction to the PT3 Intranet site and logging on for email, then progressed to more complex assignments like creating a PowerPoint presentation and Inspiration diagrams. Following the practice period, there was a time for questions and a time to reflect on how the 'new' technology could be used back in the classroom

Implementation

In order to provide an immediate opportunity to practice using the Internet and email, UVTI decided to use a 'free' intranet option, for the short term, to create the UVTI web site. The UVTI site was modeled after the NH PT3 site and proved to be a familiar location for the supervisors. UVTI also investigated the feasibility of partnering with the Vermont Institute of Science, Math and Technology (another PT3 grant recipient), and use their site then being developed specifically for educators. Travel, health problems and weather, caused several months to pass before site visits and demos could be arranged. It was not until late spring that we had access to the National Institute for Community Involvement (NICI) site. Initially UVTI felt that since NICI provided 40 hours of technical support, and the 'free' intranet site would soon start charging a fee for use, that NICI was the way to go. However, it proved to be both difficult to get everyone's accounts established and cumbersome to move around the site. By the time everything was "up and running," there was little time for mentoring; however, the obstacles that we encountered during the process provided some important lessons Basically, implementation plans must factor-in time for unforeseen delays.

Results

Technology in general and the Internet specifically hold great promise for teaching. From anecdotal comments received about the process, the following trends were noted.

Supervisors/mentors enjoyed:

- Experiential aspect
- Potential of the medium
- Email as popular form of communication due to asynchronous nature: it was convenient, kept an electronic log of interactions, and provided samples of the interns writing skill
- Additional compensation made them feel like valued professionals

They also indicated that significant personal and professional growth and learning took place.

Developmental opportunities:

- Need more consistent and frequent use
- Need help in guided reflection format and expectations
- Need a mechanism on the site to clearly indicate when and what 'new' information is posted
- Need more support back at UVTI because several supervisors required individual sessions

Interns observations:

- This group more technically proficient than supervisors
- Several regularly checked intranet site and email
- Liked the asynchronous nature of the tool, so they could view presentations, information and mail at their own convenience
- See the potential for the technology to be used as a professional development tool

Developmental opportunities:

- Need more consistent participation by all: no dialogues took place on the threaded discussions because too few participated
- Need reasonable minimum hardware configurations defined: speed and capability make a difference

Those who were technologically literate became discouraged when so few participated in on-line interactions.

Next Steps

It appears that several changes are needed before the technology can make a significant difference. Administrative mentors need more time to practice and use the technology. Building the site use into everyday routine may give them a reason to consistently log-in and check for email, messages and 'new' information. Teachers who mentor also need to know about and practice using new technologies in their classrooms so the interns see its value beyond 'a professional development tool'. Mentors and interns need

to set goals and establish minimum participation requirements that account for part of their grade so everyone uses the technology at a required level. Mentors also need to define reflection on practice for the interns, and share their own reflections with each other in order to experience the process and capitalize on the professional growth the role of 'mentor' provides.

Conclusion

The technology, in the form of the Internet and electronic conferencing methods, now exists to allow communication across geographical distances. Even though adults may initially be intimidated, many are eager to learn this new method of communication. Training should consist of basic instruction and time to practice, with technical support provided. Collaborative mentoring is a way of bridging the distance between educational theory and practice, provided the mentors focus on dialogue and reflection as opposed to merely providing emotional support to pre-service teachers.

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Laptops, Student Teachers, and Teachers-in-Residence: A PT3 Winning Combination

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Abstract: Louisiana State University, Southern University, and the East Baton Rouge Parish Schools have developed a strong, cohesive partnership through their joint PT3 Implementation Grant, PT.NET (Pre-service Teachers Networking Environments Through Technology). Now in the third year, all grant activities have been directed toward teacher education program reform at both universities. Much has changed in regard to technology integration within both programs and several of the strongest components are highlighted and shared. Three specific initiatives are addressed as providing a "winning combination" for the grant participants: Student Teacher Laptop Loan Program, Student Teacher Technology Conferences and other training, and Teachers-in-Residence.

Introduction

Seeking to ensure that current and future educators are prepared to integrate technology into instructional methodologies, Louisiana State University's College of Education facilitates a multi-faceted program for faculty, classroom, and pre-service teachers. The comprehensive program, built upon the results of state grants and a PT3 Implementation Grant, assists in implementing a full-scale improved teacher education program benefiting PK-16 students and faculties. With the primary purpose of PT.NET being to assure that all elementary education graduates are competent and confident in integrating appropriate technologies in inclusive classrooms to improve children's achievement, the programmatic goals continue to guide the Colleges of Education in their quest for program strengthening, effect upon teaching and learning, and the nurturing of pre-service and faculty professional growth.

Objectives

Entering the third year of our PT3 Implementation Grant, PT.NET (Pre-service Teachers Networking Environments Through Technology), the College of Education has met and exceeded original expectations of the grant's four programmatic goals. A summary of the goals and indicators of goal completion provides a concise overview of the successes and subsequent strengthening of the College of Education.

Goal 1

University faculty in the arts and sciences and in professional education in both universities will model appropriate use of technology in their instruction.

The Colleges of Education and Arts & Sciences have strengthened their relationship through the auspices of several joint grant activities funded at both the state and national levels. As the participatory number of Arts & Sciences faculty members increases, the mutual respect between the colleges expands. In sharing a common goal of being "teachers of teachers", faculty members are drawn into this circle of scholars and the lines of communication widen. The ever-broadening effect of this camaraderie continues to encompass additional faculty from other disciplines across the university.

Goal 2

Post-secondary educators involved in elementary teacher education programs will engage in cross-disciplinary collaboration.

A variety of program implementations have contributed to the establishment of cross-disciplinary collaboration among the university teacher education faculty. With the defining of additional Professional Development Schools combined with the strong grant component of the Teacher-in-Residence program, the College is assuring that classroom teachers, university faculty and pre-service students are afforded opportunities for true collaboration and planning. These programs are foremost in the College of Education sustainability plan for positive systemic change.

Goal 3

Pre-service teachers will systematically integrate technology to support and enhance student learning and achievement.

In meeting this goal, the College strives to provide opportunities and support for the application of technology in culturally diverse classrooms. All student teachers have mandatory experiences in both high and low SES identified schools. With the expansion of our program focus, the College is sponsoring the first annual State Student Teacher Technology Conference and a subsequent New Teacher Workshop for those hired by the State of Louisiana. The anticipation of continued professional development and training opportunities for pre-service teachers abounds.

Goal 4

University faculty and pre-service teachers will participate in hands-on learning experiences with modern technology in elementary schools.

University faculty is provided technology-rich instruction in elementary school classrooms. Pre-service teachers are required to make use of technology-enhanced activities in classrooms with diverse learning needs are two strong aspects of this program. Primary technology integration training has taken place in the PT.NET Summer Institutes, which are designed to bring together faculty, teachers, and student teachers. Follow-up technology integration sessions are planned by the three Teachers-in-Residence during their weekly visits to their assigned schools. In-classroom mentoring has and is supporting the hands-on training experiences of both faculty and pre-service teachers.

Components

Through the auspices of several state and university technology grants within the LSU College of Education, thirty-six laptop computers have been purchased for use by the student teacher program. An application process allows student teachers to write a summary of personal technology skills, depth of preparation to use technology in the classroom, knowledge of technology integration activities, and intent of use of the laptop during the student teaching experience. The testimonials and documentation from laptop users from the last four semesters have provided affirming validation to the program and its continuance within the LSU College of Education Teacher Preparation Program.

Student teachers have been participants in a number of technology integration training opportunities. These include Laptop Orientation Workshops, Summer Institutes designed to place university faculty, classroom teachers, and student teachers within the same training experience, one-on-one assistance from the Teachers-in-Residence, and workshops for student teacher/supervising K-12 classroom teacher teams to train and plan together technology-rich lessons for their classrooms. Two hundred and fifty-two (252) classroom teachers, pre-service students, and university faculty members have received training and the opportunity for follow-up support since the inception of the Summer Institutes. Student teacher/faculty teams have presented the results of their technology integration efforts at the state LACUE Conference and the local Pre-service Teacher Conference held last year. The 2002 State Student Teacher Technology Conference will provide an additional means for faculty and students to offer professional presentations illustrating their skills and team approach to classroom planning. The design, implementation, and successes of these training opportunities will be shared with SITE International Conference participants.

The three Teachers-in-Residence, hired by PT.NET, work daily with university faculty members, classroom teachers who supervise student teachers, and with the student teachers themselves in planning and implementing standards-based technology integrated lessons. These master teachers work on a rotating and as-needed basis within their assigned schools and universities providing a successful mentoring experience for all involved.

The Teachers-in-Residence are a cohesive force within the technology thrust of the universities. They have proven to be an invaluable asset in establishing and maintaining a link between the university approach to teaching technology integration and the classroom implementation of these strategies. Realizing the importance of this phase of PT.NET, the grant partners are formulating sustainability plans for this and other "winning combination" programs.

Outcome

The Colleges of Education at Louisiana State University and Southern University are determined to continue building upon these successes, thus sustaining the key components to institutionalize changes necessary to integrate technology in teaching and learning. The foundational support of our PT3 grant and other College programs are contributing to the development and technological growth of K-12 students as the ultimate beneficiaries.

The inclusion of our PT3 Implementation Grant (one of four selected from 253 Implementation Grants nationwide) in the USDOE video, "The Challenge to Change", allowed LSU's College of Education to share successes in implementing change and program reform. Our PT.NET grant was also selected as one of eight to be included in a research case study sponsored by the USDOE highlighting successful programs forming strong partnerships and initiating teacher preparation program changes. This national attention, along with more than twenty (20) conference presentations, have provided a mcans for a spotlight, but more importantly, have provided a means for self-reflection on our goals, achievements, and future needs for the College of Education.

The College is determined to continue building upon these successes thus sustaining the key components to institutionalize the change necessary to integrate technology in teaching and learning. The foundational support of this grant and the other College programs are contributing to the development and technological growth of K-12 students as the ultimate beneficiaries. Louisiana State University seeks to continue its influence among current and future educators.

Faculty Development: Inter-Institutional Collaboration

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Abstract: The Technology Leadership Academy has established an environment which fosters the sharing of innovative strategies and best practices in helping to prepare a new generation of teachers who are comfortable and competent in using the new technological tools for learning. This session will highlight the Academy's approach to developing this environment, including the following activities related to the Fall Institute, Regional Conferences, "Faculty Mentor," Consultants Database, Professional Development Task Force, and Digital Equity Task Group.

Introduction

The Technology Leadership Academy is a project funded by the U. S. Department of Education's Preparing Tomorrow's Teachers to Use Technology Initiative. The mission of the Academy is to develop a collegial network for the infusion of technology into teacher preparation programs within the four-state area of Kansas, New Mexico, Oklahoma, and Texas. Academy partners include the higher education community, state agencies involved in teacher education, and the corporate sector. This presentation will showcase online tutorials for faculty development, how the Academy has developed an online learning community for technology infusion, and how faculty members can create this collaborate environment at their universities and in their regional areas to elevate faculty teaching and improve adult learning.

The mission of the Technology Leadership Academy, a component of the Technology Leadership Institute, is to develop a learning community among teacher preparation programs. During the past year it has grown from an abstract concept to an organization with over 395 individual and 115 institutional members. From its inception, the goal was to build a collegial and collaborative organization to provide mutual support and sharing of resources in the challenging task of infusing technology into teacher preparation. The first organizational meeting, hosted by the University of Texas in January, 2000, was attended by key officials from universities and state educational agencies from the four states. Activities included: finalizing the Academy's organizational structure; establishing priorities; dividing into task groups (each concentrating on one aspect of the Academy's mission); nominating chairs of each Task Group (to serve on the Steering Committee and oversee the Task Group's functioning); and identifying a set of directives and recommendations for the Task Groups. The Steering Committee, comprised of deans, faculty and technology directors, provides direction and oversight of the Academy's activities and meets several times a year to reviewprogress and discuss future plans. There has been a shared responsibility in development of the Academy, even though the distance across these institutions makes this task even more challenging (and yet so rewarding).

Review of Related Literature

"The notions of classrooms as communities of learners is no longer restricted to the four walls of the classroom" (Norton & Wiburg, 1998, p. 210). The implications of this finding are twofold: (1) pre-service teacher educators should move beyond the walls of the classroom to prepare their students for the teaching field and (2) pre-service teacher educators should use this opportunity to explore online professional development opportunities which are outside the boundaries of their own campuses. One of the barriers for faculty members in finding online professional development resources is the time. There are so many resources on the Internet that faculty members may feel a sense of information overload. Faculty members may become overwhelmed with trying to find quality resources in a short time span. However, online tutorials offer a number of advantages. Faculty members are able to find tools that fit their specific needs. Also, time can be viewed as a benefit. Faculty members are able to find professional development opportunities on their own time—late at night, as soon as a question/problem arises, etc. Online professional development experiences offer faculty members across numerous institutions the opportunity to stay in frequent communication with one another. This sharing of expertise can facilitate a supportive environment in which faculty members can grow together as they build upon their technological abilities.

"The ability to use and teach with technology has become a requirement for pre-service teachers" (Davison, Burr, Eberlein, Fuchs, Saucedo, & Steffen, 2000, p. 11). Therefore, it is imperative that faculty members serve as role models for their pre-service educators in how to effectively infuse technology into the curriculum. Otherwise, our emerging teachers and the next generation of students may become victims of our technologically dynamic society.

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Academy Structure

As shown in Figure 1, the organizational structure of the Academy is designed to assure that it is responsive to the needs of the member institutions. The Steering Committee provides leadership for the Academy and consists of 14 individuals who represent the member post-secondary institutions. The Academy has nine task groups, and each task group is chaired by a Steering Committee member.

The Task Groups consist of volunteer faculty or staff from the member institutions and state educational agencies. Each Task Group is responsible for determining and coordinating its specific part of the Academy's functioning. Eight Task Groups emerged from the organizational meeting of the Academy. These include: Assessment and Planning, Academy Web Community, Consultants Database, Fall Institute, Policy and Leadership, Professional Development, Regional Conferences, and Technology Integration. Recently the Academy formed a ninth committee, the Digital Equity Task Group.

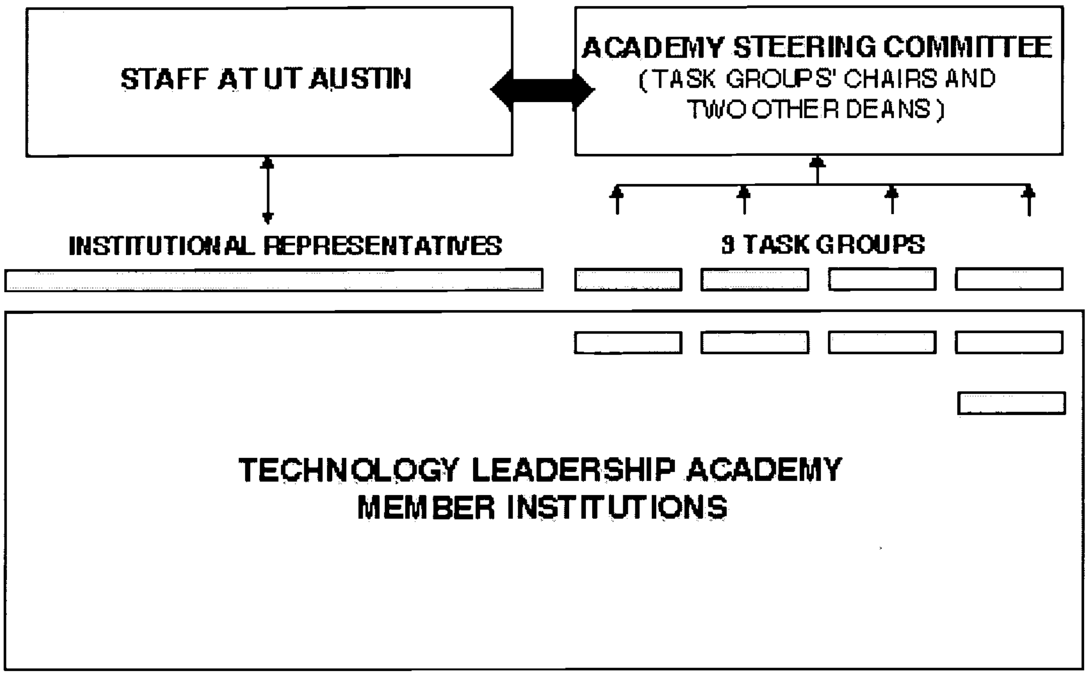

Figure 1. Academy Organization

Academy Activities

Online Tutorials

The Academy is facilitating an online tutorial process for faculty members in working with pre-service teachers to educate students of culturally and linguistically diverse backgrounds, given the changing social context. The Academy Web Community Task Group has developed a Faculty Mentor and Faculty Subject-Area Mentor. These projects are unique resources that use a question and answer format to allow faculty members access to relevant online faculty technology professional development resources, models, and research. The Faculty Subject-Area Mentor focuses on the following content areas: Math, Science, Social Studies, English-as-a-Second Language, and General Education Development.

Educational Technology Coordinating Council

Academy members are represented on the Educational Technology Coordinating Council to develop the State of Texas Master Plan for Educational Technology 2000-2003. The mission of the ETCC is to ensure the cooperation and coordination of the state's efforts to implement education technology initiatives. The State of Texas Master Plan for Educational Technology is aimed at pre-service and in-service training in technology integration for teachers and librarians. The Master Plan includes eight goals and objectives which identify the organizational infrastructure and data requirements necessary to measure successful implementation. Included in the goal descriptions are definitions, level of impact, lead agency and participating agency information, objectives, limitations, and due dates. One of the most significant sections in the Master Plan is focused on the 12 Recommendations which serve as an implementation plan for achieving statewide collaboration in educational technology.

Fall Institute

Although competition within universities can be used in a positive manner, the focus of the Academy is to instill close, working relationships among and across institutions. The Fall Institute, the Academy's annual conference, is a strategy used to accomplish this goal. Teams of 3-5 individuals from member institutions participate in a 3-day conference focused on infusing technology into teacher preparation programs. Academy members also participate in organizing Regional Conferences on member campuses to strengthen the face-to-face component of the continued attempted by the Academy to provide a structure that fosters community and resource sharing within the four-state area. Written evaluations, collected at the end of the Fall Institute, have been compiled, analyzed, and available for review on our website. The data will be used to determine the thrust of future Fall Institutes and Regional Conferences.

Consultants Database

The Academy has devised a project to recognize outstanding faculty members who are infusing technology into the curriculum. The Chair of the Consultants Database is in consultation with the Institutional Representatives of all member institutions with the aim of developing a comprehensive listing of faculty with expertise in various areas who would agree to be featured on the Academy website in a biweekly segment and to be part of a database of resources.

Participant Outcomes

This session will be an interactive experience, whereby mutual benefit will exist between participants, between the participant and the presenter, and vice versa. The following are the objectives of this session: learn more about the PT3 program; become familiar with the mission, goals and objectives, and components of the Technology Leadership Academy; participate in a discussion about accountability issues involved in building an online learning community; learn about the process that the Academy took to develop this community—discuss benefits and challenges of certain strategies taken; contribute ideas on how the Academy can reach more faculty members. Our goal is for the participants to share ideas with the presenters on how to encourage more faculty members to become involved in the Academy and be held accountable for their participation.

Conclusion

The Academy has found that although virtual environments can powerfully support the development of learning communities, extensive face-to-face interaction and opportunities to participate are also essential. It is the membership and interactions within that membership that provide the definition, the direction, and the power of the community. The Academy is a learning community with potential to have significant impact on teacher education. Although it is the individuals from the member institutions that provide the talent and resources, these resources gain strength and vision through the collaboration and support within the learning community.

Please visit the Technology Leadership Academy website at http://www.edb.utexas.edu/academy

Facilitating Systematic Change in Teacher Education: A Model for Technology Infusion

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Teachers that are capable of preparing technology proficient students for the 21st century is notably one of the most critical needs in public schools today. This need has challenged teacher preparation programs to produce teachers that are able to infuse technology and curriculum. A recent response to this challenge is *Project ImPACT (Implementing Partnerships Across the Curriculum with Technology)*, an implementation project recently funded by the U.S. Department of Education, as part of the *Preparing Tomorrow's Teachers to Use Technology* Program. This project employs a team approach to facilitate the infusion of technology in the teacher education program at the University of Tennessee and K-8 curricula. The ultimate goal of *Project ImPACT* is to provide prospective teachers with the ability to use technology to enhance teaching and learning. To assist in the accomplishment of this goal, a model was developed which establishes collaborative teams of university faculty, mentor teachers, and preservice interns. This model, designed in keeping with research findings on effective technology training and implementation, is designed to facilitate the infusion of national technology standards for teachers in university classes and national technology standards for students in K-8 schools.

A panel that is representative of participants in Project ImPACT will present an overview of the project, snapshots of the training/implementation model used, curriculum restructure activities at the university level, and prospectives regarding resulting changes from university faculty, mentor teachers and preservice interns.

Experience Counts: Comparing Inservice and Preservice Teachers Technology-Integration Decisions

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Abstract: A study of 67 preservice and 67 inservice teachers' performances on online classroom technology-integration simulations demonstrates how computer-based, decision-making scenarios with embedded assessment are utilized to identify key considerations preservice and inservice teachers use when infusing technology. Three major findings emerged from the analysis of computer-generated maps of teachers' step-by-step decisions and accompanying written essays: (1) Although inservice and preservice teachers accessed similar data, the teaching experiences of inservice teachers appeared to influence their perception of the simulations which is reflected in the differential quality of their written justifications. (2) Inservice teachers addressed significantly more key elements of educational technology integration and implementation principles in their essays. (3) In decision making, inservice teachers focused measurably more on the use of technology as a learning tool and the importance of professional development while preservice teachers emphasized neutral topics such as the ubiquitous nature of computers and access to hardware and software.

Introduction

Selecting the most effective instructional approach, including teaching with technology, is a challenging task for many teachers. A deeper understanding of how teachers prioritize issues and make decisions about their instructional programs is crucial in developing professional development in technology for classroom teachers and future teachers. This paper will present data on how experienced and novice teachers differentially make technology integration decisions. To enhance future teachers' conceptual foundations and decision-making skills on infusing technology into the curriculum, two PT^3 grant recipients have co-developed simulations of technology implementation scenarios commonly encountered in K-12 classrooms

(http://www.immex.ucla.edu). These computer-based simulations span a range of technology infrastructure, curricular content, school systems and instructional issues. An opening scenario is first presented providing a problem context. Then teachers select menu items and analyze data to reach their decisions and concurrently the IMMEX problem-solving assessment system records each menu-item selection in chronological order. Additionally, the software generates a map that illustrates teachers' step-by-step problem-solving approach, which guide assessment and metacognitive development (Underdahl, Palacio-Cayetano, & Stevens, 2001). Upon completion, teachers compose a written justification online for their decision to integrate or not integrate technology. Teachers' essays are scored based on the number of *e*ducational *t*echnology *i*ntegration and *i*mplementation *p*rinciples—eTIPs—addressed (Dexter, 2002).

Purpose and Objectives

While the eTIPs-IMMEX simulations have been primarily used as an instructional aid in preservice curricula, we conducted a comparative analysis of preservice and inservice teachers' decision-making strategies on eTIPs computer-based simulations to examine the impact of experience on technology integration and implementation. The following two questions guided this investigation.

1. What are the primary considerations of both experienced and novice teachers when deciding whether or not, or to what extent, to integrate technology into instruction?
2. How do experienced and novice teachers differentially make technology integration decisions?

Theoretical Framework

While rapid advances in technology and the proliferation of computers in school have expanded pedagogical options for educators, teachers continue to struggle with how and when to integrate and implement technology effectively into instruction. According to Pierson (2001), schools are so eager to purchase and have teachers begin using technology, that they mistake simply having and turning on a computer as integration. However, merely knowing how to use a computer is not sufficient to ensure that teachers will effectively integrate technology into the learning curriculum. Instead, a teacher who effectively integrates technology is able to draw on extensive content knowledge and pedagogical knowledge, in combination with technological knowledge, when using technology in the classroom (Pierson, 2001).

One challenge facing teacher education programs today is preparing teachers to use technology effectively in schools (Wedman & Diggs, 2001). Using problem-solving scenarios such as the IMMEX software program can provide pre-service teachers with an appropriate context in which to construct knowledge about technology integration. The IMMEX scenarios allow students adequate opportunities to learn to teach with, not just operate, educational technology (Dexter, 2002). The eTIPs IMMEX-powered cases challenge teachers to apply their knowledge of the following six principles when integrating technology.

Educational Technology Integration and Implementation Principles: eTIPs

eTIP 1: Learning outcomes drive the selection of technology.
eTIP 2: Technology use provides added value to teaching and learning.
eTIP 3: Technology assists in the assessment of the learning outcomes.
eTIP 4: Ready access to supported hardware/software resources is provided.
eTIP 5: Professional development is targeted at successful technology integration.
eTIP 6: Teachers reflect on, discuss, and provide feedback about the role of and support for educational technology.

Data Sources

Data was collected from 134 written responses from a random sample of a combination of 67 credential candidates and 67 inservice teachers were analyzed. Preservice teachers solved the eTIPs cases as part of a Technology in Education course assignment at a university in California. Similarly, inservice teachers

performed the eTIPs cases as a requirement for a 120-hour educational technology professional development program.

Methods

eTIPs IMMEX-Powered Cases

As part of a Department of Education grant, two PT^3 investigators have co-developed computer simulations of typical classroom technology implementation scenarios to enhance future teachers' conceptual foundations and decision-making skills on infusing technology into the curriculum. The eTIPs Cases IMMEX-based simulations are an expansion of the case-based problem solving in content-specific disciplines continuum developed at the UCLA School of Medicine in the mid 1980's (Stevens, Lopo, & Wang, 1996). The eTIPs IMMEX-powered cases span grade levels, curricular content, and technology readiness. Using online instructional cases can provide preservice teachers with an appropriate context in which to construct knowledge, providing multiple opportunities to practice their instructional decision making about technology integration. These simulations are meant to supplement, not supplant, teachers' classroom-based integration experiences. Using these scenarios as exercises provides a common point of experience that allows discussion about goals and approaches for technology integration. Intrinsic to IMMEX problem solving is the concurrent tracking of menu-item selections as users research data to solve problems posed in the prologue. Below is a representative sample of a prologue that introduces teachers to the technology integration dilemma.

"You are in your second year teaching English at West Bend Junior High School, a grade 7/8 school that features "looping." That is, you, and the other three members of your interdisciplinary team work with the same group of students during both of their years at the school. A special grant the school received has provided new technology resources for you and your students. You are in the process of planning units on persuasive writing and informative writing for second quarter and want to consider how this technology might best support teaching and learning in your classroom. For end of the unit assignments your students are expected to complete authentic writing projects that can demonstrate their progress toward the State's content standards. You need to make a decision this week about when and how, or even whether, to integrate educational technology resources into one or both of these two writing units. After you have used the menu items to explore the information provided in this case, state your decision about whether or not to integrate educational technology resources into your classroom in the "Solve" menu item. If your decision is to integrate, also describe how you would do so. Use information from the case to explain and justify the answer you submit. "

Scoring of Teachers' Essays

Teachers' essays were scored based on the number of educational technology integration and implementation principles—eTIPs—addressed (Dexter, 2002). We examined the quantity and quality of information written by the two groups of teachers. Each sentence in the essays was tagged for key elements of eTIPs incorporated. Depending on the depth of the answer, an essay can receive a maximum 12 points, receiving up to two points for each of the six eTIPs. We used the following criteria to determine the essay's score on each of the six eTIPs.

Zero-- when the teacher makes no reference at all to the substance of the eTIP;

One-- when the teacher makes a general reference to the substance of the eTIP, or implies consideration of the eTIP; and

Two-- when the teacher discusses a specific eTIP comprehensively and provides supporting details from the information presented in the case.

The following is a sample essay written by a teacher that was assessed using the above scoring guide.

"The technology assignment to support the authentic writing English projects should be integrated starting in the Fall *(Technology Implementation/Planning = eTIP 1)*. The teachers have time in their schedules to implement the program. They also have enough technology *(Hardware Access = eTIP 4)* shared or otherwise to support the English project. Furthermore, the students seem well prepared to focus their assignment on the computer. All students have had computer software and training since seventh grade *(Prerequisite Skills = eTIP*

2). This will ensure a first year success on the project in the classroom. Next, administration, colleagues, teachers, and the community really seem to support the technology assignment. *(Administrative Support = eTIP 4)* In-services, activities, and mentor programs are all available to new and veteran teachers *(Professional Development = eTIP 5)*. Last, the resource information supports the standards component for integrating technology into the English curriculum *(Standards = eTIP 1)*. Research findings, complex reasoning, mind tools, and software reviews are all available to lend a helping hand to new programs that these English teachers may want to integrate *(Reflective Teaching = eTIP 6)*. I say yes to the integration. I say have a meeting in the summer before school starts and get this curriculum up and running."

This essay was assigned a score of *ten*. The teacher addressed eTIPs one, two, four, five and six that are indicated in parentheses. Since the teacher included one key element for five eTIPs and provided supporting details from data presented in the simulation, the teacher was awarded the full two points for five out of six eTIPs. However, like most teachers, this teacher did not address the use of technology for assessment, eTIP three.

Results

IMMEX-generated maps of decision-making strategies by preservice and inservice educators indicated that most teachers examined the majority of the information in the problem space and most appeared to do so in a sequential manner through the menus. While there were few item-selection differences between the groups, inservice teachers addressed significantly ($p < .05$) more eTIPs in their essays than preservice teachers. Preservice teachers were also more likely to mention more neutral topics such as the ubiquitous nature of computers, impact of technology on teaching, etc., than were inservice teachers. There was an equal frequency of mention of hardware, software and standards. The listing of most frequently mentioned issues collected from the essays is shown in Table 1. These data indicate that although the two groups accessed the same data from the simulations, the experiences of the inservice teachers influenced the perception of the simulations and the decision justifications.

eTIPs Key Elements	Number of Times Mentioned by Teachers	
	Preservice	Inservice
Technology Implementation Planning/Curriculum	11	35
Computer as Learning Tool	14	28
Prerequisite Skills	14	20
Cooperative Learning	10	20
Professional Development	4	12
Technical Support	8	15
Linking Curriculum to Technology	0	6

Table 1: Preservice vs. Inservice Teachers Differential Emphases on Key Elements of eTIPs

Importance of the Study

Despite the significant investment in technology and professional development in recent years, it is still uncertain how teachers make the decision to integrate technology or not and to what extent (Zhao & Cziko, (2001). What are the primary considerations experienced and novice teachers use when deciding whether or not, or to what extent, to integrate technology into instruction? We pursued this question by examining experienced and future teachers' written reflective analyses of decision making in conjunction with IMMEX search-path maps of step-by-step decision-making approaches on computer-based simulations that span a range of

classroom scenarios. The observation that preservice teachers are inclined to focus on access to technology and marginally consider crucial dimensions of learning with technology such as technology implementation planning, prerequisite skills, and characteristics of learners suggests curricular areas in need of increased emphases in educational technology curricula. Instructors can utilize data attained from teachers' performances on eTIPs IMMEX-powered cases to design instructional interventions and refine curricular content for future educational technology courses.

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Inventing New Strategies for Integrating Technology into Education

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The purpose of the PT3 grant *Inventing New Strategies for Integrating Technology into Education (INSITE)* is to develop a scalable model of a technology-infused educational program for the next generation of middle and high school teachers of mathematics and science. *INSITE* brings together key players from the core content courses, professional sequence courses, and field experiences; facilitates collaboration among these key players; and provides the technology-related expertise they need to model exemplary educational technology in science and mathematics. The graduates of the program have internalized a vision of mathematics and science education in which technology is an integral part of the teaching and learning process. They have seen the critical role technology can have in shaping all aspects of scientific and mathematical thinking: its conduct, methods, records, evidence, collaboration and dissemination. *INSITE* represents a commitment to systemic change, initiated by a consortium from the Colleges of Education and Natural Sciences of the University of Texas and the Austin Independent School District (AISD).

Research shows that ew teachers will not be able to initiative or sustain the use of technologies in schools unless it is a critical and enduring part of their preparation (President's Committee of Advisors on Science and Technology, 1997; Office of Technology Assessment, 1995). They will not develop critical capacities to evaluate effective and ineffective uses, nor to learn efficient techniques of integration, unless their university experience integrates in all aspects of their preparation. They will not understand the pernicious effects of the Digital Divide on access to technological careers, unless the witness effective programs to be the needs of the children of the working poor. To meet these challenges, INSITE has partnered with UTeach (http://www.uteach.utexas.edu), a highly successful secondary preparation program, to create a seamless teacher preparation program to span all four years of the students' undergraduate experience. It will include the implementation of a digital portfolio assessment and institution of an annual evaluation and planning cycle by a Technology Leadership Team.

The UTeach program has been immensely successful. Currently there are 230 students in the UTeach Program, with an overall retention rate of 72.6%. In Fall 1999, 40 new students entered the UTeach Program. Of these new students, 80% continued on to the next courses in the program for Spring 2000. The first cohort of 28 students was selected for UTeach in the fall semester, 1997. By the spring of 2000, UTeach enrollment has grown to more than 200 with 40-60 new students being accepted into the program each semester. Retention rates for UTeach students have been far better than for their undergraduate peer group in the College of Natural Sciences. This success is due to aggressive recruitment of students at all levels, financial benefits, pervasive field experiences, one-on-one interactions with master and mentor teachers and a revised, enhanced sequence of education courses directed at math and science teaching. We expect UTeach to grow to 500 students by the 2002-2003 academic year.

Although the UTeach program has experienced marked success, its integration of technology was not originally as effective or ubiquitous as desired. We have been hampered in finding school-based sites that reliably use a broad array of technologies in creative and resourceful ways. Faculty in the sciences still question technologies use in developing basic concepts with students and thus use it sporadically. While technology has been integrated in the initial pedagogical courses, growth in the program has threatened the continued and enhanced use of technology as it is embedded in curricular initiatives. Because these courses and student teaching depend on field components, prospective teachers must be given the opportunity to observe and to practice integrated technology in their field experience. These sites of practice must include contrasting types of schools to ensure that technological disparities do not continue among poorer children.

To this end, INSITE has provided support for faculty in the colleges together with cooperating teachers to plan a technology-rich teacher preparation program. With the assistance of PT3, UTeach has become an exemplary model program of teacher preparation in science and mathematics. UTeach is now poised to have a major impact for the country.

INSITE has four major goals to help facilitate technology infusion within an exemplary teachers development program:

1. To intensify, extend and enrich the use of technology as a modeling, visualization, data representation, symbol manipulation and collaborative tool in introductory courses for mathematics and science majors.
2. To institutionalize and fully implement the integration of technology in the three mathematics and science education professional development courses

3. To establish an expanding cadre of mentor teachers who can provide our students access and experience in multiple sites of best practice using exemplary technology, particularly with urban and rural populations
4. To establish an intensive collaborative Technology Leadership Learning Community among all teacher-educators in the UTeach program, to plan for technology infusion, establish an integrated program, and share expertise.

Evaluation

The evaluation plan for the INSITE project is based on the Goals and Objectives of the total scope of the project. A brief description of the Evaluation Design as it relates to each of the project goals. Full results will be presented at the Conference Meeting.

Goal I: *To intensify, extend and enrich the use of technology as a modeling, visualization, data representation, symbol manipulation and collaborative tool in introductory courses for mathematics and science majors*

The course syllabi for every content and methods course in the teacher-preparation sequence will be examined as a means of documenting instructional and course activities and requirements for technology integration. Student products will also be examined to determine if students are learning to integrate technology with the teaching and learning process. Both completion of projects and types of technology featured in the projects will be monitored. Formative and summative course evaluations by students will provide additional data.

Every preservice teacher candidate will have a Student Portfolio in digital format. These portfolios will examined to ensure each contains designated technology components. A panel of experts comprised of Methods and Content Instructors and Technology Integration Specialists from both UT and AISD will use a Delphi-voting process to reach consensus on the content of a performance-based student assessment drawing from the NETS, TEKS, and SBEC requirements for preservice

Goal II: *To institutionalize and fully implement the integration of technology in the three mathematics and science education professional development courses*

The influence of course instructors on their students will be measured by how well preservice teacher candidates perform on the Student Teacher Final Evaluation process on the section related to technology integration. Also, by the end of the Professional Development Sequence, preservice teachers will be required to complete technology-enhanced lesson plans. Completion of these and their descriptions will be documented in the Student Portfolios (digital format).

Goal III: *To establish an expanding cadre of mentor teachers who can provide our students access and experience in multiple sites of best practice using exemplary technology, particularly with urban and rural populations*

Focus groups of mentor teachers will be formed to aid in the development of a top-quality teacher preparation program in integration technology. School district records will also be kept and monitored to document the number of mentor teachers prepared and the number of teacher candidates being served. Evaluation data will be collected from semi-structured interviews with mentor teachers, UT faculty, student-teaching supervisor, and the students themselves. As a means of providing follow-up information about these teacher candidates and whether they continue to use technology integration in their teaching, an electronic survey will be conducted via the on-line conferencing system. The quality of the Units of Practice and the structure of the portfolio design and assessment will provide additional data.

Goal IV: *To establish an intensive collaborative Technology Leadership Learning Community among all teacher-educators in the UTeach program, to plan for technology infusion, establish an integrated program, and share expertise.*

Outside reviewers will examine samples of student portfolios blindly and compare their evaluations. A rubric, currently under development, will be utilized to incorporate aspects of content domain, educational technology and learning theory in order to provide needed feedback to the students. The portfolios will become objects of reflection and revision by the participating UTeach students as they receive feedback from UTeach faculty and staff. The portfolio will serve both a formative as well as summative assessment component. We will make the rubric available at our proposed website in order to assist other universities in assessing their own use of multimedia portfolios.

Our intent is to present the results of project INSITE through the Fall 2001 semester. In addition to the four goals we will also present the results of extensive clinical interviews with our PT3 Fellows as they engage in their first full semester of incorporating technology into their existing practice.

Transforming Activities with Technology: Professional Development in Preservice Education

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Abstract: In professional development work with preservice teacher educators at the university, we have tried to take seriously the constructivist notion of beginning from where the faculty are, and building towards more and more sophisticated and elaborate possibilities for integrating technology. The teaching practices and activities faculty have been using represent important aspects of their knowledge and capabilities, as well as a tangible foundation on which to build. Focusing on the activities and practices with which faculty begin offers us the opportunity to develop new practices that those faculty take ownership of, while transforming the activities to include technology as a tool. In this paper, we focus on productive processes of change from our faculty's existing teaching and learning activities and practices toward activities enhanced by technology. These models of the transformation of teaching practice are meant as examples of how meaningful change can successfully be undertaken.

Educators generally agree with the constructivist notion that schoolchildren learn through the active construction of knowledge, based on their present understandings, rather than simply absorbing whole ideas transmitted to them. Too often, professional development efforts with faculty of education ignore this truism. In the Preparing Tomorrow's Teachers to Use Technology (PT3) project at the University of Missouri-St. Louis, we have tried to take seriously the notion of beginning from where the faculty are, and building towards more and more sophisticated and elaborate possibilities for integrating technology.

Researchers in the cognitive and learning sciences differ to some degree in their ideas about the mechanisms of learning, but a common recommendation to foster learning is a process of inquiry, including planning, action, and reflection (e.g., Bransford, Brown, & Cocking, 1999; Bruer, 1993; Polman, 2000). Researchers in the sociocultural tradition (e.g., Wertsch, 1998) built upon the work of Vygotsky (e.g., 1978) and Bakhtin (1981) have stressed the notion that learning occurs through action carried out in the world, with the social support of other individuals and the support of cultural tools such as language, the practices that have been handed down, and other mediating artifacts like books and computers. In our professional development work with preservice teacher educators, the teaching practices and activities they have been using represent important aspects of their knowledge and capabilities, as well as a tangible foundation on which to build. Focusing on the activities and practices with which faculty begin offers us the opportunity to develop new practices that those faculty take ownership of, while transforming the activities to include technology as a tool.

During an early meeting in the 1999-2000 school year, our first group of participating full-time and adjunct university faculty began developing a "Technology Integration Menu" with the support of PT3 staff. In the group meeting, examples of activities and practices incorporating technology were brainstormed. A set of five broad emergent categories of activities was determined from the brainstorming, and after the meeting a written checklist of activities was created for use by each faculty member in the project. The written menu has been modified and expanded over the past two and a half years, but the basic structure has remained. Table 1 summarizes the categories and gives an example from each:

"Menu" category	Example "menu" item
A. Electronic communications	Discussions on the university-provided course web space (a version of Blackboard)
B. Electronic publishing	Posting a syllabus online
C. Integrating technology	Asking students questions that require them to look at instructor-provided websites or CD-ROMs
D. Electronic assignments for students	My students will create a PowerPoint presentation
E. Faculty projects that use technology	I will research the internet for web sites for my students to use

Table 1: Summary of "Technology Integration Menu"

In subsequent individual meetings, PT3 staff used the technology integration menu as a starting point for discussions with faculty members on ways they could take what they are already doing and, by using technology, enhance it. That process has continued with new groups of 5 to 9 participating full-time and adjunct faculty joining us as a cadre each fall and winter semester. Each semester, we have several meetings with the participating faculty, including some opportunity to check in on progress and share ideas.

Table 2 summarizes a number of the possibilities for the transformation of existing practices of our university faculty to technology-enhanced practice. Some of the items, including putting syllabi online (Table 2, item 3) and converting lecture overheads to a computer-based medium (Table 2, item 1), are relatively easy for faculty to undertake, and relatively common. They result in little substantive change in opportunities for the learning of students, although they do provide a context for some faculty to familiarize themselves with a technology they have never used, and a flexibility in access to information for students in the class. A few instructors who take these steps are uncomfortable or unwilling to move beyond them to more ambitious change.

		Previous Practice	Technology-enhanced practice
A.	1	Lectures with overheads	Lectures with PowerPoint
	2	Face-to-face group discussions during class	Online discussion boards or email listserves between class meetings
B.	3	Paper syllabus handed out first day of class, and assignments later	Syllabus and assignments posted online
C.	4	Paper multiple choice tests given during class	Online multiple choice tests given outside of class
	5	Lesson plan development	Lesson plan development incorporating web resources and/or PowerPoint template to scaffold student learning
D.	6	Multiple, separate, activities in a PE class	An integrated, scenario-based WebQuest incorporating web resources
	7	In class, group, oral review	Individual review to create PowerPoint summarizing class, followed by class presentation and discussion
	8	Separate papers and written assignments on school philosophy, school setting investigation, and school curriculum	An integrated WebQuest in which students act in the role of a committee starting a new charter school

	9	Group project on developmental psych topic, resulting in a paper	Group project on developmental psych topic, resulting in an annotated web site and resource for others
	10	Local history project resulting in a paper	Local history project incorporating digital camera photos taken by students, posted on the web by instructors.

Table 2: Transformations of practice

The instructor who has replaced multiple choice tests given during class time with equivalent online tests (Table 2, item 4) has not changed that pedagogical event itself drastically, but his purpose in doing so is to free up class meeting time in an introductory course for more active learning strategies.

> My students won't be doing anything but online testing from now on. I'm trying to move lower level information to technology so I have more time in class. The tests are timed . . . honor system . . . over several chapters at once. (The program) draws from a pool of questions so every student gets a random set of different questions.
>
> (Evaluator notes, Fall PT3 Faculty mtg., 2001)

Online discussions taking place *between* class meeting times (Table 2, item 2) have taken a number of specific forms within our faculty, but have a number of attractive features in common. In contrast to in-class face-to-face discussion, the asynchronous nature of online discussion allows for greater participation by *all* members of the class. One faculty member commented that students are less inhibited and more direct and honest in their questioning online, echoing the findings from communications research (e.g., Sproull & Kiesler, 1991). Several instructors use class time after the online discussion to summarize the ideas presented, and address any issues that might need clarification. Despite the overall popularity of online discussions, several of our more reluctant faculty, particularly those with large classes, had concerns with keeping track of online discussions. Other faculty in large classes chose to limit the requirements for numbers of posts by rotating student involvement, and also devised means of students monitoring one another and reporting back to the instructor, rather than requiring in depth monitoring of all posts by faculty.

The PE instructor (Table 2, item 6) became interested in using online resources after our Director sent her a number of URLs of sites directly pertaining to her field of expertise. Some of those sites included WebQuests and units from a web site called "Filamentality." At a PT3 meeting soon after, some of our technology-using partner teachers from 4-6 classrooms talked about WebQuests and suggested that each instructor and preservice teacher should write one. These 4-6 classroom teachers were sold on the use and effectiveness of WebQuests and they passed on their enthusiasm to our faculty members at the meeting. That little push was all the instructor needed. She wrote a WebQuest that incorporated a number of activities that her students used to do out of context, into an interesting, scenario-based WebQuest.

Another instructor (Table 2, item 7) presented oral reviews and held class discussions toward the end of each semester to serve as a semester review. She decided that her students would retain more information if she had them create their own reviews in PowerPoint. The students prepare their presentation outside of the classroom, thoughtfully and actively processing information from the semester. They return to class and share their presentations with the rest of the students, teaching them what they have learned, thus making the information their own. A discussion ensues. Students also have an artifact that they have produced which could become part of their portfolio.

> It is a culminating activity which they synthesize in a powerpoint presentation (what they have learned). Even novices seem to be able to do this in about three hours of work. Students have surpassed the teacher. One student has a clip for cultural diversity. To me it is magic. Very nice and very professional.
>
> (Evaluator notes, Fall PT3 Faculty mtg., 2001

One instructor (Table 2, item 8) inherited a class that previously had students compose papers on school philosophy, investigate a school setting and study the issues surrounding a school's curriculum. This instructor decided to write a WebQuest to incorporate all those things. Now, instead of having a number of somewhat disjointed assignments, the students are approaching a problem as if they were on a committee coming together to start a new charter school. All of the above mentioned issues are addressed in the WebQuest, in an interesting, real-world approach to school site issues and philosophy. These ideas found their origin in a fall PT3 faculty meeting after an initial discussion with one of the PT3 staff.

> 1st Instructor: I could do "Designing A School" (WebQuest), in a social reconstructivist manner. (The program) could approach each of the core philosophies and how would you approach this from an existentialist perspective or . . .
> 2nd Instructor: Each group could do a different one . . . use the PBS series for informing school design or curriculum . . .
> 1st Instructor: They use Ed Week, NEA abd AFT sites, and the ASCD site . . . Is it possible to design a WebQuest that could be done simultaneously with different levels of students? It would be a neat group portfolio piece.
> (Evaluator notes, Fall, 2001)

Several instructors enhanced assignments by providing the opportunity for publishing the resources. The instructor of the developmental psychology class (Table 2, item 9) transformed a paper assignment written for grading by the instructor into a web research assignment resulting in a networked resource for the students own and others' future use. The secondary social studies methods instructor (Table 2, item 10) enhanced a local history project with digital photography as well as the opportunity to post materials online for later reference and use.

Finally, a number of instructors (Table 2, item 5) in advanced courses have students develop lesson and unit plans, and increasingly these must include web resources. These may be further enhanced by technological scaffolding built into document and presentation templates.

> Best experiences so far have been to go onto the internet and find a good lesson plan and find a unit with lesson plans. They were shocked at what they found. They found incoherent units and lesson plans. This was a good experience because they are always looking for an easy answer.
> (Evaluator notes, PT3 Faculty Mtg., Spring 2001)

In previous work presented at SITE (Polman, Mastin, Beyer, & Navarro, 2001), we described our efforts at systemic reform to support technology integration by preservice teacher educators. In this paper, we focus more specifically on productive processes of change from our faculty's existing teaching and learning activities and practices toward activities enhanced by technology. These models of the transformation of teaching practice are meant as examples of how meaningful change can successfully be undertaken.

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A Different Approach to Professional Development: Teacher Education Faculty Meaningfully Engaged in a Pre-service Technology Course

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Abstract: This study looks at a different approach to professional development of higher education faculty. Faculty members were asked to participate in a preservice technology course. Forty-nine faculty members accepted the invitation and took the course during Fall Semester 2001 or will take the course during Winter Semester 2002. Interviews and focus groups were used to find the impact participation in this technology course had on the faculty members' attitudes toward technology integration in teacher preparation courses as well as their use of technology in their own teacher preparation courses. Our preliminary study found that faculty members are accepting of and will excel in this model of professional development.

Introduction

This pilot study reports on one component of a larger PT3 grant project focused on the integration of technology into the teacher education program at a large western university. One goal of the PT3 grant is to help teacher education faculty develop skills in technology use, model the proper use of those skills to preservice teachers, and implement technology assignments in their courses. Over the past year, as the faculty worked together on committees, participated in workshops or talked informally, the topic of technology integration became a common conversation. Faculty wanted to know what their students knew, what technology skills they had, how to gain these skills themselves, how to change their curriculum and how to create meaningful assignments that used technology. Over and over again, the instructors for the IP&T 286 course were approached with questions, suggestions, and requests for help. On a whim, one instructor said, "I think everyone should take the technology course along with the students." As we thought about this idea and discussed the possible ramifications, it seemed like a great possibility. With the support of the IP&T 286 course instructors, the PT3 project directors, and with minor adjustments to the course curriculum the idea blossomed into a viable plan. As part of their professional development faculty were invited to complete the technology course required for all pre-service teachers. Participants agreed to:

- Complete course assignments and develop "products" for use in the pre-service courses they teach.
- Model the use of these "products" in pre-service courses.
- Create assignments for their students in their pre-service courses during Winter Semester 2002 that use the skills gained in the technology course.
- Participate in focus groups to share their experiences in learning and then in using technology in their courses.

Data Collection

The data collection for this pilot study has been qualitative in nature. Focus group interviews, classroom observations, and examination of course syllabi were used as tools. Comments to PT3 grant leaders from the faculty during the course have been reviewed and reported. While the larger study is focused on the process of change for the entire teacher education program, this study reports on the faculty who volunteered to complete the technology course required for all preservice teachers in the current program. The primary research questions include:

I. Is the faculty-as-student taking the technology service course model effective for professional development of higher education faculty in a teacher preparation program?

II. Does it promote change in the use of technology in participants' course syllabi and assignments?

III. Is this model more effective than traditional workshops and seminars in helping faculty integrate technology into their courses?

The following is a list of questions developed for the focus group and individual interviews.

Group A: Questions Regarding the Technology Course Curriculum

1. What are your feelings and observations regarding the curriculum in the IPT 286, preservice technology course?
2. What are some of your successes with the content/curriculum?
3. What are some of your failures/frustrations with the content/curriculum?
4. Are the skills taught/gained relevant to the McKay School of Education pre-service teacher preparation program?
5. Are the skills taught/gained relevant to your course(s)?

Group B: Questions Regarding Personal Change

1. How have your ideas/thought processes regarding the use of technology changed due to your experiences in IP&T 286?
2. Are you or have you changed your teaching and content delivery methods in any way because of your IP&T 286 experiences?
3. Has being in the same classroom as your students allowed you to better relate to them?
4. Has having the shared IP&T 286 experience started new conversations between you and your colleagues?
5. Have you worked with other colleagues while completing assignments?
6. Are you discussing curricular and/or program changes?
7. What have you learned together?

Group C: Questions Regarding Curricular Changes

1. Do you feel you can change your curriculum to use the skills/knowledge/understanding you have gained?
2. Are you going to change your curriculum to use the skills/knowledge/understanding you have gained?
3. What are you or have you changed in your curriculum and/or assignments because of your IP&T 286 experiences?
4. Do you feel you better know what you can expect from your students in their use of technology?

Group D: Questions Regarding Program Changes and the Faculty-as-Students Model

1. Do you see the potential for program changes based on your IP&T 286 experiences?
2. What kind of program changes would you propose based on your IP&T 286 experiences?
3. Do you think that the faculty-as-students taking the technology services course model is a good one?
4. If you participated in last years traditional workshop training, compare and contrast the differences.
5. Is the faculty-as-students taking the technology service course model better? Why?
6. Is the traditional workshop model better? Why?
7. Why do you feel one is better that the other?
8. Which do you feel you learned the most in? Why?

9. Which has had or do you think will have a greater impact on your teaching methods and curriculum?

Group E: Questions Regarding Miscellaneous Ideas

1. What were you hoping to learn? And have you?
2. What were you expecting the course to be like? And was it?
3. What roadblocks have you run up against? What were your greatest successes?
4. What kind of preparation do you recommend for faculty-as-students prior to taking IP&T 286?

Results

Forty-nine faculty members have agreed to complete the technology course; 28 Fall Semester, 14 with a possibility of 4 more Winter Semester for a total of 18, and 3 more have committed for later semesters. Seven percent of the faculty members who enrolled Fall Semester have dropped from the program; one left the faculty and returned to the K-12 arena full-time and the second retires in a year and felt the work was not worth his time. Sixty-one percent of the faculty members, who enrolled Fall Semester, have completed the course with 25-30 percent completing the assignment on time. Thirty-two percent of the faculty have felt a time crunch and are spreading the course over the duration of both Fall Semester 2001 and Winter Semesters 2002. From the interviews and focus groups it was found that 64 percent of the faculty felt that the course should be spread over a period of two semesters for faculty. The course work was too demanding with their existing teaching and research responsibilities. The faculty members suggested that having an optional weekly seminar would be helpful. This would allow them to meet with the course instructor or a teaching assistant to ask questions and get additional help with assignments. This would also create an atmosphere of communication and collaboration with the group. A natural peer lead support system would also be created.

Results of the Focus Group and Individual Interviews:
Twenty-two of the 28 faculty members enrolled in Fall Semester participated in an interview or focus group. One faculty member missed her focus group, the two that dropped opted not to participate, and the last three didn't have enough of an experience to warrant comment.

Group A:
From this group of questions the focus was on questions four and five that concentrate on the relevance of the technology course's curriculum to the pre-service preparation program and the faculty member's course in general. The feeling was that the course has great relevance as a whole. There was concern regarding two of the modules; those being HTML coding and HyperStudio. Many faculty members didn't feel there was any relevance for HTML coding to their courses in particular. Of the 22 interviewed 17 struggled with the HTML module to the point of wanting to give up the project. On the other hand all 22 found the Microsoft Office module extremely relevant, most particularly PowerPoint.

Group B:
From this group of questions the focus was on questions one and two that concentrate on the changes in individual faculty members' thought processes regarding the use of technology and their teaching methods. It was found that most of the faculty had already begun to rethink their uses of technology in their courses prior to this experience. However, participation in this course solidified their resolve to make changes to their own courses. It also gave them the confidence and the needed technology skills to make the desired changes. Sixteen of the 22 plan on adding or expanding the use of PowerPoint in their course, either for personal use or as assignments for their students. The entire group is considering some type of electronic communication.

Group C:
The primary focus in this group of questions was on whether or not the faculty members better understood the knowledge and skills their students brought to their courses. This was a resounding yes. All of the faculty felt they could hold their students to a higher standard and ask more of them with regards to technology use and integration. They felt they could include more technology requirements in various assignments. Many didn't feel that they would change their present curriculum significantly to better take advantage of their newfound skills nor the skills the students bring to the table.

Group D:
This group of questions received a lot of time in the interviews and focus groups and was thoroughly explored. Twenty of the 22 felt participation in the pre-service technology course was an excellent form of professional development. Over all, this was an extremely positive experience for the faculty with very few frustrations.

The faculty were asked to compare this experience with other traditional workshops/seminars they had participated in. They felt that the traditional model (workshop/seminars) heightened their awareness of available technologies and possible uses but didn't allow them the time to learn the skills needed to incorporate the use of these products into their courses. Many times following a traditional workshop/seminar they felt frustrated as they returned to their offices to try and use what they had seen. For most, they couldn't make the technology work as they had seen it demonstrated. Many of them abandoned trying to use technology because they didn't have the time nor the patience to figure it out.

The faculty found participation in the pre-service technology course a wonderful experience because they could learn at their own pace with the guided tutorials and help from computer lab assistants. The tutorials gave them something to refer back to and they had constant teaching assistant help when questions or problems arose. They have been able to generalize the skills gained to their everyday lives. One faculty member learned how to use several software packages that he had at home and had no idea previously how to use them. Learning how to use them made him extremely happy. The faculty member had bought the computer so he could work from home but was unable to use the technology; now he has the skills and confidence to succeed.

Group E:
This group of questions concentrated on the learning desires of the participants and whether or not they were met. The first and foremost goal of all the faculty members was to better understand the technology skills their students would bring to their course. They wanted to know if they could make changes to their courses and if the students could meet the expectations of those changes. They all feel they now know what to expect from their students. They can now say, ''I know what is taught in the technology course and you can do this assignment.'' Some feel that they could make many small changes to assignments because they know their students should be able to do the work. From there the learning desires greatly deviated by individual. Power Point was the most desired technology skill wanted. The PowerPoint module gave them a basic knowledge, but some felt they needed more advanced applications to better use this tool. The greatest disappointment came for those seeking web design skills. Many felt the HTML coding module was too difficult and had no relevance because there are so many web-editors available for use.

Some comments made to the PT3 project director(s) and/or IP&T 286 class instructors as email messages are:

- The class has been very interesting and beneficial for me. (I have substituted many of the lab assignments to meet my personal interests and needs - but the lab assistants have no way of signing off on these - any suggestions?) Yes, it is difficult to be a student again especially meeting deadlines. (I haven't done so well here - certainly I wouldn't get an "A"!)

- I've been grateful for the accommodations Becky (the instructor) has made for us. She's allowed us to put HyperStudio on our laptops, which will be a great blessing as we're off campus for four weeks during the time those assignments are due. The lab aides have been very polite in my experience with them.

- Thanks for helping set this up for the faculty. (I think it would be helpful if the deadlines could be adjusted for faculty—possibly extending through two semesters rather than one. I know Roger has felt overwhelmed, but would be able to succeed if the time constraints weren't a factor.)

- I'm slowly making progress -- I just need time, doesn't everyone? I heard we could have HyperStudio put on our laptop -- so we can work at home. Who do I talk to about that?

- I have learned a bunch and want to finish up Winter. I would like to learn all that the course has to offer. I will be in touch with you after the first of the year. Thanks for the opportunity.

- Enjoyed the class on Wednesday. The timeline was great. The first assignments are helpful. I look forward to the rest.

- Thank you for your wonderful class. I have loved learning from you. I feel like you have become my treasured and respected friend. I can't believe how much I have learned in such a short time.

- I have some concerns about being able to finish this in one semester. Is it possible to extend it through next semester or do I need to just suck in up and finish it this semester?

- Well, I will tell you that I've decided not to do the class. From the packet and zip that was given to me, it seems that the information is presented for Apple/Mac, but I am a PC person, so I'm not doing the assignments. I admit that I did not take the time to find out if the assignments were also written for PC platforms. The reasons I didn't do this was most of the things that were part of the syllabus I already know how to do--I am very competent with word processing, clipart, word art, tables, formatting, etc.; I can use spreadsheets and databases, I can merge; I use PowerPoint for every class I teach; I've scanned documents; my family Christmas newsletter includes multiple columns, photos, clip art, calendar, etc.; so, I'm pretty technologically with it. I was hoping to learn about video editing and html--but not with a Mac. So, again, it might sound like I am whining and complaining--and in fact I might be. But the course is not going so well for me.

After receiving the last email above, a project member sat down with the faculty member and discussed her concerns. She was about to be the first dropout. The project member, with permission from the course instructor, restructured the assignments to better meet the needs of the faculty member. She was shown how to use the existing tutorials and class materials with her PC technology, which completely changed her outlook. The faculty member will focus on HTML and video editing. She will start producing her own class web site, which will take advantage of effective teaching videos she has produced with her video editing skills.

Conclusion

We have found in this pilot study that the faculty-as-students taking the technology service course model is an effective form of professional development for higher education faculty in a teacher preparation program. The faculty has found that they have been able to better learn the technology skills presented to them and that they have found ways to better generalize those skills to their own courses and research. The traditional conference/workshop model opens their eyes to possible uses of technology, while the faculty-as-student model gives them the skills needed to produce technology enhanced products, model those products, and write meaningful assignments for their students. Twenty of the 22 participants in focus group and individual interviews recommended the continual use of this model and would recommend the model for use at other institutions of higher learning. Some modest changes have been planned for Winter Semester courses and assignments by faculty who participated in the technology course. One of the most valuable outcomes of this project has been the open communication between faculty members across several departments. As they have worked on assignments together and met with the course instructors, students, and each other many barriers have been removed and they look forward to a continuation of learning and working together. The IP&T 286 course instructors as well as the teaching and learning support center director and teaching assistants are more open to faculty suggestions and the faculty are more willing to try new technology in their own courses. More time will be needed to measure the extent of the impact this experience will have on the faculty members as they continue to revise their curriculum and assignments to include technology. The positive response to the faculty-as-students model shows the need for further research in this area and further development of this model for faculty development.

**Infusing Technology into Preservice Teacher Education:
An Evolution in Methodology**

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Abstract: A teacher educator and technology specialist explore different methods of infusing technology into a secondary teacher education program over a four-semester time frame. They hoped to determine an effective methodology for infusing technology into the regular program and to determine if preservice teachers' self-awareness of classroom computer application was raised and if strategies of how they might apply technology skills within their future classrooms were valued. They found preservice teachers had varying levels of technological competency and their level of value for the strategies introduced in their teacher education course differed according to their self-identified competency levels. Implications for practice included implementing technology components on-site at technology rich public schools and allowing preservice teachers to apply computer application skills within the classroom.

Introduction

Technology and its classroom use has been a primary focus of education reform. National technology goals have been developed and continuously revised to meet accountability standards of various federal, state, and local governing groups (NCATE (1997), ITSE (2000), Texas Education Agency (1995), and others). As states and local districts implement standards-based initiatives to bring veteran teachers into the information age, future teachers must be able to show evidence of their technological skills.

Teacher preparation programs address the call for instructional technology in various ways. Whether requiring stand-alone courses within programs or infusion of use throughout regular course work, teacher educators are obligated t o prepare students for classrooms they will soon enter. (Gillingham & Topper (1999), NCATE (1997), TEA (1995).

The Problem

Texas secondary teacher preparation programs are limited in the number of education classes required by the state governing board (Texas Higher Education Coordinating Board, 2000); therefore, many variations of "technology" coursework are accepted as meeting program requirements. In essence, secondary preparation students fulfill university technology criteria prior to entering certification programs. Students' experience of computer usage focuses on fulfilling course work requirements within their major college and rarely on applications classroom use.

The Purpose

Primarily the purpose of this study was formulation and implementat ion of an infused technology component into secondary teacher preparation courses. We also hoped to determine if preservice teachers' self-awareness of classroom computer application was raised and if strategies of how they might apply technology skills within their future classrooms were valued. The research questions guiding the study were:

1. What was the level of self-claimed educational technology competency of preservice teachers at the beginning of the semester?
2. How might the teaching team formulate lessons and activities, which might heighten preservice teachers' awareness of various technology usage as a planning/instructional tool?
3. How did the technology component within the class influence how preservice teachers might use technology in future classroom situations?
4. What was the level of self-perceived educational technology competency of the preservice teachers at the end of semester?

Contextual Setting

Over four semesters the teaching team (the teacher educator and technology specialist) conducted various activities with preservice teachers. The technology specialist designed and conducted a pre-test of self-perceived technology competencies. Throughout each semester the teaching team taught three to five technology lessons (hands-on, interactive instruction). Course requirements identified the submission of technology-informational and instructional activities for evaluation and inclusion on class web sites. The technology specialist conducted a post -test of self- perceived technology competencies. The teacher educator asked each class participant to address the value/non-value and possible future applications of the technology component in the students' final self-assessment of the class.

Methodology and Data Sources

The teaching team used a mixed methodology to analyze data collected from four semesters in which the technology component was infused into preservice teacher education classes (Miller & Crabtree, 2000). Simple descriptive statistics were used to analyze the demographic, pre and post -test data, as well as prescribed proficiencies on technology related assignments. Qualitative methodswere used to derive emerging themes of individuals' perceptions of value/non -value of the technology component within the framework of the teacher education class.

Pre- and post tests on self-perceived computer skills were taken each semester. Computer skill activities were designated as part of course curriculum and competency was assessed by the teaching team. Students were also asked to specifically address aspects of the technology component, which they deemed valuable/non -valuable in their final self-assessment of the course.

Results

Collectively, the demographic data revealed a typical population of preservice teachers: a majority were Anglo, female, middle class, and from within local geographic rural, urban areas (Lortie, 1975; Howey & Zimpher, 1989; Darling-Hammond, 1990). On the pre-test, 75% of the students identified their level of competency as computer literate, 11.2% selected "true beginners", 2.9% identified themselves "experts"; and 10.2% were unsure of their ability level. Post -test results saw a slight increase in self-perceived upper levels of competency, with a decrease in the "true beginner" category. Of the 68 students participating in t he study, 54.4% did not participate in any field experiences 13.2% had 40 or more hours, and 32.3% had less than 25 hours.

From the preliminary qualitative data analyses, several predominant themes emerged. Flexibility for individual students and classes and a difference in perceived needs between students and the teaching team emerged as a strong theme for consideration. Changes were made to address needs of

preservice teachers and to better utilize available technology resources within the university. We made adjustments in the curriculum to be more open for preservice teacher input of particular needs, eliminating some activities and adding others.
The teaching team identified themes of value/non-value which were particular to the self-perceived computer abilities of the preservice teachers. Of those who categorized themselves *as computer "experts"* the technology component had two reactions: non-value and less than valuable in terms of skills, yet valuable in terms of educational application. Of those who identified themselves as *computer literate*, the theme of awareness emerged of how technology can be used in the classroom. Frustration, gratitude and application knowledge emerged as preliminary themes from *the true beginners*.

Implications and Suggestions for Our Own Practice

One obvious implication gleaned from the preliminary data is modification of expectations and requirements for a heterogeneous classroom, where differing levels of competency require differing levels of assignments. Secondly, we must provide opportunities in the field for preservice teachers to experiment with, explore options, and apply the lessons and activities they are asked to complete. Perhaps what the teaching team has actually done is create a "stand-alone" set of lessons infused within a course. While the preservice teachers profess to "see" the need for and use of technology within the classroom, they will not entirely value it until it they can apply it.
Preliminary data will guide and direct the development of an instructional plan to present the ITPTE model (Infusing Technology into Preservice Teacher Education). In spring 2002 a cohort of undergraduates will be placed at a technology-rich middle school for blocked methods classes and 30 hours of observation, teaching and classroom interaction. The availability of adequate technology resources for instruction, plus the possible opportunity to implement technology applications within field experiences may give us a clearer direction on how better to infuse technology into teacher preparation classes.

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Results of a Study on Developing Learner-Centered Technology Assignments with Student Teachers

Joyce A. Rademacher, Jane B. Pemberton, & Tandra Tyler-Wood

Carefully designed infusion of technology into field experiences for preservice teachers can provide a formal teaching and learning approach that encourages future teachers to demonstrate and model proficiency in technology applications and usage. Thus, novice teachers will develop the ability to use available technology as a tool to enhance the learner's experience.

Ideally, appropriate technology infusion should give preservice teachers the opportunity to learn how to structure lessons, student projects, and student activities that are motivational, involve active participation, permit collaboration, emphasize content mastery, and individualize instruction. As these teachers enter the profession, they will have a unique set of skills and technology-related experiences that will empower them to be adept in their classroom environment. Additionally, these new teachers will know how to plan the equitable use of technology-related resources and build a dynamically networked learning community based on curricular needs and goals.

Using technology to enhance pedagogy is necessary in a Professional Development School (PDS) model where universities and school district personnel work in partnership to prepare technology-competent teachers. Learning how to infuse technology into lessons and assignments that will meet the needs of all members of the learning community requires explicit planning in order to be effective. Nothing can be more important for the student teaching experience than mutually shared goals between university faculty and district practitioners in regard to technology-related experiences that will benefit public school students.

As a result of a Preparing Tomorrow's Teachers in Technology grant (The Millennium Project ,1999), a district team teacher worked with university faculty in a PDS partnership to assist student teachers in the development of learner-centered assignments.
A learner-centered assignment is defined as an assignment that ensures equity in excellence for all learners (Texas State Board of Education, 1994) by including the characteristics of a high-quality assignment that is respectful of the needs of all learners while encouraging the use of their skills and talents (Rademacher, J.A., Deshler, D.D., Schumaker, J.B., & Lenz, B.K. (1998).

Team teacher planning and development activities that facilitated successful completion of assignments by the student teachers and their students were as follows: (1) The team teacher consulted faculty who taught content courses and helped them locate high-quality lesson plan sites, identify technology resources in the schools, and design the assignment completion guidelines the student teachers were expected to follow; and (2) Planning guidelines for the assignment were explained in the curriculum class and student teachers were taught how to use two planning forms entitled the Student Intern Planning Sheet and Approval Form and the Self-Evaluation of Student Choice Assignment form. These guidelines helped the student teachers design their assignments check their final product for quality.

Team teacher support activities that ensured student teachers were successful in the design and implementation of assignments with their students were as follows: (1) Student teachers were instructed to consult their mentor teachers for ideas and approval of assignments that were relevant to their particular student teaching setting; (2) District curriculum coordinators were invited to share ideas and resources with the student teachers; (3) Two days of "hands on" technology training was provided in the district technology lab to brainstorm project ideas; and (4) The team teacher provided ongoing assistance to the student teachers as needed while they developed their assignments. Student teachers were required to share their assignments during the last student teaching seminar.

Types of assignments varied according to student/mentor needs and interests. Example assignments included web pages, power-point presentations, Internet research projects, learning center assignments, brochures, and pet care guides. Student teachers and mentor teachers were very pleased with the final products and attributed their assignment completion success to the support provided to them by the

team teacher. Students in mentor teachers' classrooms were also quite pleased with what they had learned as a result of the student teachers' assignment planning and implementation process.

A survey based on technology standards as defined by The International Society for Technology in Education (ISTE) was administered to these 31 preservice teachers three times over the course of the student teaching year. One part of the survey, Stages of Adoption of Technology (Christensen, 1997), asked student teachers to circle the stage that best described where they were in their use of technology at the beginning of the year before they completed their student teaching assignments. They were also asked to complete the survey mid-way through the year, and again at the end of the yea after they had used technology in their student teaching placements. The scale was as follows: Stage 1 = Awareness; Stage 2 = Learning the Process; Stage 3 = Understanding and application of the process; Stage 4 = Familiarity ; Stage 5 = Adaptation to other contexts; and, Stage 6 = Creative application to new contexts

Results were analyzed to determine if there was a change in the student teachers' attitudes toward technology and their level of confidence in using technology to enhance teaching and learning for their students. Survey results indicated that student teachers' felt more confident at the end of the student teaching year in contrast to the beginning of the year as to their level of confidence in adopting technology. Mean scores were calculated to show how perceptions had changed from the beginning of the year to the end of the year as follows. The differences in mean scores and how they changed from the beginning to the end of the year are as follows: Stage 1 Awareness = 4.0 to 6.0; Stage 2 Learning Processes = 4.4 to 4.8; Stage 3 Understanding and application of the process = 4.3 to 5.0; Stage 5 Adaptation to other contexts = 2.9 to 4.5; and, Stage 6 Creative application to new contexts = 3.3 to 4.5.

Conclusions from this research are as follows: (1) Opportunities for enriching technology experiences are possible for everyone during a PDS experience; (2) The assignment completion planning forms were helpful in designing and evaluating the components of a learner-centered assignment; (3) District support is needed and necessary in order to facilitate rich technology assignments for student teachers; and (4) Team teacher support should be expanded to increase technology integration opportunities for both faculty and students in the field.

Note: For a detailed explanation of the methods, procedures, and planning forms employed to develop and implement learner-centered technology assignments in a field-based setting, see the following reference: Rademacher, J, Tyler-Wood, T, Doclar, J., & Pemberton, J. (2001). Developing learner-centered technology assignments with student teachers, *Journal of computing in teacher education*. *17*(3), 18-25.

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Laptops in the Classroom: Mediating Power Between Students and Their Teacher

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Abstract: This paper explores the work of a unique graduate math methods class that used its difficult start with laptop computers as an opportunity to develop teacher-student relationships that were supportive and collaborative. This teacher dropped the role of all-knowing lecturer to move among the students asking questions that drew multiple ways to express theories from students in a Sketchpad program. Instead of isolated work at computer stations, students carried their computers to each other's table to share this tool for knowledge building and the conceptual understanding of geometry. Observations in this classroom and two others found students sharing their developing skills, discoveries and experience with each other and their professors in an atmosphere that sometimes left the observers wondering who was the teacher and who was the student.

Introduction

This examination of the use of laptop computers in the college classroom began with a class that madc clear why faculty members in many universities do not model use of technology (Mousand & Bielefeldt, 1999; Wetzel, 1993). The teacher's discomfort with the wayward touchpad curser on the laptop, the disappearing projected screen, and a challenging software program seemed to prove through their failure the truth of Groves and Zimmel's (2000) assertion that professors want computers and a software program that are easy to use and instructional technology (IT) support that makes their job in the classroom look easy. The students' distress with the roaming curser on their laptops' touchpads was equaled by their own unfamiliarity with the new software program. To these observers it seemed to be an example of a disastrous first lesson.

However, this instructor and her students turned their initial turmoil with the laptop computer and a new software program into an equalizing learning experience. They demonstrated the truth of Smaldino and Muffoletto's (1999) claim that students first gain understanding of applications through an in-depth examination of the way the program works in the classroom. This paper explores the work of a unique class that used its difficult start not as an obstacle but as an opportunity to develop teacher-student relationships that were supportive and collaborative. As the students' role in the decision-making process grew in the classroom, the roles of teacher and student became equalized (Holland, 1994).

Laptops as Power Mediators

Learning in schools is marked by a basic, concrete division between powerful teachers and the powerless students (Giroux & Penna, 1981). As students gained opportunities to problem solve and initiate activities, the powerful teacher as lecturer role shifted to one of teacher as mediator in the graduate methods class on geometry. After two class periods, the laptop computer forced the professor to move among the students asking questions that turned student's initial line segments into radii of circles, sides of parallelograms and angles, and angle bisectors. Students were constructing, labeling, and measuring geometric forms with the aid of Sketchpad and discussing how these forms combined isolated theorems into theory. This graduate class of classroom teachers and teaching consultants were using the laptop and a software program, Sketchpad, as another manipulative tool in their conceptual approach to teaching geometry and linking geometric concepts to algebra.

The professor and her students continued to evaluate ways of exploring geometric concepts with Sketchpad and other reinforcing manipulatives during each class period of the semester. Students were free to complete class tests with the assistance of Sketchpad and the laptops or with other classroom manipulatives. The final six hours of class found students in the class offering collaborative lessons with the laptops and the Sketchpad software. Interviews with teachers and teaching consultants in this class made clear that they were aware of the way they have begun to work as equals in the room co-constructing knowledge. Discoveries came fast as geometric forms could easily be removed and restructured with the Sketchpad software. Instead of being isolated at computer stations students carried their computers to each other's table to show their work and share this tool for knowledge building and the conceptual teaching of geometry.

As members of the Preparing Tomorrow's Teachers for Technology (PT3) team, we followed the work of this class and two other classes this semester to chronicle the relationship of the teacher, students, and laptop computers and to lend assistance when needed. The students shared their developing skills, discoveries and experience with each other and their professors in an atmosphere that sometimes left the observers wondering who was the teacher and who was the student.

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Listservs Facilitate a Cross-Sectional Study of an Instructional Technology Class for Preservice Teachers

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Abstract: The University of Houston's Preparing Tomorrow's Teachers for Technology (PT3) team has found an unexpected tool for the evaluation of the effectiveness of its restructured instructional technology class. The individual listservs offered with the three new three-semester, one-hour labs that replaced the original three-hour single course provided a cross-sectional study of student progress through the labs. This satellite view of the three semester lab restructuring suggested that despite a disorienting first semester, preservice teachers progressed toward the incorporation of technology in the classroom culminating with authentic lesson integration for their students.

Introduction

As a major part of its Preparing Tomorrow's Teachers for Technology (PT3) grant, the University of Houston PT3 team has restructured the instructional technology class for its pre-service teachers. The original three-hour class was reorganized into three one-hour labs taken over three semesters beginning in the pre-service teacher's junior year. The goal has been to employ a constructivist approach to facilitating the integration of technology into the methods of instruction these students are learning in their education courses, a goal encouraged by Leggett and Persichette (1998). The long-term goal is to encourage the use of appropriate technology in the future K-12 population taught by these graduates. This year a cross-sectional study of the effectiveness of the three labs was facilitated by the postings of students in their individual listservs or hypergroups.

The listservs supplement the labs by expanding social and knowledge networks (Harasim, 1993) with the other sections taking their course and with the team of Technology Fellows that facilitate the lab. The listservs are examples of Baym's (2000) "communities of practice" with both a virtual and real time class life for these students.

A Chronicle of Student Progress

For the PT3 team, the listservs also provide a satellite view of the progress of the students through this series of three labs. The beginning students in the first semester lab were still adjusting to constructivist nature of the class as the following two students explain in their early postings.

Student 1: *It has been very difficult for me, considering I have never had a computer class since high school. I am not sure of what the exact expectations are, and what the process is of turning them in. Is there tutoring, or someone who could write out the steps for me to follow? Thank you!*

Student 2: *I'm very confused about this class as a whole. It seems like most of the learning I have to do on my own.*

As these students are asked to hone their technology skills as part of their co-construction of knowledge for integrating technology into teaching methods in the classroom, they are often overwhelmed because they find themselves to be the architects of their own learning.

Students began to think for themselves in the second semester. Note a student's early response to the new vocabulary that describes the students' work accountability system as it shifts from the standards set by the International Society for Technology in Education (ISTE) standards to skill proofs and knowledge proofs.

Student 3: *I think I am finally grasping the concept of having knowledge proofs and skill proofs instead of ISTE's. Knowledge proofs are an explanation--in a preservice teacher type manner--of the knowledge gained, and skill proofs are a very short explanation of what I did with that particular skill.*

Even though these students in the second semester of lab work were beginning to think like pre-service teachers, they were still missing the application in the classroom as practicing teachers that the students in the final semester were experiencing. Notice the contrast in the responses of students 4 and 5 to Internet sources for teachers.

Student 4: *A useful website for the classroom that have reviews of software for the classroom is http://www.superkids.com. This website has education articles and educational tools that every teacher can use in his or her classroom.*

Student 5: *My 5th graders are studying the founding of Jamestown in Social Studies. EDSITEment has a link that contains maps, labor contracts, court records, public records, newspaper clippings, ... all about the founding of the Jamestown Colony. ... My kids can use this site to help "build a new settlement." I've bookmarked this site for future use when I have my own class.*

Although Student 5 was not yet teaching on her own, she was in the classroom every day and had found a way to integrate technology into a lesson now and in her future role as a teacher on her own. Student 4 in the second semester of her technology lab was still referring to her teaching experience in the third person.

The students in the third semester were also learning about the discrepancy between having computers in the elementary school classroom and using or being trained to use the computer in the university classroom as students 6 and 7 explain in their postings.

Student 6: *The computers in my class are all brand new Dell computers. They have windows 2000, Accelerated Reader, School House Rock, Grammar Crunch, Internet. They have all kinds of games and software discs that the children can use.*

Student 7: *I have not seen a tremendous amount of technology in any of my methods classes. My math methods prof has used technology in our classroom in meaningful ways, from videos, to a power's of 10 exercise that was great. My other methods classes have had discussions about the use and importance of technology integration, but have not had actual technology present. I look forward to visits from the tech fellows in our methods classes in order to enrich our learning and the learning of our future students.*

The students in the final semester were surprised and pleased to see computers in their classrooms. They were also surprised that their methods teachers were not actively using technology in their teaching. However, the students did find ways to integrate technology into their practice teaching and appreciated the technology lessons the tech fellows would bring to their methods class.

This satellite view of the three semester lab restructuring suggests that despite the early disorientation for the first semester students, the payoff for the technology lab students develops as they reach the classroom and finally get to practice what they have been learning. Student 8 offered a similar conclusion in her last posting on the listserv.

Student 8: *I learned a great deal the last three semesters about integrating technology into the classroom. ... Children need to be stimulated and challenged in the schools and I value the importance of technology in helping me to do that.*

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EDENStandards: Standards for Digital and Education Equity

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Along with Standards for challenging content and discipline-specific teaching methods, we need Standards for equity, inclusion and diversity-responsiveness in K-12 teaching and learning and teacher preparation. If we neglect the imperative to address historic inequities with regard to underserved learners even as we work to integrate emerging technologies into teaching, learning and teacher preparation we can expect to exacerbate Digital, Education and Opportunity Divides. Panelists for this presentation are colleagues from the Center for Language Minority Education and Research (CLMER) at California State University, Long Beach. The Equity through Distributed Education Network (EDEN) a PT3 Catalyst grant for which CLMER serves as lead agency has worked with diverse educators to develop EDENStandards for meaningful, diversity-responsive approaches to technology-enhanced teaching and learning. We will share our EDENStandards, discuss their implications and share a number of teaching and learning, teacher preparation, professional development, community-building and policy approaches that flow from attention to these EDENStandards.

Panel Participants and Presentations

Panelists will focus on key diversity and equity issues addressed in the framework of the EDENStandards. This discussion will include proposing an equity vision for 21^{st} century learners, addressing key elements of education reform from an equity perspective and sharing the use of CLMER "equity lenses" of: Language, Critical Pedagogy, Anti-Racist Education, Community Learning Theory, Standards and Technology Fluency. Panelists will describe how these lenses are operationalized in approaches to professional development, teacher preparation, policy work and work with schools, districts and communities.

Kevin Rocap, Director of the PT3 EDEN Project, will describe the process of developing the EDENStandards and the key practices of the Center that reflect these standards, sharing strategies, resources and lessons learned. These will include sharing information and strategies regarding an innovative professional development approach for developing communities of practice among teachers, administrators, parents, pre-service teachers, teacher education faculty and others to develop equitable, diversity-responsive K-12 learning projects and supportive cross-role community approaches to equitable education reform.

J. David Ramirez, Executive Director of CLMER, will discuss "making the invisible visible," diversity-responsive approaches to assessment and accountability designed to address both Education and Digital Divides. Dr. Ramirez will address specific issues of educational equity with regard to English Language Learners, girls, religious minorities, children of color, low-income children and children with special needs. A framework for assessment and evaluation that draws on critical multicultural and anti-racist theories and practices will be shared, along with examples of the application of the framework to projects and K-12 practices.

KimOanh Nguyen-Lam, Director of an Alternative Bilingual Teacher Preparation project and a policy forum leader, will describe the development and work, over the last several years, of a national network of Southeast Asian and Pacific Islander educators and community leaders (the APA Forum). Dr. Nguyen-Lam will discuss the myth of the model minority and share the priority issues and action agenda of the APA Forum and related organizations committed to addressing the needs of underserved Southeast Asian communities. Further, she will share her work creating distributed learning courses that address the CLMER vision of a multilingual, multicultural 21^{st} century learner. Courses will be discussed for their capacity to support K-12 Two-Way Bilingual Immersion programs and the integration of technology-enhanced, performance-based assessments in the development of high-quality, diversity-responsive teaching and learning practices.

Yolanda Ronquillo will describe the work of CLMER in facilitating the development of Community Learning and Technology Centers that link K-12 learning and community-based learning, and

that level the playing field for diverse, underserved learners. Further, Ms. Ronquillo will share uses of image, metaphor and storytelling in adult learning and as a support to cross-cultural community building and action planning in K-12 education reform. The promotion of digital equity will be discussed as a significant outcome of work across several school communities in the Hawaiian Islands.

All panelists will invite participants to consider ways to apply EDENStandards and related equity frameworks within their own situated practices and communities.

Global Learning Networks in K-12 and Teacher Pre-Service

Kevin Rocap, CLMER/CSULB, US
Kristin Brown, CLMER/CSULB, US
Carla B. de Herrera, CLMER/CSULB, US

Global Learning Network projects provide excellent opportunities for domestic and international K-12 collaborations that are multilingual, multicultural and academically challenging. Further, they can promote cross-cultural understanding, a commitment to social justice and provide challenging content and pedagogy for traditionally underserved learners. This workshop describes K-12 Global Learning Network projects and new learning projects that link pre-service teachers, teacher educators and K-12 classrooms. The Center for Language Minority Education and Research (CLMER) has facilitated and co-sponsored K-12 Global Learning Network projects since 1996 in collaboration with I*EARN and "De Orilla a Orilla." As part of the Equity through Distributed Education Network (EDEN) PT3 Catalyst grant CLMER has enhanced and extended these projects significantly to include teacher education faculty and pre-service teachers. These projects are performance-based additions to teacher preparation coursework and field experiences, with great potential for providing a meaningful, multilingual and multicultural enhancement to teacher preparation.

Workshop Purpose

This workshop engages participants in understanding the power of Global Learning Network projects not only as K-12 learning projects, but as powerful tools for in-service and pre-service teacher professional development. This workshop will address the following objectives:

(1) Provide a model for the design and implementation of academically challenging, social justice-oriented Global Learning Network projects.

(2) Engage participants in examination and discussion of successful projects.

(3) Share innovative uses of Global Learning Networks for Teacher Professional development and Teacher Education.

(4) Engage participants in action-planning around potential participation in Global Learning Network projects.

Workshop Methods

Presentation and discussion of a critical pedagogy framework used in the design of Global Learning Network projects will be facilitated, with discussion among participants and use of a graphic organizer for participants in pairs or threes to brainstorm use of the framework on content of their own choosing. Logistics permitting, three presentation stations will be set-up so that participants can rotate through three presentations of different Global Learning Network projects including two that have been used to link pre-service teacher educators with K-12 classrooms and to other pre-service educators for bilingual study of learning theories. If this format is impractical, ppresentations will be done from the front of the room with small group processing and discussion between presentations. We will facilitate dialogue on the power of Global Learning Networks, the protocols for participation, cross-cultural issues and how to deepen projects with social action outcomes for addressing issues of diversity, equity and international education. Also, we will facilitate discussion regarding the professional development and pre-service value of Global Learning Network projects for creating motivated, international communities of practice. Small group work will be facilitated for action planning and next steps regarding participation in projects.

Technology Rich Lessons from the Field

Cindy Ross, Bowling Green State University, US
Rachel Vannatta, Bowling Green State University, US
Mike Duplay, Bowling Green State University, US

This poster will present numerous examples and samples from children, teachers, university students, and university faculty demonstrating their growth and current practices of technology use in the classroom. These projects represent a variety of age levels as well as curricular areas. In addition, lesson plans from classroom teachers and university faculty will be presented as examples of the infusion of technology into the classroom. This collection of technology enhanced lessons will be demonstrated from the project website that is available to others as a way to share information. Each of these lesson plans not only demonstrates the infusion of technology into the classroom but each also includes the identification of the ISTE standard(s) facilitated in the lesson. The participants have included elementary, secondary, special education students, teachers, preservice teachers and university faculty. The university faculty represents regular education and special education methods as well as faculty from arts and sciences.

The materials that will be displayed represent a variety of software programs that have been used in the classrooms; they include Kidpix, PowerPoint, Inspiration, Kidspiration, "Work Appleworks, etc. These products also represent a variety of ability levels as well as growth by the teachers and the students. University faculty has been working to develop their skills to begin to or further infusion of technology in instruction and assignments in their classrooms.

A scavenger hunt was developed to have teachers and faculty identifies ISTE Standards within lessons and from poster board presentation to facility the understanding of these standards. This will also be shared. Student products will demonstrate how technology has been infused into a variety of themes and content areas.

Individuals representing the project directorship, university faculty, trainers, and preservice teachers will be apart of the poster/demonstration to explain the materials prepared by the project participants.

Faculty Development Training Time: 96 is Not Enough!

Tweed Ross, Kansas State University, US
Rusty Taylor, Kansas State University, US

As part of a United States Department of Education Preparing Tomorrow's Teachers to Use Technology (PT3) project faculty from College of Education, Arts and Sciences, Community Colleges and local school districts participated in yearlong intensive academies. The guiding philosophy behind these academies is that "Teachers will teach as they were taught." Unless we change the habits and practices of the professoriate and clinical instructors who work with future teachers,little progress will be made in changing the teaching methods of preservice teachers about to enter the profession. To bring about the needed change in teaching practice on the part of those charged with preparing future teachers, the College of Education set about creating intensive academies for faculty and teachers to integrate technology into the classroom. The intensive academies for faculty identified many factors necessary to successfully modify teaching habits of university faculty and clinical instructors. Some of these factors were anticipated. Others came as a revelation. All came about because of an intensive review and evaluation process developed to assist this effort.

This paper will discuss the review process that was maintained throughout the academies and used to guide in an on-going, nearly real-time manner the activities of the academy. Also, this paper will cover the many interested findings from these evaluation activities and discuss possible reasons and necessary modifications that future technology leaders will need to address in their design of technology and pedagogy development for university faculty and clinical instructors. Among these are:

Initial partnership creation
Required infrastructure
Successes and barriers
Tailor the program to a diverse audience.
Making a win-win partnership
Long-term implications for success

The Right Hand Helping the Left: Tech Savvy Students Assisting Classroom Teachers

Tweed Ross, Kansas State University, US
Sue Maes, Kansas State University, US

This presentation will cover a newly launched initiative as part of a Preparing Tomorrow's Teacher's to Use Technology (PT3) grant project. It is based on two premises. First, that some students entering the teaching profession possess advanced technology skills before they are admitted to the College of Education (e.g. good high school preparation or personal motivation). These students are not challenged by the basic technology course in the college. This project will allow these student an opportunity to advance their skills and gain practical experience. Secondly, many College of Education Methods faculty and K-12 teachers find that the development time necessary to accomplish technology enriched instructional activities is limited in their already crowded day. They may need extra help in initiating or finishing a technology-based instructional unit. A hands-on experience developing and using software applications, directed by an educational professional, is a powerful model for a teacher candidate.

Research studies from The Office of Technology Assessment (OTA) and the International Society for Technology in Education (ISTE) both confirm that the majority of education faculty do not model technology use to accomplish teaching objectives nor do they teach students entering the teaching profession to use information technologies for instruction. The public school educator is also critical in providing the real day to day capstone experiences preservice teachers need prior to entering the teaching profession. Students do not learn from technology per se, but from creative teachers who have knowledge of technology options and model technology through the use of curriculum enriched experiences and activities.

In an effort to address these needs, sixty-one (61) faculty and public school educators have participated in a Preparing Tomorrow's Teacher's to Use Technology (PT3) grant opportunity designed to integrate and model appropriate technology applications in the classroom environment over the past two years. The PT3 focus was on the guiding philosophy that "teachers teach as they have been taught" and through curricular revision, advice from well known consultants, assistance from peer and technical mentors, plus on-site hands-on technology workshops, participants developed a mediated project using appropriate technologies to enhance student learning.

Extensive evaluation and frequent reality checks revealed that participants in this project felt empowered and were enthused to use technology in their classroom(s), but lacked the necessary development time to build additional mediated learning experiences after completing the scheduled workshops. Therefore, in this third year of the PT3 project, this new initiative allows qualified preservice students an opportunity to take some accelerated coursework/training and be paired with a practicing teacher (one of the sixty-one PT3 Alumni) to help facilitate the development of instructional-based units for the classroom.

A win-win partnership!

You Can't Do it Alone: Requirements for Preservice Teacher

Tweed Ross, Kansas State University, US

Preparing Tomorrow's Teachers to use Technology (PT3) at one College of Education was a unique experience in forming collaborative teams across several educational levels. This PT3 Grant was closely interwoven with another United States Department of Education Improving Instruction grant effort aligned with a College of Education and its associated Professional Development K-12 Schools, College of Arts & Science faculty and Community Colleges. One of the real challenges in Preparing Tomorrow's Teachers to use Technology effectively in class in an effort to improve student learning is building collaborations between the College of Education (COE)--- which ultimately provides the methods and pedagogical experiences for pre-service teachers---and the many departments and colleges that are allied with the COE through undergraduate experiences. These other stakeholders provide the formative and capstone experiences for teachers about to enter the profession. A typical learning path found COE teacher candidates engaging in learning experiences with community colleges, college of arts and sciences, and school districts. Each of these institutions has fundamental differences in organizational mission and outlook toward education. All are directed toward developing young people who are involved in the teaching and learning process. Developing effective collaborations, particularly in implementing technology, is one of the key components of getting the These collaborations are not hastily built to meet immediate demands. They take years of compromise, minor collaborations and trust building before the grant is written and the technology components are added. Once technology is added to the mix of skills that future educators must master for the classrooms of tomorrow, these collaborations involve extensive communication at the administrative level, technology support level, technology training level, and supervised teacher level. Another critical highlight of this work was the integration of technology and the vertical integration of instructional improvement. This project resolutely refused to simply teach the technology applications. Instead the project required participants to do three steps: 1) identify a difficult or repetitious teaching/learning concept from their curriculum, 2) identify learning objectives, and 3) select appropriate technology enhancements that would further student learning. This presentation will review the efforts that resulted in this successful collaboration in several parts.
Initiation
Vision of the Programs
Diverse Partners and Required Commitments
Support Research
Specific Goals and Projects Steps Taken to Accomplish Goals and
Complete Projects Evaluation Components
Selected Findings, Barriers, Successes and Frustrations.

Assessing Program Alignment With Technology Standards

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Abstract: The faculty in the elementary education program at Salisbury University utilized a database to gather data regarding their integration of technology in course objectives, learning activities, and instructor modeling. An examination of their use revealed that faculty used technology with students primarily to access information and to communicate. Fewer faculty modeled the use of technology to support learning activities within the classroom. Greater access to technology in the classroom and continued faculty development are necessary if faculty are to use technology as a tool for teaching.

The Study

The study posed the following question: In what ways is technology being used in the elementary education program at Salisbury University?

Method

Background

Through Salisbury University's PT3 Capacity and Implementation PT3 grants, faculty were participating in professional development in the area of technology and were beginning to utilize technology in their courses. With the release of Maryland's Teacher Technology Standards, the faculty needed data to determine if students in the elementary education program were having learning experiences that enabled them to meet these technology standards. Further, the faculty needed to determine if students in all sections of a single course were getting the same experiences with technology. The faculty needed a way to examine current practice and developed a database to provide the necessary data.

Data Collection and Analysis

Based on the Maryland Teacher Technology Standards (MSDE, 2001), the database provided a checklist of technology indicators within three areas: technology objectives, technology rich learning activities, and instructor modeling of technology-based teaching strategies. During the Fall 2001 semester, elementary education program faculty, using course syllabi as guides, entered data into the database, indicating which of the indicators were addressed in their courses.

Findings

The data revealed that the Maryland Teacher Technology Standards were being addressed in the elementary education program. The most frequent reference to technology in course objectives, occurring in 61% of the program syllabi, was in the area of information access. The next section of the survey examined the use of technology in learning activities for each course in the program. Again, the program was strong in using technology to access information. For example, 79% of the faculty indicated that they

required students to research a topic using an electronic source of information. Sixty-one percent of the faculty required students to use email to communicate. Using email (88%) and providing students with Internet resources (82%) dominated instructor modeling of technology-based teaching strategies as well. Additionally, many faculty were using web resources to provide students with online syllabi (45%) and web based discussion areas (36%). Fifty-two of the faculty indicated that they use PowerPoint to convey information to the class.

Conclusions

An examination of the data revealed how and where technology was being used and for what purposes. On the whole, there was minimal reference to technology in program course objectives. Faculty used technology as a tool to meet content area objectives and for the most part did not indicate the use of technology as a primary outcome of their courses.

Examination of the faculty's use of technology in learning activities revealed a pattern of usage. Technology was primarily used as a tool to access and organize information and to communicate. For example, most faculty were requiring students to access information on the Internet (79%) and to use email to communicate (61%). Technology integration was addressed primarily through assignments. Forty-two percent of elementary program faculty indicated that they required students to develop a lesson, unit plan, or learning center that incorporated best practices for technology integration. The second most common integration activity (36%) was to require students to examine educational software. No other indicator for technology integration was addressed by more than 15% of program courses.

Elementary education faculty frequently modeled the use of technology for information access and communication. Many of them provided lists of Internet resources that were pertinent to their content areas and even more used email to maintain contact with their students. Almost half of the faculty had their course syllabi online. Faculty, however, were not yet modeling many of those strategies that utilize technology to facilitate learning. Thus, while faculty were using technology to support their courses and while students were using technology to support their learning, in many cases neither were experiencing those strategies for integrating technology that are more appropriate for the K-12 classroom. Currently, teachers in the K-12 setting rarely communicate with their students through web based syllabi, discussion boards, or email. However this seemed to be one of the most prevalent strategies for integration in the elementary education program at Salisbury University. Computers were not yet commonly used as tools to enable students to develop understandings within content areas. Computer programs that can help shape and construct student understandings such as databases, spreadsheets, concept maps, WebQuests, multimedia production, scientific probes, and simulations were not widely used. In the elementary education program, technology was primarily a tool to access information and communicate.

Implications for Practice

The data analysis revealed that faculty were indeed including technology within their courses. In the area of technology integration, however, faculty were primarily instructing *about* technology by assigning students to create lessons that used technology instead of teaching *with* technology. Schools of education need to continue to provide professional development to assist faculty with integration strategies. Additionally, education departments need to continue to provide increased access to technology. When completing the survey, several faculty mentioned access as an impediment to integration. At SU not all classrooms are equipped with technology. While the department does have a computer lab and a mobile laptop cart, reservations must be limited because of the large number of faculty who must share these resources. Under these conditions, it is difficult for faculty to teach with technology on a regular basis. There must be ready access to technology before it will become a seamless part of teacher education.

References

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Making It Work: Sharing Technology With the Masses

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Abstract: As part of second year initiatives under our PT3 grant, significant changes to instructional technology facilities and increased training opportunities are providing faculty, pre-service teachers, and classroom teachers with significant technology support. We have increased our efforts to ensure that educators at all levels receive training on the use, operation, and integration of technology into their respective curriculum areas. Through these initiatives, we have learned many lessons in reference to "what works" and what "doesn't work". This paper and presentation will highlight lessons learned as we continue to experiment with methods to help university faculty, practicing and pre-service teachers increase their knowledge about technology and enhance their ability to successfully integrate it into their teaching.

Introduction

A historically white public institution and a small historically black private institution have partnered in their faculty development efforts as part of a PT3 Implementation grant. Through this grant, two diverse universities have jointly implemented a series of initiatives to transform their respective teacher preparation programs. Specific initiatives include: 1) providing release time for faculty to develop and infuse instructional technology into their courses and to serve as leaders in their respective disciplines; 2) increased opportunities for university faculty, practicing and pre-service teachers to receive individualized technology assistance by creating an "Infusio" Laboratory that provides "hands-on" assistance to incorporate technology into classroom instruction, and 3) offer workshops and technology discussions geared for educators at all levels to provide opportunities to share ideas and technological innovations with peers.

This paper highlights lessons learned as we continue to implement our PT3 grant, evaluate our progress, and seek solutions to technology and pedagogical problems as they arise.

Lesson Number One: Time

Typically, faculty at VCU teach a nine-hour course load each semester. Through our PT3 grant, several faculty each semester are provided a course release (three hours) which allows them to partake in technology training sessions. These sessions provide instruction on the use and integration of technology into their respective content areas. Through our observations, we have found that faculty who successfully implement new technology into their courses (i.e. the use of a course management system, such as Blackboard Course Info) must commit a large amount of time to learning how to use these new tools. Faculty report that often they are just starting to gain confidence with a new technology tool just as their course release time is about to end.

To provide faculty members with more time to hone their skills and develop appropriate technology activities that match their course objectives, we are providing each faculty member who obtains a course release during the academic year with a summer stipend to continue their technology exploration. Several technology training sessions are offered during the summer. Faculty comment that they appreciate the opportunity to explore technology on their own during a slower paced time of year. As one faculty member stated: "*Having time in the summer allows me to get to know a program in-depth. I can explore technology resources and really think about what I want to use with my class, and more importantly – decide what I don't want to use with my class. Technology blends into what I am doing*!"

Lesson Number Two: Technology Savvy Faculty and Limited Resources

Both VCU and VUU have come a long way in expanding available technology resources for both students and faculty. VCU has a state of the art technology-teaching lab, and is in the process of hard wiring several classrooms in the education building. These classrooms will contain a mounted projector, which easily allows software programs and Internet tools to be shown to students. VUU has enhanced their wireless network, which allows faculty to access the Internet and VUU's network from a variety of classrooms.

As faculty become more technology savvy, we have found that they want to provide hands-on technology experiences to their students during class time. When interviewed, one faculty member reported: *"I'm grateful for the opportunity to learn about such wonderful technology, in some ways the more I learn the more I become frustrated about our current state of affairs....my opportunity to use [technology] in my instruction is hampered by the lack of technology in our own classrooms...how am I to model the use of technology for my students?"*

The PT3 project coordinators at both universities are attempting to address this problem. At VCU, we are investigating the purchase of wireless notebook networks which can easily be used in classrooms. As new laptops are purchased, we are mandating that they have built in wireless capability. As the demand for "hands-on" learning grows, we are also examining our current physical space and determining if we can create another technology teaching lab in an existing classroom. We have also facilitated discussions with colleagues in other buildings across our campus to determine whether they may have technology rich classrooms that we may use on a limited basis. Additionally, we are informing the technology officers of the university of our needs. Our thinking is that if we require more technology rich teaching environments, our colleagues throughout the university must also have these needs. At VUU, staff there are expanding their wireless network and are in the process of updating their computer lab.

Lesson Number Three: More Learning, More Training

We have been delighted that faculty have taken advantage of the many training opportunities provided to them in the School of Education and throughout the university. While faculty learn much at these training sessions, we have found that often they require some one-on-one assistance or a review of material covered during a training session. We have been able to provide this support through the Infusio lab which is housed at VCU.

The Infusio Lab, which is partially funded by PT3 funds is a staffed facility which contains several computer workstations and a variety of equipment. The lab houses a two-way video-conferencing distance education classroom, interactive whiteboards, Mimeos, and a variety of scanners and digital cameras. Due to increased use, we have hired a lab director who oversees the day-to-day operation of this facility and supervises several graduate students who work with faculty. As faculty and their students learn more about the uses and applications of technology, we have found that there is an increased demand for assistance in the Infusio Lab. Therefore, we have expanded the days of operation to five days a week and have also extended the hours of the lab til 8 P.M. to accommodate the schedules of university faculty and student teachers.

While Infusio staff are available to provide assistance to faculty and students, we have recently started to create "job aids" which provide clear directions on how to use a variety of equipment and software which both universities use. These aids are useful to faculty who need step-by-step guidance when using a new piece of hardware or software. The lab has also purchased CDs which provide instruction on a variety of software programs. These CDs can be checked out, and also allow faculty to learn at their own pace.

Conclusion

As university faculty and pre-service teachers use and learn more about technology, we are finding that we must examine how we best train and provide technology opportunities for members of the university community. We are in our second year of our PT3 grant, and are quite pleased with the progress we have seen in the areas of technology integration. Having to rethink policy and change established practices shows us that we are making significant progress in the use and integration of technology into our respective School's of Education.

Enhancing Student Centered Classrooms with Technology

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Abstract: This paper is a report on training provided for in-service teachers through a PT3 grant at a regional university in the south US. Teachers were trained using a new instructional design model that focuses on learning on a continuum and shifts activities from teacher-centered to student-centered. Technology was integrated at all levels of learning and multiple resources were made available to the teachers. Learning Units were created and implemented in local classrooms. Videotapes were obtained of portions of the implementation of the learning units and students response was positive, enthusiastic, and showed strong interest in having more lessons that used the computer.

Introduction

Valdosta State University is the recipient of a three-year, US Department of Education grant entitled, "Preparing Tomorrow's Teachers to Use Technology." One of the components of the grant project is to work with local teachers to develop interactive learning activities using various technologies. The method choscn to train practicing teachers to develop learning units, utilize technology, and implement he units in their classrooms was workshops. Teachers were offered stipends for products they created and substitute teachers were paid for when teachers needed to miss class to work on their products.

The Project

Participants were required to attend 6 face-to-face sessions at Valdosta State University (VSU), use online discussion boards for collaboration with peers and colleagues, and communicate with instructors via email. Furthermore, participants contracted to design and develop technology integrated learning units, implement the learning units in their schools during the upcoming term, allow observation and evaluation by a PT3 team member during the unit in their school, as well as have the unit used by another teacher and obtain formative evaluation of the unit. Once evaluation occurred the unit was refined and submitted for final approval and publication in the Virtual Learning Resource Bank (VLRB), an online resource created for teachers through VSU's PT3 grant project.

The workshop is designed to introduce teachers to creative ways of integrating technology at every level of learning. An instructional design model was developed to provide the framework for the workshops. The model is based on the principle that learning occurs on a continuum, and with appropriate planning, teachers can accomplish objectives that are directly related to grade-specific (K-12) state standards. The learning units follow a theoretical model that ties objectives, instructional strategies, technology, and assessment together to form activities that promote success for learners in every grade.

Participants are introduced to a vast number of resources during the workshop. WebQuests, Xcursions, Virtual Field Trips, and Virtual Reality worlds are among a few of the Internet based resources that teachers are introduced to. For some, these resources become an important part of their teaching. One teacher said, "For me, the most valuable part of the PT3 experience has been learning about WebQuests and the vast number of relevant web sites for teachers. I also came away with a great learning unit that was valuable to my students."

Lessons Learned

Data were collected throughout the workshops and include surveys, interviews, observations, videotapes, and workshop artifacts. Qualitative data indicate that workshops have been quite successful. Participants frequently comment on the use of the model in designing their instruction. One teacher said, "I have thoroughly enjoyed today's session. New techniques were learned and I especially enjoyed seeing the model. The model is one that should be used by all teachers in all grade levels." Another commented "By planning my learning unit according to the workshop model I was able to closely plan my unit to the QCC's [Quality Core Curriculum, Georgia's state standards] and integrate technology in new ways."

The workshop has been administered multiple times throughout the previous two years and will continue to be offered through 2002. Several things were discovered during the first workshop that inspired change in formatting for the workshops that followed. Teachers who participated in the workshop had an average of over 16 years teaching in the field and were essentially unfamiliar with the process of creating instruction that tied to state standards. Not only were we surprised at the inexperience with attending to standards, but also we were quite disturbed by the inability of teachers to write the type of learning objectives that we were boking for in the units that were to be published on the web. Discussions with workshop participants led us to conclude that many of them had been teaching for so long that much of what they did was second nature, in their heads, and rarely transmitted to paper. Therefore, when they were asked to articulate these ideas clearly in a way that others could use them, many teachers were neither comfortable nor confident in their ability. Although later workshops spent more time teaching these skills, teachers still continued to come to the workshop in need of such instruction. However, in those workshops there was a significant increase in comments like the one by a science middle school teacher who said, "By planning my learning unit according to this model it made teaching the unit easier. I was able to see what QCC's were covered for each lesson."

Conclusions

A great deal of data has been gathered as a result of this project and in the future we believe there will be much to offer the academy in the way of lessons learned. However, currently what is important is that the PT3 grant that VSU is administering seems to be making a positive difference in the learning experiences of children in rural South Georgia, as well as spreading enthusiasm among teachers for the potential of integrating technology into their classrooms. Evidence of this is clear in the response of one participate to the survey question, "What happened as a result of having another teacher use your unit?" The response was, "The seventh grade teacher who used the unit for his class wants me to help him come up with a unit in his class using the Internet and computers. He does not like the computer but he said that his students were highly excited about the learning on the computer and that he would like to incorporate the computer lessons in his usual teaching lessons. This was a successful workshop for me and I want to thank you PT3!!!

Handheld Technology in Field Based Reporting

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Abstract: This is an exploratory paper on the uses and applications of handheld technology in field based reporting. It focuses on the adoption of handheld devices by student-teacher supervisors and department chairs in their day-to-day observation and documentation functions. In this paper, handheld devices are defined as portable and personal data assistants carrying among others, word processing capabilities using a Microsoft Word translator. Initial observations indicate a favorable perception of the use of handhelds as a portable word processing computer. However, the Graffiti® writing system and the reliance on paper forms for field-based reporting present a few obstacles in adopting handheld technology in field-based reporting.

Background

Personal data assistants (PDA) are no longer solely used as address and appointment keepers. They have become small-scale computers that offer tremendous portability and connectivity. In the palm of your hand, you can access multiple educational as well as word processing programs. The handheld device can be used as a note-taking medium to document meeting notes and personal memos. To facilitate the note taking process, a Microsoft Word translator and a portable keyboard are introduced in this paper. Several Microsoft Office translators are available on the market namely "Documents-to-Go®", "install buddy", "Quickword" and others. The third party software programs enable Microsoft Word files to be viewed, edited and created on the Palm OS handheld. The keyboard is integrated in this application since it allows for rapid data input.

Handhelds in Education

In this paper we are surveying the possible uses of handhelds by student-teacher supervisors and department chairs. Many teachers supervise student-teachers in the field and the task requires them to travel to school sites and write reports about their observations. This process could be completed using a handheld device and a portable keyboard. This alternative method of documentation ensures the information is backed up on the handheld and on a personal computer. Likewise, department chairs who commonly attend and preside over numerous meetings, could also benefit from the documentation possibilities of PDAs. For this latter group, meeting notes can be inputted and registered on the handheld.

The observations presented on this paper were based on the experiences of the student-teacher supervisors and department chairs at the College of Education, San Francisco State University. In training the said audience, the

basic Palm operating system features such as Graffiti®[1] writing, beaming[2] and the operating system's main menu which includes the preferences, phone book, appointment book and memo pad were first introduced. Afterwards, the content was customized to each individual's needs. During the follow up meetings, the participants individually described their job and the elements they could use help in. Some expressed the need to facilitate appointment scheduling while others wished to set alarm reminders for their appointments. The majority foresaw using their handheld as a note-taking device.

Results

With the combination of a handheld, a Word translator and keyboard, supervisors and department chairs alike can easily take notes during meetings or field based observation visits. Files created on the handheld can be copied to the personal computer through the 'HotSync®' process. This process allows for files created or modified on the handheld to be transferred to the personal computer. Likewise, files created or modified on the personal computer can also be transferred to the handheld.

Moreover, the observations underscore the weakness in using Graffiti® to input data into the handheld. Graffiti® writing is often slow and some find it difficult to learn. The addition of a portable keyboard to the handheld greatly enhances the data input process. In the case of field-based reporting and meeting note taking, where there is intensive writing, it is important to have the help of a keyboard to expedite the process.

The Word translator, which in the study is Documents-to-Go®, greatly enhances the use of handhelds in field-based reporting and meeting documentation. The portability of Microsoft Word documents appeals to the participants who see the advantages of being able to use their handheld as a small-scale computer.

Overall, the use of handheld devices in field-based reporting offers promising possibilities. It boasts a paperless process where files are created and stored in digital format on personal computers. Observation comments can easily be e-mailed to student-teachers. However, the general educational system is still paper based. The student-teacher observation process is reliant on carbon copy based forms. The advantage of using the standard carbon copy form lies in the fact that supervisors can give student-teachers a copy of the observation feedback on the spot. Moreover, supervisors are used to this paper format and it may be difficult for some to adopt this new method to document information.

[1] Graffiti® writing is a unique way to write alphanumeric characters so that it could be recognized on the handheld.
[2] Beaming refers to sending information from one handheld to the other using infrared sensors.

Effecting Pedagogical Change through an Action Research Process

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Abstract: This paper will describe a PT3 implementation grant that is based on a dual-approach collaborative development model grounded in an action research process. Action research involves constant change and therefore is the appropriate methodology to meet the goals of this project. This model provides a concentrated effort on developing personal and professional technology expertise of both faculty and students in a preservice teacher program in a university setting. Action research provides the foundation for this project, but it is also the process for all interactions that occur throughout the grant implementation involving both the team and stakeholders.

Project Overview

The University of Houston PT3 implementation grant is based on a dual-approach collaborative development model grounded in an action research process. One half of our development model is comprised of our work with our teacher education faculty. Our project Curriculum Specialists meet first with each faculty member, including professors and adjunct instructors, to establish a collaborative relationship and to identify skill levels, instructional needs, and comfort with technology. After this initial relationship building, each curriculum specialist brings in a Technology Fellow to work one-on-one with the faculty member, building on the existing knowledge base and progressing from that point. If personal technology skills need to be established, the technology fellow works weekly with that faculty member to facilitate teaching technology skills acquisition. The more technologically advanced faculty members may need only occasional assistance on specific topics or skills of interest. In addition to mentoring, Technology Fellows are available to assist with set up and operation of necessary technology, equipment checkout, and whole class presentations. This individual attention allows faculty to grow at their own pace and to receive assistance when and where they need it. Our team meets faculty members in their offices, their homes, and even in local coffee shops. Our use of individual technology fellow mentors truly allows for meaningful and consistent relationships to be formed between our team and our faculty. Although our action research is flexible, a well-formed infrastructure is essential for faculty engagement (Groves, & Zemel, 2000).

In addition to being the main contact for faculty, Technology Fellows are also the main contacts for students, accessible in campus-based methods courses, during weekly one-hour lab workshops, and electronically via e-mail. To provide an environment in which our future teachers can visualize the appropriate and exemplary use of technology in education, we have implemented structural changes to our technology course. We have restructured the existing three-credit hour required technology in education course into three one-credit-hour sections that are taken over the three-semesters immediately prior to the student teaching experience. Thus far,

we have taught the first two of those three sections. Campus-based students attend a one-hour weekly lab session with optional open lab times available. Technology Fellows are the most knowledgeable about the progress and commitment of faculty as well as the most aware of student needs for technology-rich environment through which to demonstrate their technology proficiency. This two-sided collaborative effort forms the heart of our program and has already proven successful in bringing together faculty and students in the creation of a strong technology-rich program. Action research involves constant change and therefore is the appropriate methodology to meet the goals of this project.

Action Research as a Design and Development Process

Action research derives from the perspective that a problem experienced by any person does not exist in isolation, but is indivisibly linked to and grounded in a set of interactions, relationships and social worlds that are part of the ongoing history of experience of the individual concerned. Research seeks to discover the particular ways in which it might be possible for people to understand the problems and to creatively engage in ways of resolving features of the situation that have become problematic. The first questions in research, therefore, are "What is the issue?" "Who is primarily effected by the issue?" and "Whose research, therefore, is it?" Answers to those questions provide the overarching agendas driving the procedures outlined below.

Further issues arise when these questions have been answered, since the purpose of inquiry is to extend people's understanding, taking them through and past existing definitions of the situation-their current ways of defining or explaining what is happening-to the new ways of envisaging the problem or situation resulting from processes of investigation. Providing people with this frame of reference requires them to position themselves quite differently in relation to people and events, requiring them to take a stance of inquiry and to be able to work productively alongside people they may see as "enemies", "outsiders" or "experts". The processes presented below suggest, first, some fundamental working principles guiding these processes, then provide a set of procedures to work through the first stages of a process of inquiry.

The Basic Action Research Process

The need for systematic, structured processes of investigation indicates the need for frameworks of inquiry to guide research activity. A Look, Think, Act process provides a simple way of envisaging the basics steps to the type of inquiry explicated in this project. For this project, we have also added a fourth step – Share – as a means of disseminating the resources and lessons learned. This process is cyclical and not linear, and it enables participants to systematically acquire information, reflect on its significance, and plan the next steps in the process. It is a constructive process, in which emerging understandings gradually refine and clarify elements of the situation, gradually increasing the scope of investigation to encompass all major factors influencing the issue investigated. This process assumes that there is an issue providing the focus for investigation, and a particular context in which the issue will be investigated. Though the issue may change or be re-framed, and the context broadened or narrowed as people provide input, the process remains essentially the same.

LOOK entails gathering relevant information to build a picture of the situation, enabling the researcher to describe what is involved, what is happening, and how, where and when events and activities occur. Information is acquired by observing, interacting and talking informally with people.

THINK requires researchers to explore and analyze the emerging picture. In the preliminary stages of investigation reflection enables a clearer understanding of the stakeholding groups effected by or affecting the issue, and identifying people in each group who should be included in the processes of inquiry.

ACT defines the actions emerging from reflection. It requires people to plan their next steps and implement appropriate activity.

SHARE describes the dissemination of the information to a larger community.

EVALUATION of these steps requires a return to the beginning of the cycle.

Although the look, think, act, share routine is presented in a linear format throughout this paper, it should be read as a continually recycling set of activities. As participants work through each of the major stages, they explore the details of their activities through a constant process of observation, reflection, and action. At the completion of each set of activities, they will review (look again), reflect (reanalyze), and re-act (modify their actions). As experience will show, action research is not a neat, orderly activity that allows participants to proceed step by step to the end of the process. People will find themselves working backward through the routines, repeating processes, revising procedures, rethinking interpretations, leapfrogging steps or stages, and sometimes making radical changes in direction.

Community-Based Action Research

In practice, action research can be a complex process. The procedures are likely to be ineffective, however, unless enacted in ways that take into account the social, cultural, interactional, and emotional factors that affect all human activity. Community-based action research seeks to change the social and personal dynamics of the research situation so that it is noncompetitive and nonexploitative and enhances the lives of all those who participate. This collaborative approach to inquiry seeks to build positive working relationships and productive interactional and communicative styles. Its intent is to provide a climate that enables disparate groups of people to work harmoniously and productively to achieve their various goals. A key feature of community-based action research is that it takes into account the impact of activities on the lives of people engaged in or subject to investigation. Its intent is not only to get the job done, but also to ensure the well-being of everyone involved.

The art and craft of community-based action research includes the careful management of research activities so that stakeholders can formulate jointly constructed definitions of the situation. The aim of inquiry is not to establish the truth or to describe what really is happening, but to reveal the different truths and realities held by different individuals and groups. Even people who have the same facts or information will interpret them differently according to their own experiences, worldviews, and cultural backgrounds.

The task of action researchers, therefore, is to develop a context in which individuals and groups with divergent perceptions and interpretations can formulate a construction of their situation that makes sense to them all – a joint construction. The major purpose of the process is to achieve a higher-level synthesis, to reach a consensus where possible, to otherwise expose and clarify the different perspectives, and to use these consensual/divergent views to build an agenda for negotiating actions to be taken. This process is fundamental to action research, requiring people to work together with purpose and integrity to ensure the effective resolution of their issues and problems.

Working Principles of Action Research

There is no one right way in which to engage action research. The processes will differ from group to group, from issue to issue and from context to context. They do so because people in each new situation will describe and interpret similar events in quite different ways. The major task of any particular project, therefore, is to creatively find ways to enable the diverse groups to negotiate a definition of the situation enabling them to work productively together. There is a strong need to take into account the differences in culture and perspective, and the emotional responses of people who engage in the processes of inquiry.

Action Research with Faculty

Contact with faculty has paralleled on a lesser scale the action research model of the entire project. The most significant process that the grant team uses with the faculty members is an interview process. In action research this takes the shape of questions, feedback, and more clarifying questions. In our grant experience, it was quickly apparent that faculty and curricula were so diverse that only the one-to-one exposure of action research could uncover their individual needs and issues. Bailey (1997) compares the process of technology and staff development with the activities undertaken by early American pioneers. The paths are largely uncharted before the exploration begins.

In spite of the differences among faculty and curricula, a few central themes emerged:

- Physical access to technology

- Faculty needed assistance at their level
- Time was an essential element
- Relevancy piqued interest
- Student-professor-tech fellow
- Plateaus and "What Next"
- Individual technology in curriculum approaches

Access

Initial meetings required strong attention to the professor's needs and interests. Many stated that they would use more technology if more "computers/projectors/internet connections" were available. Campus limitations to physical components of technology emerged as a key problem. Because of the dollars involved in improving access to technology, this is not an issue that can be quickly resolved. The action research process, however, was instrumental in bringing the situation to notice, a necessary first step in progress.

With this awareness, the grant team was able to help many faculty members identify and apply for equipment funding. Policies on "check-out" and use of departmental resources were reexamined. The one-on-one assistance that the team of technology fellows provided gave other professors the encouragement to budget for appropriate technology. With the assurance of assistance, new numbers of instructors were willing to book labs, check out equipment, and investigate new venues for technology integration.

Assistance

Other reticent faculty members were initially concerned that the assistance that would be forthcoming would be inappropriate, and a poor use of their time. The action research model, however, allows the support to be tailored for each instructor's particular need. Both proficient and beginner technology using instructors were concerned with this. Proficient users wanted to be recognized for their skills, and beginners were more afraid of perceived obstacles. The dialog between the tech fellow and professor about real needs fostered the growth of both a collaborative relationship and a safe and productive learning environment.

This supportive relationship was just as important later, when faculty began investigating more technology integration with their own students. Consistently, the professors have been enthusiastic about technology exploration when they trust this support system.

Time

Often the professors were inclined to feel they were too busy to learn more technology until the team member offered a technology that could save the professor time or effort. Interviews with our faculty members also revealed that they are rarely on campus at the same time, and even less likely to be free simultaneously. There were many opportunities for informal learning through lunch-hour "brown-bag" events, but there were always numbers of instructors who reported that their schedules prevented them from attending. The tech fellows were able to bridge this difficulty by scheduling individual support directly into each professor's available time slots. This flexibility made scheduling so convenient for each faculty member, that many of them arranged to have weekly, standing sessions. Multi-session training such this has been reported to enhance faculty understanding and feelings of competency with technology (Smith, 2000).

Relevancy

Above all, our instructors were interested first in technology that would be useful, and not in technology for technology's sake. A number of professors began the collaboration with very direct and limited requests. As stated earlier, the goal of the dialog between the tech fellow and the instructor was to tap into the instructor's needs and interests. Once the faculty member began to see usefulness or a more efficient result, the discussion generally broadened into a more inquisitive, creative, and less directive approach to technology.

Student-Professor-Tech Fellow

A second relevancy for the professors was that the tech fellows also were technology instructors to the preservice teachers. This meant that the tech fellows were in a unique position to be a sort of a bridge between the professors and the students. The undergraduate technology lab courses were structured so that preservice students could focus on their academic requirements, and the tech fellows would provide them with lab support for their classroom projects. This enabled the professors to understand what they could expect from their students, and enabled the tech fellows to better assist their lab students.

Plateaus and "What Next?"

One of the most compelling phases in action research is at the end of a spiral of "Look, Think, and Act." These spirals can be imagined in all different sizes for all of the various faculty involvements and all the individual goals set at any point in time. At the end of the revolution, sometimes we see a "plateau" with the individual faculty members. It is difficult to seek something that one does not know is there, and it is also difficult for professors to imagine needing or using a component of technology that they are not yet aware of. These plateaus have given the team enormous opportunities to develop strategies for introducing new levels of achievement to the faculty.

The team was initially reticent to provide many discrete curriculum integration suggestions, fearing that the professors would feel overwhelmed. This may, in fact, be true during early stages, but as the team developed and introduced alternate views and suggestions for technology integration, the faculty met them with applause. Though this appeared to be one of the biggest surprises in faculty work, under our action research model we were able to redirect our approaches to satisfy this faculty interest.

Technology in Curriculum Approaches

The "look (listen) and think" part of our action research plan led the team to find concrete ways to help the faculty think through the whole idea of technology integration into the curriculum. For this, the faculty feedback on previous technology integration ideas was organized into a chart corresponding to traditional classroom and educational techniques. Examples of these would include "class discussion, presentations, communication, group work, research," and the like. Tech fellows would meet with each professor individually over one course syllabus, and explore the syllabus and chart together. Areas where technology might be appropriate would be discussed. Negotiations and modifications were encouraged, and often resulted in an even better idea of technology use in education.

Summary

Our program was redesigned to include several critical factors for success: the use of an action research approach to ensure that progress towards goals is continually assessed and evaluated; the purposeful creation of collaborative learning environments in which future teachers are empowered to develop content, pedagogy, and technology strategies; and a dual approach to address the best ways to develop and use skill with technology for instruction.

Pedagogical change is the outgrowth of both the integration of technology and the development of the collaborative community created by the project. The integration of technology that provides for active participation in the learning process encompasses instructors, team members, and students in the process of change. Through this collaboration, the team members have found that many instructors of future teachers have become eagerly engaged in learning to integrate the appropriate use of technology into their teaching. By modeling technological integration and the concomitant pedagogical change, these professors are helping the future students of these pre-service teachers acquire the technical integration skills critical to success in the 21st century.

As a result of the action research model, the faculty at the College of Education has begun a steady and comfortable migration toward greater and more effective technology integration. Although systemic changes are slow and difficult to distinguish, there is such ample anecdotal feedback, that the PT3 team is certain of the ripple that has already been created through our many spirals with the faculty.

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Strategies for Preservice Technology Integration

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Abstract: This paper describes a multi-directional approach aimed at enhancing preservice technology integration within the University of Houston College of Education. Strategies used by the grant team include reorganizing the structure and content of the undergraduate preservice technology classes, a one-on-one approach between team and faculty for facilitating individual technology growth, an ongoing offering of workshops and lunch seminars, and a consistent team-faculty approach toward increasing appropriate and fitting technology integration within various and differing curricula.

Introduction

The University of Houston PT3 grant, Action Communities for Teaching Excellence, has adopted a multi-faceted approach to addrcss and facilitate preservice technology integration. Following an action research model, the PT3 team has identified three major areas in teacher education where attention to technology may benefit the preservice teachers. These areas are: the preservice "Technology in Education" courses, the undergraduate education classes, and the preservice field-based experiences at area schools.

Processes

A variety of strategies were aimed at enriching technology experiences of the preservice teachers. Facing what many consider a multimedia revolution, Vogel and Savage (1996) predicted displacement of traditional modes of thought and action. The strategies for technological change in the College of Education reflect that view as well. Historically, the preservice "Technology in Education" class for undergraduates consisted of a single traditional three-hour course. The one semester technology course was broken into three one hour courses spread across three semesters, and a constructivist curricular approach facilitated projects with relevance to the students' other current education courses.

As the technology courses were restructured, the PT3 team also initiated meetings with the faculty who taught the undergraduate core courses in education. Since folk wisdom dictates that these professors'

visions of technology integration are unlikely to exceed their own level of experience with technology, the PT3 staff offered individual technology instruction and support to faculty. Faculty technology development can be viewed as a process that is not solely oriented toward faculty mastery of classroom technology, but toward the use of instructional technology to enhance students' achievement of curricular objectives (Cagle & Hornik, 2001). Faculty members were interviewed for subject matter and teaching style, along with technology interests and visions of technology integration. A team member was matched with each interested faculty member to promote a collaborative and consistent relationship with the grant team.

Following faculty involvement in personal technology exploration, the topic of curriculum integration was approached, with an eye for providing preservice students additional opportunities to explore technology in their College of Education assignments. Faculty and PT3 team members joined for a collaborative look at technology possibilities offered within their curricula.

As preservice students moved out into the schools for their field based experiences, the PT3 team made contact with the field based methods teachers to offer continued support and collaboration on site. One-on-one technology support was expanded to include all undergraduate methods teachers.

Responses

As the contiguous technology course semesters unfolded, the preservice students evolved into a remarkable community of technology users. The current students entering field experiences display confidence in their ability to integrate existing technology at any level of real-world availability.

Quick and Davies (1999) reported that faculty development participants requested training opportunities fitting their time constraints. University of Houston College of Education faculty particularly favored a one-on-one team approach toward individual technology skills development. An interviewing and matching process was employed to meet varying skills, interests, and schedules. Brown bag and workshop opportunities were also available to address common interests.

The next tier of faculty support explored particular curricular interests and additional integration opportunities. This again was carried out on a case-by-case basis, resulting in many new and innovative curriculum additions. Instructors responded positively to the collaborative nature of the additional exploration. Particularly well received was a series of charting processes developed by the team to provide consistent scaffolding for these tailored individual approaches. For example, faculty feedback on previous technology integration ideas was organized into a chart corresponding to traditional classroom and educational techniques, including "class discussion, presentations, communication, group work, research," and the like. Tech fellows would meet with each professor individually over each course syllabus, and explore the syllabus and chart together, discussing areas where technology might be appropriate. These charting processes facilitated a convenient and easy way to explore technology options in almost any curriculum environment.

Conclusions

The variety of strategies employed by the PT3 team at the University of Houston College of Education are gradually impacting the nature of technology use in all areas associated with preservice education. Not only are preservice teachers emerging from the education program with enhanced skills and proficiencies, but the nature of technology use by faculty is also changing around them. An integrated community of technology users is emerging from the classrooms and offices of the College of Education.

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Using Technology for Urban Teacher Preparation: a PT3 project

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Abstract: Through a U.S. Department of Education PT3 grant, the University of Illinois at Chicago (UIC), in partnership with the Technology Resource Network of the Chicago Public Schools (CPS) and other Consortium partners, designed a flexible process for integrating technology-infused instruction into urban pre-service teaching courses for elementary and secondary programs. This poster presentation describes this 5-pronged process, which includes: (1) interdisciplinary team-based curriculum development; (2) faculty development initiatives; (3) infrastructure development to support teaching with technology in all of the teacher education programs; (4) technology-rich pre-service coursework and field placements; and (5) standards-based accountability mechanisms across all teacher education programs at UIC.

Introduction

In an effort to bring about educational reform, many states have changed to a standards based competency model and adopted new accountability procedures that demand results from students, teachers and schools. These standards and procedures follow the lead of current research in education, requiring teachers to have substantial background in both content and pedagogical knowledge (Ball, 1994; Ball & McKiarmond, 1990; Seixas, 1998; Shulman, 1986). A strong push in the standards movement is toward the use of technology enhanced instruction.

Research has indicated that the traditional model for technology education, a single technology competency course or multiple competency modules, has been found inadequate (Moursund & Bielefeldt, 1999). Rather, effective technology infusion in PreK-12 classrooms requires teacher preparation coursework that fosters the development of content-rich, pedagogically sound strategies for integrating technology throughout the entire teacher preparation curriculum.

The purpose of this poster presentation is to describe the components of a comprehensive PT3 initiative occurring at the University of Illinois at Chicago (UIC) in cooperation with the Chicago Public Schools (CPS.

Design team concept and processes

Interdisciplinary subject-area design teams collaborate to create discipline rich technology materials that can be infused into teacher education methods courses. The activities of the design teams begin with an assessment of curricular needs

within the College of Education. These needs are then addressed through the development of easily accessible technologies. Each module is based on a set of domain thinking skills and concepts (such as, in a History course, supporting claims with evidence from documents), which are embodied in the use of specific kinds of technology tools (such as hyper-text linking from text to documents). The technologies employed are used to support the learning objectives, rather than just being used as an add on to instruction.

Professional development strategies

Professional development strategies were designed to help faculty identify synergistic places in their courses for marrying content and technology and to increase faculty members' abilities to use appropriate technologies to achieve specific outcomes within their domain. Strategies for professional development included interactive technology tool-based workshops, a technology development center designed to provide faculty with support for creating technology-based course materials, and summer curriculum institutes for developing technology infused curriculum within teacher education courses.

Infrastructure development

Through ongoing systematic technology planning and deployment, infrastructure could support all aspects of this initiative. Technology planning activities will be described.

Developing and sustaining technology rich field experiences

Fieldwork plays a pivotal role in a teacher candidate's education, and insuring that a field placement can support technology integration is an essential component. Methods implemented to develop and nurture university-school partnerships included recruitment assessments, technology-based curriculum development workshops for k-12 mentor teachers and teacher candidates, and the establishment of an online learning community for consortium partners.

Evaluation

Program evaluation is an extremely important part of successful projects in educational technology reform, without which no program can make any claim of success. In this poster session, innovative data collection techniques via the WWW and authentic performance indicators will be demonstrated.

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Developing Proficiencies for Web-based Course Delivery: Examining Changes in Faculty Attitudes and Behaviors

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Abstract: LINKS is a three-year technology project designed to integrate technologies into the teacher preparation curriculum at the Texas Woman's University (TWU). The project is supported by a U.S.D.E., Preparing Tomorrow's Teachers to Use Technology implementation grant. As part of the systemic approach to the integration of technology, the project supports changes in university faculty involvement and roles, technology curriculum content and delivery. Two broad research questions were used to guide this study: (1) how were the development of faculty technology proficiencies supported and (2) what was the progress of the participating faculty in infusion of technology in university web-based course delivery? Second year findings regarding the examination of changes in faculty attitudes and behaviors and the effectiveness of the implemented project are provided.

Introduction

Preservice teachers need to experience technology within a meaningful context in both their learning opportunities at the university and their field-based student teaching experiences. A crucial element in supporting the development of "fearless users of technology" is the modeling of advanced and emerging technologies by faculty who instruct preservice teachers (OTA, 1995; Topp, Mortenson, & Gradgenett, 1995; Wetzel, 1993). In order to model this type of framework within their course structures, faculty must change attitudes and behaviors toward the use of technology (Joyce & Showers, 1983; Schrum, 1999). They must model the use of various technologies to increase instructional effectiveness, be cognizant of the high level of skills essential for preservice teacher certification, and focus on the metacognition surrounding the use of technology as a tool. As Strudler and Wetzel (1999) assert, the "goal of technology integration is a moving target" (p.80), and therefore must be studied within the context of continued learning and professional development for both the student and the instructor.

Learning and Integrating New Knowledge and Skills (LINKS) is a three-year technology project designed to integrate technologies into the teacher preparation curriculum at the Texas Woman's University (TWU). The project is supported by a U.S. Department of Education, Preparing Tomorrow's Teachers to Use Technology implementation grant. As part of the systemic approach to the integration of technology, the project supports both changes in university faculty involvement in addition to changes in technology curriculum content and delivery. This study's purpose is to describe changes in behaviors and attitudes as well as changes in institutional processes. Two broad research questions were used to guide this study: (1) how were the development of faculty technology proficiencies supported and (2) what was the progress of the participating

faculty in infusion of technology in university web-based course delivery? To address these questions, second year findings regarding the examination of changes in faculty attitudes and behaviors and the effectiveness of the implemented LINKS project are provided.

The Study

In order to increase the quantity of technology-proficient teachers who use technology to support teaching and learning, the University must change, the curriculum must be changed, and active partnerships must be created and maintained between professors from diverse disciplines. The change process itself must be studied to monitor changes in attitudes and behaviors of participants. This study is grounded in the Concerns-Based Adoption Model (Hord, Rutherford, Huling-Austin, & Hall, 1987) that monitors changes as an innovation is implemented. Changes in participants' technological proficiency over time, implementation concerns, and in some cases their levels of technology use were monitored.

A needs assessment from a purposive sample of current faculty addressed faculty needs relating to the integration of advanced technology tools into course delivery. Their perceived critical needs were in three areas of: (1) productivity; (2) connectivity; and (3) the integration of technology. Faculty members see **productivity** as a priority including support in development of their skills related to multi-media presentations and the creation of a professional web page for use in classroom instruction and communication with pre-service teachers. The survey data indicated the need for training to extend their multimedia presentations with more advanced media tools and the use of **connectivity** tools such as the World Wide Web and asynchronous and synchronous forms of communication. Building from these perceived needs, the LINKS program for faculty was created and implemented.

A volunteer sample of university instructors (N=20) agreed to participate in professional development sessions. Sessions primarily focused on an orientation to LINKS resources and the preparation of web-based course delivery via *Blackboard*, the university's web-based course delivery template. Data were collected on instructors' stages of concern, levels of use, and perceptions of the utility and quality of training. Faculty participants included individuals from the following disciplines: Biology, Chemistry and Physics, Family Sciences, Health Studies, Kinesiology, Performing Arts, Philosophy and Psychology, Reading, Teacher Education, and Visual Arts.

Training Goals. Two primary training goals existed: (a) Introduction of the LINKS standards and resources, and (b) support for instructor delivery of web-based courses as models for the future teachers in their classes. The goals were implemented through a series of technology-training sessions divided into two categories a whole-group professional development sessions geared to broad topics, and hands-on professional development sessions specializing in specific areas for remediation or advanced work.

Training Sessions Overview. In order to provide a model for preservice teachers, faculty were encouraged to integrate technology into the design and delivery of their instruction. These sessions also served as a training vehicle for the preparation of web-based course delivery via Blackboard, the University's delivery template. Sessions were administered throughout the year, seven per semester. These two-hour sessions (28 hours total) were delivered in a University computer lab, using Blackboard as the method of delivery. All materials were available on the class Blackboard site for later reference. By using Blackboard to communicate with the faculty participants, meaningful learning was integrated into their own Blackboard course development.

Personnel from Information Technology Services (ITS), the Distance Education Support Team, and specialists from the library services collaborated with LINKS personnel in organization and implementation of the training. Professional development sessions included an introductory LINKS project overview, sessions on Internet resources, Internet searches, creating a virtual office, uploading course material and online tests, and seven sessions addressing the use of Blackboard, the university's web-based course delivery template. Blackboard sessions covered the following topics: preparing documents, adding information, uploading material, using shortcuts, changing the appearance of courses, adding security measures, student management, and online assessment. One-on-one assistance was available from LINKS staff on request.

Data sources. The Concerns Based Adoption Model (CBAM) was used to assess university instructors' progress toward the use of *Blackboard*. Pre- and posttest data were collected for the Stages of Concern Questionnaire (SoCQ) and Levels of Use. Parametric paired-sample t-tests assessed differences across time. To assess quality and utility of the training sessions, qualitative analyses were conducted for open-ended items on session evaluation forms.

Concerns about Technology. The SoCQ monitors changes in attitudes and behaviors as an innovation is implemented. The SoCQ consists of 35 items that are rated on a 7-point Likert scale with three anchors: 1 (*not true of me now*), 4 (*somewhat true of me now*), and 7 (*very true of me now*). The instrument measures the intensity of concerns around three main clusters (self, task, and impact concerns). The technical qualities of the instrument are acceptable. Cronbach alpha coefficients of internal consistency range from .64 to .83, and the test-retest Pearson r correlations range from .65 to .86.

Level of Use (LoU) Questionnaire. For the first project year (1999-2000), data on instructors' Level of Use was collected through individual interviews. Due to excessive time requirements for individual interviews, project staff developed an objective LoU questionnaire to be administered online intermittently during year 2. Drawing on year-one interview responses, project staff developed items related to Blackboard use. Eight distinct levels of use of an innovation have been identified (Nonuse, Orientation, Preparation, Mechanical Use, Routine Use, Refinement, Integration, Renewal). According to Hord et al. (1987), each stage encompasses a range of behaviors with distinctive actions that move the individual to the next level. CBAM's LoU interview was adapted to describe the behaviors of university instructors relative to the adoption of Blackboard. The LoU Questionnaire included 56 items items rated dichotomously as 0 (*disagree*) or 1 (*agree*), with 7 items for each of the eight dimensions. The purpose of the LoU was to establish participants' level of use at various stages of the innovation adoption process.

Quality and Utility of Training. Instructors completed session evaluation forms including both objective and open-ended items. Their evaluations first asked for ratings on a 6-point scale from *strongly disagree* (1) to *strongly agree* (6) for the training sessions' possible effects on motivation to use technology in the classroom and ability to use technology more effectively. On a final item, respondents rated sessions overall on a 6-point scale ranging from *not at all helpful* (1) to *extremely helpful* (6). All participants completed three open-ended items: (a) What have you learned or gained from the training sessions? (b) What is your main concern about using the information? and (c) Do you have any suggestions for making the training sessions more effective?

Findings

Stages of Concern Questionnaire (SoCQ). Mean instructor ratings on the seven stages of concern (awareness, informational needs, personal implications, time mangement, consequence for students, collaboration with others, and refocusing or refinement) are presented in Table 1. Significant pre- and posttest differences were evident for faculty on two domains, with both related to self-concerns. Outcomes suggested that instructors' initial awareness and informational concerns (M = 2.36 and M = 4.64, respectively) had decreased significantly by spring ((M = 1.70 and M = 3.57, respectively). Management, consequence, collaboration, and refocusing concerns intensified, although not significantly.

Table 1: Stages of Concern Questionaire

	Pretest (F00)		Posttest (S01)			Paired
Cohort 2	Mean	SD	Mean	SD	Difference	*T*-test
Self						
Awareness	2.36	1.38	1.70	0.89	-0.66	*
Informational	4.64	1.86	3.57	1.34	-1.08	*
Personal	4.59	1.57	4.59	1.69	.01	--
Task						
Management	3.76	1.81	4.01	1.88	.26	--
Impact						
Consequence	4.79	1.52	5.04	1.16	.26	--
Collaboration	4.63	1.18	4.77	1.34	.14	--
Refocusing	3.61	1.19	4.29	1.33	.67	--

Note. Statistics basedon 14 valid matched pairs using paired-samples t-tests. * $p < .05$. Ratings made on a 7-point scale with three anchors: 1 (*not true of me now*), 4 (*somewhat true of me now*), and 7 (*very true of me now*).

Levels of Use (LoU) Questionnaire. Results for the LoU Questionnaires are summarized in Figure 1. Individual LoU profiles were created for university instructors (labeled U1 to U13). To construct the profiles, mean item ratings were first calculated for the eight stages of the LoU, with mean ratings ranging from zero (*disagree*) to one (*agree*). Next, individual pretest (initial LoU) and posttest (final LoU) outcomes were determined for each university instructor. Mean ratings at least one standard deviation above the instructor

group average (mean of 0.7 or higher) were regarded as strongly exemplifying a "stage of use." Instructors are organized in three categories as "beginners who progressed," "mechanical users who made strong progress," and "mechanical users who failed to progress."

Figure 1: University Instructors' Levels of Use Profiles (Pre- and Posttests)

Stage of Use	U8	U12	U7	U13	*U1*	U2	U3	U5	U4	U6	U9	U10	U11
Nonuse	P^1	P^1											
Orientation	P^2												
Preparation			P^1	P^1			P^1					$P^{1,2}$	
Mechanical Use		P^2	P^2	P^2	P^1	P^1		P^1	$P^{1,2}$	$P^{1,2}$	$P^{1,2}$		$P^{1,2}$
Routine Use													
Refinement													
Integration													
Renewal					P^2	P^2	P^2	P^2					

Key. U = University Instructor (n = 13). P^1 = Pretest (Initial LoU). P^2 = Posttest (Current LoU). Shaded area indicates a mean rating of 0.7 or higher on a scale of 0.0 (disagree) to 1.0 (agree).

Nonusers/novice users with moderate. growth. Four instructors (labeled U8, U12, U7, and U13) began as nonusers or were at the orientation/preparation stage, but over time they progressed to a higher level of use. As an example, university instructor eight (U8) considered himself a nonuser at pretest and progressed to orientation by posstest. Although progress was made, this individual is currently exploring the value of Blackboard, but has not made a decision to start using the innovation. Another instructor (U12) began as a nonuser, but she progressed to mechanical use of Blackboard. SoCQ mean ratings for these instructors showed they had lower informational (3.4), collaboration (4.0), and refocusing (3.7) concerns, while their personal (4.6), management (4.7), and consequence (4.9) concerns were moderate.

Mechanical users with strong growth. Another four instructors (labeled U1, U2, U3, and U5) began as mechanical users, but they progressed over the year to become routine, stabilized Blackboard users wanting to refine Blackboard to increase student impact, collaborate with colleages to achieve a collective impact, and to alter Blackboard to increase impact. Interestingly, the mean SoCQ ratings for these instructors were comparable to the beginners who showed moderate growth. They had lower informational (4.0) and refocusing (3.8) concerns, and moderate personal (4.5), management (4.8), consequence (4.6) and collaboration (4.4) concerns.

Mechanical users with no growth. Five of the university instructors (labeled U4, U6, U9, U10, and U11) showed no growth from pretest to posttest on the LoU Questionnaire. Four of five began as mechanical Blackboard users, while one was preparing for first use. Notably, these university instructors had very high personal (5.7), consequence (6.2), collaboration (6.4), and refocusing (5.8) concerns, whereas they had very low informational (3.8) and management (3.2) concerns.

Quality and Utility of Training

Most important learning. The most important learning usually coincided with the session topic. For example, instructors mentioned learning about "changes in Blackboard," "logistics of Blackboard," "direct access to multiple search engines," and "basic HTML." Instructors also noted heightened awareness and knowledge of technology resources, most commonly the various Internet search engines and online library and database resources. Several instructors reported gains in their knowledge of the LINKS project and its benefits.

Main concerns regarding application of the information. Common concerns centered on the time needed for technology and instructors' personal technology skill proficiency. Instructors mentioned a need for time to "learn," "assimilate new information," "practice these new skills," "play with it all," and "the amount of time to do it for every course!" Typical concerns about limited technology proficiency included "lack of familiarity," "my own inadequacy to learn fast enough," "putting all the pieces together," "learning all of the acronyms," "becoming more comfortable with [the] Internet," and "taking advantage of the information." Instructors also expressed concern with their ability to retain their technology skills, the availability and quality

of resources, their ability to integrate technology into the classroom, and a need for continued technology support after the sessions concluded.

Suggestions for making sessions more effective. Suggestions for improvement included instructional pace, training content, and a desire for more hands-on opportunities. Several instructors advised slowing the pace of the sessions or creating separate sessions for novices and more advanced technology users. They stressed the "different levels of expertise" among session participants and a need for "more hand-holding." In addition to pace, instructors also offered suggestions for changes in training content, including "opportunities to see concrete examples," "more practical information," and a greater concentration on Blackboard. Fewer suggestions related to the provision of hands-on activities and training timing, and several instructors noted that no improvements were needed.

Conclusions

This project introduced university faculty members to the LINKS project and resources, and supported instructor delivery of web-based courses as models for future teachers. Descriptive statistics and profiles for the SoCQ suggest that instructors' self-concerns declined while task and impact concerns heightened. The majority moved toward higher levels of technology use. Qualitative analyses of open-ended evaluation items revealed concerns with their own ability, the time needed, and the applicability of their new learning.

Findings regarding the implementation and effectiveness of the LINKS project within the teacher education program has implications for increasing the technology proficiencies of entry-level teachers as well as providing a model for other universities undertaking similar changes in teacher preparation programs. Further, the resources created by LINKS, such as the Technology Passport, are available to other institutions on the project web site. Findings have particular relevance to explain how university professors can be supported as effective models of technology use in web-based course delivery and electronic communication with students. The documentation of learner-centered standards for preservice teachers through the Technology Passport provides a much-needed model to monitor and assess changes in preservice teachers' technological proficiencies related to the Texas Education Agency's Learner-Centered Proficiencies for Texas Schools.

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Providing Support for Technology Infusion into a Teacher Preparation Program

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Introduction

Through a unique technology infusion approach, The Learning and Integrating New Knowledge and Skills (LINKS) project addresses national, institutional, and teacher education goals as preservice teachers are prepared to use a variety of technologies. Funded through a U.S. Department of Education, Preparing Tomorrow's Teachers to Use Technology implementation grant, the LINKS program encompasses the integration of technology use as intrinsic to all courses leading to professional certification as well as within the professional education field-based courses. In the professional education field-based coursework, preservice teachers complete their documentation of technology skills mastered and demonstrate the use of these tools in a variety of school settings. Specifically, this study addresses these questions: (1) how did LINKS support technology infusion in teacher preparation, (2) to what extent did preservice teachers build technological skills and understanding, (3) how did mentor and supervising teachers build technological skills and serve as guides of technology integration?

The Study

Overview. As participants in the LINKS project, students progressed through university coursework, technology seminars, documentation of proficiencies in a Technology Passport, and field-based placements as they moved through Intern I, II, and Residency over three semesters. Responsibility for preparing students was divided among technology seminar leaders, university liaisons, and supervising teachers. This study focused on the second and third cohorts of three separate cohorts established for this project. Cohort 2 included 62 Intern IIs in fall 2000, 41 of which continued as Residents in spring 2001. For Cohort 3, 66 preservice teachers participated as Intern Is in fall 2000, and 62 progressed to Intern IIs in spring 2001. As Intern Is and Intern IIs, preservice teachers participated in three technology seminars, bi-weekly conferencing groups, and completed the Technology Passport. During Residency, preservice teachers began their student teaching and attended two technology seminars. Pre- and posttests were administered to all preservice teachers to assess changes in technological proficiency and use, as well as attitudes and concerns. Parametric paired-sample t-tests were utilized for analyses of quantitative data for preservice students with complete data sets. In addition, preservice teachers completed evaluations at the end of each semester to assess the utility and quality of their TechTrek experience.

Training. Each semester, Interns interacted weekly with mentor teachers during classroom observations. Mentors (N=30) participated in on-campus training sessions and received assistance designed to encourage their receptivity toward technology use. During Residency, preservice teachers were paired with supervising teachers for their student teaching experience. A select group of supervising teachers (N=15) participated in specialized training dedicated to creating classroom appropriate technology products

for use and evaluation in the classroom setting. Both supervising and mentor teachers completed training evaluations to assess quality and utility of training. In addition, supervising teachers also completed instruments to assess technological proficiencies, attitudes, and use.

Data Sources. Implementation data came from reviews of project documents, attendance records, evaluation forms, information on LINKS-related web sites, and interviews with project staff. Data sources for the student, supervising and mentor teacher populations are listed below.

Preservice teachers. Quantitative measures were administered at the beginning and end of the fall and spring semesters. Measures included: Self-Evaluation Rubrics for Basic Computer Use, Advanced Computer Use, and Internet Use, and the Stages of Concern Questionnaire (SoCQ). Parametric paired-sample t-tests assessed differences across semesters. Qualitative data were derived from course evaluations to assess changes in attitudes about technology.

Supervising and mentor teachers. Supervising teachers completed the *Self-Evaluation Rubrics* for *Basic Computer Use*, *Advanced Computer Use*, and *Internet Use* at the end of their semester as supervising teachers. Quantitative results were compared with those for preservice Residents. Qualitative analyses were conducted for open-ended items on questionnaires completed by email and on session evaluation forms by both supervising and mentor teachers.

Findings

This study presents findings for the second-year of the three-year grant. Results for preservice educators revealed that participants considered themselves more technologically proficient after experiencing the technology integration, with statistically significant pre- and posttest differences for all domains of the Basic Computer Use, 10 out of 11 domains on the Advanced Computer Use, and all domains on Internet Use. Preservice teachers moved toward higher impact concems and relatively low self-concerns as measured by the SoCQ. Qualitative analyses revealed generally positive acceptance of and comfort with technology, as well as confidence in curricular integration of technology. Interestingly, supervising teachers expressed less technology proficiency overall, and scored lower than Residents on all domains on the self-evaluation rubrics for Basic Computer Use, Advanced Computer Use, and Internet Use. Qualitative analyses of open-ended items indicated that supervising teachers were generally positive about technology integration, and being paired with a Resident appeared to be a supportive factor. Concerns related to time, resource quality and availability, and personal skill proficiency.

Conclusions

Findings regarding the implementation and effectiveness of the new LINKS curriculum within the teacher education program has implications for increasing the technology proficiencies of entry-level teachers as well as providing a model for other universities undertaking similar changes in teacher preparation programs. Further, the resources created by LINKS, such as the Technology Passport, are available to other institutions on the project web site. The documentation of learner-centered standards for preservice teachers through the Technology Passport provides a much-needed model to monitor and assess changes in preservice teachers' technological proficiencies related to the Texas Education Agency's Learner-Centered Proficiencies for Texas Schools.

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High Tech Mentoring: Assessing the Effectiveness of a Preparing Tomorrow's Teachers for Technology Project

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Abstract

This paper presents the first year findings of a mixed-method study of the High Touch Mentoring for High Tech Integration project at a suburban state-supported university. This three-year project was funded in part by the Preparing Tomorrow's Teachers to Use Technology (PT3) Federal grant program. Participants were teacher education faculty (faculty partners), K-12 technology proficient teachers (teacher partners) and preservice teacher education candidates. The purpose of the study was to: gather baseline data about faculty members', teacher mentors', and preservice teachers' backgrounds and usage of technology; examine how well the faculty-teacher partnerships were working; determine how the faculty-teacher partnerships affected the integration and use of technology in faculty partner teacher education courses; and provide feedback for formative and summative improvement of the project.

Theoretical Framework

The ideal way to prepare preservice teachers for incorporating technology into classrooms is by integrating technology-based learning environments into thc college curriculum, with university faculty modeling usage (Sprague, Kopfman, Dorsey, 1998). However, a recent survey by the Milken Exchange (1999) revealed that most faculty, whether in colleges of education or in the disciplines, do not model the use of technology in their courses. Faculty, like teachers, need time to develop technology skills and to learn how to teach with technology. They need to reflect on their own teaching practice and beliefs. They need to explore software appropriate to their content area and need support as they begin to implement new teaching approaches. One faculty development model that is receiving much attention is one-to-one mentoring in which faculty can focus on their own individual needs (Thompson, Hansen, and Reinhart, 1996, Sprague, et. al., 1998, O' Bannon, Matthew, and Thomas, 1998). Little research has been done on this model to determine its effectiveness on a wide scale.

In June 2000, George Mason University (GMU), a state-supported institution located in a highly diverse urban/suburban region near Washington, DC, was awarded a PT3 grant by the U.S. Department of Education. This PT3 project involves pairing K-12 teachers with faculty from the Graduate School of Education (GSE) in one-to-one mentoring relationships. These teachers are providing models for the effective use of technology, are demonstrating various software and web-based programs that can be used in education, and are assisting GSE faculty in redesigning their teacher preparation courses. Sixteen GSE faculty members participated in the first year of the project.

Methods and Results

Quantitative and qualitative methods were employed in this study. Quantitative methods included the use of pre- and post- web-based surveys that faculty partners, teacher partners, and preservice candidates completed. Qualitative methods included classroom observations of GMU professors and teacher partners, informal interviews of several faculty and teacher team members, and document review. A paired-samples t-test on pre-post faculty data for comfort levels and for frequency of use was performed. Significance was set at .05. A Cronbach's Alpha Reliability (.9571) was conducted on the post-survey. Qualitative data from the interviews and classroom observations were reviewed for common themes among the participants. Data reported reflects pre- and post-surveys from twelve first year teams of GMU faculty and K-12 teachers. Data also include classroom observations of 9 professors, and 9 teacher partners, and informal interviews with 7 professors and 3 teachers.

Based on a 4-point Likert scale, three of the items on the pre-post questionnaires were significant. Under frequency of use faculty rated their use of technology imbedded in pedagogy at a higher level on the post-test (Pre-test Mean=2.0, Post-test Mean=2.8, p=.012). Under comfort level faculty rated an increase of comfort in modeling the use of technology in the K-12 curriculum (Pre-test Mean=2.75, Post-test Mean=3.3, p=.027) and in participating in online professional development and collaboration
with other education professionals (Pre-test Mean=2.6, Post-test Mean=3.6, p=.004).

Findings of all other data collected indicate that:

1. Overall, as a result of the mentoring relationships, professors integrated technology in ways they would not have without the grant opportunity.
2. Over 80% of the teams formed a close relationship that resulted in an increased use of, understanding of, and infusion of technology by the faculty.
3. Overall, faculty partners increased their technology skills and level of comfort whether they were novice or advanced technology users prior to joining a team.
4. Several factors promoted positive professor-teacher-mentor relationships:
    - The pairing of professors with teachers who had several years of experience at a variety of grade levels (especially at the elementary school level)
    - The pairing of professors with teachers who had the resources to model a variety of uses of technology (e.g., whole group in a lab, small groups in a classroom, a variety of software programs)
    - Provision of release time for teacher-mentors to meet with professors
    - Description of clear goals, objectives, and expectations of all parties involved at the onset of the project

Discussion

The results of this study provide evidence for further efforts for one-to-one mentoring between university faculty and K-12 teachers in order to ensure faculty members develop the necessary skills and knowledge needed to integrate technology into their teacher preparation courses. Pairing the faculty members with K-12 teachers allowed them to see the challenges of integrating technology in K-12 education. It also gave the faculty the opportunity to explore a variety of software programs and websites. Such opportunities have resulted in an increase of technology integration in the faculty partners' courses.

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Perceptions Held by Participants in a Preservice Teacher Preparation Program Regarding the Role of Technology in Education

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Abstract: The PT3 funded program at Arizona State University investigates the effects of integrating technology skills in the preservice teachers' methods courses. How preservice teachers will integrate computers in their teaching practices tends to be framed by their perceptions about the role of technology in education, their experiences in their undergraduate teacher-training program, and the role models they encounter along the way. Through a series of focus groups this study attempts to capture the perceptions the held by preservice students and their instructors towards the role that technology plays in teaching practices (K-8).

Introduction

In the face of rapid advancements in technology, possibilities for enhancing instruction have equally expanded. Those who will be primarily responsible for the implementation of technology in education will be classroom teachers (Piña & Harris, 1993). Therefore, it is important to examine the perceived role of technology in both the university and the K-12 arenas, where preservice teachers transition from students to practicing teachers. Researchers have identified key obstacles to infusing technology into preservice teacher training. For methods instructors, a lack of university faculty training, lack of administrative expectations, an inadequate amount of time for skill development, plus lack of technical support have contributed to faculty inefficacy regarding technology use (Ertmer, 1999). The resultant lack of appropriate modeling by classroom teachers and teacher-educators presents a considerable obstacle (Beyerbach, Walsh, and Vannatta, 2001). In conjunction with the PT3-funded initiative, one large university envisions technology as an integrated component in a field-based teaching experience for preparing teachers. Students' experiences in this field-based model include the following: a) modeled activities; b) opportunities to develop and implement technology-rich instructional activities in authentic teaching situations; and c) technical support (Brush, Igoe, Brinkerhoff, Glazewski, Ku, & Smith, 2001). The research discussed in this paper focuses on collecting comparison data from participants in this initiative. The data collection is aimed at addressing the following questions: 1) What perceptions do methods faculty and preservice teachers hold regarding the role of technology in K-8 environments? 2) What beliefs and attitudes do methods faculty and preservice teachers have related to teacher preparation for technology integration?

The Study

Participants included four methods course instructors who conduct field-base courses, and eight preservice teachers who participated in the field-based experiences. In order to ascertain the perceptions held by participants, four focus groups were formed: Language arts / social studies methods faculty (n=2); math and science methods faculty (n=2); Preservice teachers participating in language arts / social studies methods courses (n=2); and Preservice teachers participating in math / science methods courses (n=2). Data were collected in October 2001. A researcher led each focus group separately using a semi-structured interview protocol. The protocol questions related to current uses of technology, beliefs regarding the role of technology in education, perceptions of the effectiveness of preservice teacher preparation for technology integration, and ideas for effective technology integration preparation. Each one-hour session was taped and transcribed. The results were analyzed for overlapping and contrasting themes.

Findings

The overall findings indicate that technology as a learning tool is seldom modeled in an educational setting, either in methods courses or in the K-8 classroom. The preservice teachers in this study tended to minimize the role of technology in this formative stage in their careers. Dedicating the extra time towards learning new skills and developing instruction using technology skills were viewed as impediments to change from the traditional method of instruction.

Focus group data indicated five trends. *1. Perceptions held regarding the importance of technology in education*: Pre-service teachers viewed technology with a mixed importance. Member of this group felt that technology made students "lazy" and perceived important skills were being lost as the consequence of computers. Pre-service teachers generally felt the Internet provided a positive, but limited, resource for information. Although the methods instructors regarded computer literacy as important, they cited online investigations, graphing data, and communicating with peers as more appropriate uses technology in education. All groups thought it would be easier to introduce technology in grades above the primary level (K – 3). The language arts / social studies faculty indicated technology use was important when it "fit neatly into the flow of real classroom life," but they could not articulate a means for accomplishing this. *2. Classroom experiences and observations*: In response to inquiries in this area, the pre-service teachers were generally more negative than positive. Each classroom had at least one computer, but its apparent role was non-educational. A typical comment was: "I assume it is used by teachers for grades and worksheet." Methods instructors had few personal experiences with technology integration. Computer use was limited to personal productivity, such as email and a student database. *3. The quality of preservice teacher preparation*: Preservice teachers felt ill prepared for technology integration in. One stated, "I'm computer illiterate...I don't see myself using the computer to instruct students." Methods instructors felt students possessed basic skills, but they were not prepared to use these skills as instructional tools. *4. Perceived impediments to integration of technology in education*: The most frequently mentioned impediments to integration of technology were time to learn skills, time to develop integration strategies, insufficient resources, and insufficient support. Preservice teachers had not been encouraged to try a technology-based lesson, nor did they consider it as part of the school culture where they served as interns. The methods instructors identified a lack of training opportunities, on-site technical and instructional support, and reliable hardware as impediments. They were motivated to integrate technology more in their courses, but felt uncomfortable with their current skill level. *5. Perceived solutions for the future:* More time, access, and resources were identified as keys to successful technology integration in the teaching/learning environment. Pre-service teachers agreed that the modeling of lessons using exemplary technology integration was important. Methods instructors felt a minimum of a 5 computer workstations in each classroom; a projection system to display computer output; and support (instructional and technical) would be a good start.

Conclusion

The focus group results suggest that he greatest impediments to integration are time, information, and equipment. The implication is that this is true from the university to the elementary classroom. The use of technology in teaching concepts is only minimally observed or practiced (if at all) by any of the groups, instructors or preservice teachers. Therefore, it seems unlikely that the use of technology for the enhancement of learning is perceived as a significant educational strategy. Methods faculty expressed a willingness to integrate more technology into their teaching, but they felt a need for training and support. Unless preservice teachers observe exemplary use in the classroom and by the university faculty, it will not be deemed important. Unless they are encouraged to integrate technology into practice lessons, they cannot expect to experience its benefits. Unless the equipment is there and functioning, they cannot expect to do either one.

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MOVING FORWARD WITH TECHNOLOGY INTEGRATION: WHAT WE DID ON OUR SUMMER VACATION

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Abstract: The practice of using mini-grants to encourage faculty members to explore using technology with their students has been documented as an effective model of professional development (Strudler & Wetzel, 1999; Strudler & Weiss, 2001). With the 2001 mini-grants, Project THREAD took the concept a step further and implemented the Summer Technology Institute. This series of workshops provided faculty with hands-on technical training as well as various methods of integrating technology throughout their courses. By providing both technical and pedagogical skills associated with technology, the 2001 mini-grants proved to be even more successful. This paper will discuss the Summer Technology Institute and findings related to its implementation. For more information and examples of faculty projects please see: http://www.unlv.edu/projects/THREAD/.

Project THREAD (Technology Helping Restructure Educational Access and Delivery), is a U.S. Department of Education PT3 grant awarded to the University of Nevada, Las Vegas. As part of the grant's overreaching goal, Project THREAD has implemented programs that weave together a mixture of new and existing learning opportunities in order to prepare pre-service teachers for tomorrow's technology-rich classrooms. One such initiative was the Summer Technology Institute, held during the 2001 summer session at UNLV.

The Summer Technology Institute consisted of a series of workshops and one-on-one training to support faculty taking part in Project THREAD's mini-grant program. Under the mini-grant program, UNLV professors brainstormed ways that they could effectively integrate technology into student learning activities. They then submitted proposals that included the specific kind of technology that they would use as well as how they planned on integrating this technology into their teaching. In exchange, the mini-grant program offered a professional stipend to cover the time and expense required to learn new technical skills, redesign the courses, and implement the new course modules. In order to assist faculty with this challenge, Project THREAD implemented the Summer Technology Institute to provide ongoing support throughout the course of the program. As a final part of the mini-grant program, faculty were required to update their course syllabi to reflect the integration of technology.

Specific objectives of the mini-grant program and the Summer Technology Institute included:

- enhancing the ability of university faculty and field supervisors to effectively model technology use and support pre-service teachers in their use of technology;
- making technology resources readily available to faculty so that they will have access to varied and necessary models and resources for their use in teaching, and
- helping university faculty modify their courses to meet ISTE standards for integrating technology.

The goal of the program was to provide a means for faculty to make time in their schedules for professional development and to provide training and support based on their needs. During 2000, thirteen College of Education faculty members took advantage of this opportunity. While the program was successful, (Strudler & Weiss, 2001) it was a challenge to meet all of the training and support needs on an individual basis. In the following year, the Summer Technology Institute was implemented, as the mini-grant program expanded throughout the UNLV campus, to include seven departments and four colleges. In 2001, twenty-one mini-grants were awarded to 25 faculty members working on 15 professional development projects. Projects included instructional use of digitized video, teaching with educational software, and using web-based resources.

The workshops of the Summer Technology Institute were carefully designed to meet the technical and instructional needs of faculty. Various workshops, such as "Introduction to Imaging with Digital Cameras, Video Cameras, and Scanners," "Creating I-Movies," and "Creating Web Sites Using Dreamweaver" focused on specific technical skills. Other sessions concentrated on integrating technology in the classroom with sessions like "Technology in the Elementary and Secondary Math Classroom," "Technology in the Science and Social Studies Classroom," and "Teaching with a Mobile Lab." Workshops focused on technical skills as well as integrating technology were offered because the current research shows that professional development involving technology must include instructional support in order to be successful (Ronnkvist, Dexter, & Anderson, 2000).

In light of this research, faculty members were advised as to which workshops they should take in order to best help them achieve their integration goals. In addition, project staff offered ongoing support, including help with hardware/software product selection and installation, as well as individualized instruction and access to useful Internet resources. By providing opportunities to learn about integrating technology that were site-based, ongoing, content-focused, and involved faculty as active learners, Project THREAD was able to create a series of workshops that were based on an effective model of professional development (Birman, Desimone, Porter & Garet, 2000).

Outcomes

Reaction to the 2001 Summer Technology Institute was overwhelmingly positive. Thirty-seven faculty members participated in at least one session. Over the course of three weeks, there were a total of 197 registrations for the 21 sessions. Faculty used the opportunity to participate in the mini-grant program to learn ways that they could incorporate technology in their teaching practices. All of those faculty members attending workshops and receiving mini-grants indicated in workshop evaluations that they had gained skills and/or knowledge and would use this knowledge with their students (Anderson, 2001). The next step will be to begin a comprehensive planning process based on the ISTE-NETS Standards for Teachers. This will include visiting College of Education faculty to examine how they have integrated the technology learned during the Summer Technology Institute and throughout the mini-grant program.

Future Directions

For the 2002 mini-grant program, we are considering creating specific strands which determine the type of technology that will be used by faculty. These might include digital video technology, productivity tools, and online teaching and learning. By concentrating the areas of mini-grants, we would be able to better tailor professional development workshops to meet the specific needs of instructors. Also, with the Summer 2002 Technology Institute, Project THREAD plans on offering a clear sequence of workshops that would provide an ideal balance between technical and integration skills. These sessions would be required of mini-grant participants so that they could develop the necessary skills in order to effectively integration technology in their courses. Through implementing specific technology strands and expanding summer institute sessions, Project THREAD will continue to visit the mini-grant concept to improve upon this professional development model.

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RESTRUCTURING THE FIELD EXPERIENCE COMPONENT OF TEACHER PREPARATION

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Abstract: This paper reports on initiatives to restructure pre-service teachers' field experiences to support the integration of technology. The field experience component is multifaceted and involves close coordination with the local school district. Implementing changes in this placement process poses challenges to planners and coordinators. Several ongoing projects are described that address systemic changes in the process. Included is information on creating request options for students, revising student handbooks, addressing the development of field supervisors, and providing alternative models for students' field experiences.

Introduction

Project THREAD (Technology Helping Restructure Educational Access and Delivery), is a U.S. Department of Education PT3 grant awarded to the University of Nevada, Las Vegas (UNLV) in collaboration with the Clark County School District (CCSD), the nation's fastest growing urban school district. The project's overarching goal is to weave together a mixture of learning opportunities to prepare pre-service teachers for tomorrow's technology-rich classrooms (Strudler & Heflich, 2000). A critical component of meeting this goal has involved revising expectations and procedures for students' field experiences. This paper documents our efforts in this area. It begins with some brief background information, followed by a description of specific initiatives, and concludes with a discussion of our outcomes thus far and future directions that we envision for our program.

Background

A study of first year teachers in CCSD confirmed gaps in their preparation to use technology. In a recent survey, only 25% of beginning teachers reported that they were required to teach a minimum of one lesson using computers in their field experiences (Strudler, McKinney, Jones & Quinn, 1999). This finding is consistent with the survey reported by Willis & Mehlinger (1996), which concluded that technology was barely considered in student teaching placements and only a minority of student teachers were required to teach with computers in student teaching. As the literature attests, this component of technology integration in teacher preparation is clearly the most lacking, and arguably, the most important. Since technology has been implemented unevenly across K-12 schools and classrooms, it is difficult to place education students with teachers who are both accomplished in technology integration and have adequate access to appropriate computer resources. Researchers have concluded that this would likely remain a problem for some time (Mergendoller, Johnston, Rockman & Willis; 1994). But as the Office of Technology Assessment's report

noted (U. S. Congress, 1995), if information technologies are to become an integral part of teacher education programs, "K-12 and university educators must work together to integrate technology into curriculum and classroom practice" (p. 165). Project THREAD is addressing this need through various collaborative initiatives designed to support the integration of technology into students' field experiences.

Field Experience Initiatives

The field experience component of the grant involves a collaborative effort between UNLV and CCSD, and is clearly entrenched within each of the organization's policies, procedures, and cultures. Major changes, therefore, are not easily implemented, especially due to the large number of student teachers that need to be placed each semester. In view of this, rather than attempting to revamp the entire placement system, we decided to initiate an opportunity for students to request a placement with a technology-using teacher. While our goal, of course, is for all student teachers to be placed in technology-rich environments, we adopted the strategy of placing those who made special requests as we transition toward providing such experiences for all students. We also sought to impact the entire program by revising current expectations for technology use in field experiences. In addition, we addressed the need for professional development for field supervisors as well as experimented with alternative models for students' field experiences. Each of these initiatives is discussed below.

Creating Request Options

Based on effective practices identified in exemplary colleges of education (Strudler & Wetzel, 1999), students now have the option to request student teaching placements with a technology-using teacher. UNLV's field experience office collaboratively planned with CCSD to make this option available. The field experience applications were revised to include this preference, and the office adjusted its database to include this information with the student names forwarded to the school district for placement. The school district placement office then began the process of trying to match interested students with mentor teachers who commit to infusing technology in students' field experiences. While we initially attempted to do this for practica and student teaching, it was decided by CCSD to forego inclusion of practica students due to the difficulty of accommodating such placements for all who requested them.

To appreciate the level of collaboration needed to modify this process, it is helpful to review details of the process of placing a student teacher. On the university side, once the prospective student teachers have completed all requirements and forms, their names are entered into a database which includes their requests for grade levels, location, and a column indicating whether they request placement with a technology-using teacher. The database is then forwarded to the school district office and principals from around the district are contacted to see if they are interested in hosting student teachers. The principals consult with their teachers and decide what placements should be made based on the student teacher requests. Once the teacher has accepted the student teaching placement, the information is forwarded back to the university so that supervising teacher assignments can be compiled.

The selection process for the cooperating teachers has posed clear challenges to the goals of the project. Initially, criteria for technology-using cooperating teachers were not clearly defined in the grant. Though we had hoped that principals would select teachers who were accomplished in their use of technology tools in the curriculum, in some cases principals viewed this as an opportunity to provide technology training for teachers and thus selected those most in need. Furthermore, cooperating teachers voiced concern about their roles and whether or not their technology skills were adequate for the task.

Eventually, we fine-tuned our expectations to meet this challenge and communicated more clearly with school leaders. To address these issues, more site visits were initiated, an online communication folder was established, and information booklets with frequently asked questions were developed to address the concerns of the teachers and support them in their role of mentoring student teachers. A sample booklet is available at the Project THREAD website: http://www.unlv.edu/projects/THREAD. Similarly, expectations for the project were more clearly articulated for students, thus minimizing confusion and resulting in greater satisfaction with the program.

What is emerging from this process is a clearer picture of what we need for a good student teaching experience that integrates technology. Communication with the schools through the principal has proven to be quite beneficial in developing a positive presence for the grant. Communication with each school's technology coordinator (known as educational computing strategists within CCSD) has resulted in increased support for student teachers as they plan and implement technology-integrated lessons.

Revising Handbooks

While the option for technology-based placements helps pre-service teachers who are motivated to use technology, we are committed to making technology a required part of all students' field experiences. To accomplish this, key faculty and field supervisors were selected to participate in a planning retreat in the summer of 2001, led by our Associate Dean and Director of Teacher Education. The purpose of this session was to revisit and revise expectations for field experiences. This effort, funded by Project THREAD, was designed to address current professional standards, including the integration of technology in various subject areas.

At this point, the committee developed a revised draft of the handbook under the direction of the Associate Dean. The draft is currently under review by other education faculty members and an educational technology specialist. After all of their recommendations are received, the committee will reconvene and finish revising the document. Once the practica revision is completed, a similar process is envisioned to revise our student teaching handbook.

Including Supervisors

Orientation meetings for university supervisors included a component about the goals of Project THREAD and technology use in field experiences. At those meetings, responses from the field supervisors indicated a need to provide them with information on technology uses in the classroom. To accomplish this task, we conducted a needs assessment with field supervisors. Results of that survey were used to design a series of workshops to introduce the supervisors to a range of technology uses in the classroom. A majority of the responding supervisors (75%) indicated that technology was very important in teacher education. We found, however, that many of the supervisors had minimal comfort with computer applications that enhance classroom instruction. The workshops, designed to address these needs, focused on presentation software, generic productivity applications, and an introduction to digital still and video cameras.

Altogether, 27 field supervisors participated in our first series of workshops. The hands-on practice time and one-on-one support helped develop their personal skills with technology. In addition, field-based videos were used to provide a framework for understanding and "seeing" what technology use looks like in K-12 classrooms. This combined approach of enhancing personal skills and providing a framework for understanding is a key piece in developing their capacity for assessing technology use during practicum and student teaching placements as well as supporting the efforts of their students. The impact of these workshops was best summed in a comment from one of the participants: "Technology will have a major impact on education...I feel fortunate to be able to participate in this worthwhile project. As a supervisor of student teachers, I need to have as much knowledge as possible to be able to help them out in the field."

Providing Alternative Student Placement Models

One model involved the creation of a cluster of five professional practice schools in conjunction with CCSD. Two elementary schools, two middle schools, and a high school all located within close proximity of each other, were identified to focus on creating positive field placement opportunities for pre-service teachers. The cluster schools all serve large populations of low-income, minority, and special needs students. A second model, involving the Paradise Professional Development School (PPDS), advanced technology integration through a field-based cohort program.

The Cluster School Model

In planning for the implementation of our project with our school district partners, we did not explicitly address the levels of technology at the schools or the levels of use by the teachers. Selection of the schools was based on meeting demographic criteria and the recommendations of CCSD's administrators. We were not in a position to dictate partner schools that were chosen and believed that it was important to work with the schools that were selected. As was previously discussed, principals at the school sites selected the cooperating teachers for the project.

Typically, cooperating teachers from the school district attend four half-day sessions designed to address their role as mentors. For this project, an additional half-day was added to each of the four sessions. The focus of the additional half-day was to support cooperating teachers in developing their skills with technology as well as learning how to integrate technology in teaching activities. Project THREAD funded the additional time. CCSD and UNLV personnel delivered the workshops jointly. Over the past few semesters, an average of 26 cooperating teachers participated in these workshops.

During the fall, 2001 semester, Project THREAD expanded its professional development workshops for cluster teachers to include an online graduate course, Internet for Educators. The professional development activities in this course were designed so that participants could learn how to create web-based curriculum materials and effectively model using technology in the classroom. The classes were ongoing, content-focused, and involved teachers as active learners, traits that make professional development more effective (Birman, Desimone, Porter & Garet, 2000).

Paradise Professional Development School (PPDS) Model

A second alternative program that seeks to expand technology use in field experiences is the Paradise Professional Development School. This initiative offers expanded opportunities over the traditional field placement system to articulate expectations between the university and its K-12 partner school. The PDS cohort model, planned collaboratively by UNLV and CCSD, was designed to prepare pre-service teachers to be effective in urban settings with diverse student populations. Technology integration was identified as a major priority for the program.

It should be noted that similar to the cluster schools, we consider the cooperating teachers and administrators to be our "clients" in the project. While our ultimate goal is to better prepare pre-service teachers, we seek to do this by restructuring the system and increasing the capacity of UNLV and CCSD personnel who work within it. To help accomplish this goal, a comprehensive series of monthly workshop (four per semester) were presented for PPDS mentor teachers and university supervisors in the school. Workshop topics included: Mentoring and Communication, Meeting the Standards: Technology and Others, Students and Teachers as Researchers, and a Constructivist Approach to Teaching and Assessment. Project THREAD personnel and the Educational Computing Strategist taught the workshops.

Conclusions/Future Directions

Our experience with reforming pre-service field experiences provides further evidence for the importance of this work and the challenges that are involved. In retrospect, we believe our "two-pronged" approach for reform is a good one. That is, we have chosen to focus on selected alternative programs—a cluster of professional practice schools and a technology-rich professional development school—while also addressing the larger program and the need for implementing systemic change at that level. We have accelerated the change process by working with a subset of "volunteer" pre-service teachers, schools, and cooperating teachers, while fully recognizing that our longer term goal is to reform the entire program to ensure that technology integration is a required and supported component of all students' field experiences.

For the alternative programs, we have learned about the need to clarify our expectations, and communicate them more clearly to pre-service teachers and school district partners. Via brochures, handbooks, and online information, we are finding that participants better understand our goals and expectations, and satisfaction with the program has increased. We have also found that by being more proactive in selecting

partners at the "front end" who support the goals of the program, we can minimize problems that will likely arise. With our grant, we have been able to "buy" time for technology development through our workshops. However, issues of support and access within the schools are also critical factors in the success of the placements and are items that cannot be bought. As the literature clearly attests, we have learned that schools with strong administrative support for the program from the principal and the on-site technology coordinator offer the greatest access and support for our student teachers.

We are currently in the second year of our PT3 Implementation grant—which was preceded by one year as a capacity-building project. During that time participating schools have changed (e.g., two partner school became Edison schools and needed to withdraw from our program), and we have benefited from our experience in selecting new partners. For the final year of our grant (2002-03), we plan to ask all partner schools to assess their participation in the project and reapply if they would like to continue. We will assess how well we believe the schools supports the goals of the project and possibly make a change or two to ensure that our collaboration with partner schools provides a "win-win" for all concerned. We see this as a good "next step" to build upon the momentum that we have established thus far in accomplishing the goals of the project.

We will also seek to create more formal procedures for the placement of student teachers with technology-using mentor teachers. Our goal is to institutionalize all changes so that program initiatives will continue beyond the life of the grant and the particular individuals currently involved. As with our current effort to revise the field experience handbook, we will continue to formalize expectations and procedures in writing and seek "buy in" from key UNLV and CCSD personnel.

As we continue this work, ongoing project evaluation efforts will address the effectiveness of students' field experiences. Surveys will be administered to pre-service teachers at the end of their student teaching experience, along with exit interviews, lesson plan analyses, and classroom observations. Overall, we hope to gather all-important evidence to document if our efforts to integrate technology into students' field experiences are indeed impacting the quality of their preparation for tomorrow's classrooms. For now, though, we view our initial efforts regarding field experiences as becoming "unstuck" and are very pleased with the collaboration we have had with our K-12 partners. Through these initiatives, we believe Project THREAD is making significant progress toward achieving its goals of supporting pre-service teachers in their preparation for teaching in 21st century classrooms.

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Teachers as Leaders Using Technology: Evidence from Innovative Changes to Teacher Education

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Abstract: The Teachers as Leaders Using Technology group is a consortium of one institution of higher education and three elementary schools, located in a large metropolitan area. Faculty (P-12 and college) and prospective teachers are engaging in technology-rich learning experiences, both on campus and in fieldwork settings. An Instructional Technology Specialist provides in- and out-of-class support to both groups. This innovative teacher education project aims to increase the likelihood that new teachers will integrate technology into their classroom practices, and that faculty and teachers will use technology to create improved curriculum for all students, helping to close the digital divide.

Problem

Despite many advances in educational technology for P-12 students, pre-service teachers who learn about technology tools and applications during their preparation often do not effectively integrate technology into their classroom teaching once they become certified. Prior to that point, they need enough practice with new technology skills to feel confident enough to use them with students (U.S. Office of Technology Assessment, 1995). They need specific goals and expectations, reassurance, and the availability of in-class assistance during their first classroom methods and teaching experiences (Brand, 1998). Some studies have shown that the most crucial determining factor in whether teachers will integrate technology into their classrooms is the level of support they receive from school administrators (Sandholtz, Ringstaff & Dwyer, 1997). Thus this problem is multi-faceted and systemic, going beyond the often-stated needs for thorough instruction in educational technology tools and applications, understanding of cognitive psychological principals of learning from different media, and constructivist teaching methods (e.g., Grabe & Grabe, 1996). In addition, the problem raises the issues of faculty modeling of technology use, technology access during fieldwork and student teaching, and training and support during education coursework and beyond. The difficult problem of digital equity for diverse populations is also inherent in any discussion of technology integration (Bennetts, 1999).

To respond to these needs, the Education Department at the College of St. Catherine's, a private women's college in the Twin Cities area, is engaged in a project called Teachers as Leaders Using Technology, funded by a federal PT3 grant. The department is implementing far-reaching changes affecting faculty and students, policies and practices, to ensure that graduates will be better prepared to integrate technology into their future teaching. The Department has created partnerships with a diverse set of local schools that are serving as fieldwork and student-teaching locations for the prospective teachers. The varying amounts of technology at use in these partner schools, as well as the differing school sizes, structures, and diverse student populations, will allow comparison of the effects of St. Catherine's changes in various teaching environments.

Proposed Solution

The purpose of the Teachers as Leaders Using Technology program is to prepare teachers who are proficient in using technology to increase P-12 student learning, and who can use technology to improve their own productivity. Three major changes are being implemented over three years, with the goal of becoming self-sustaining. (1) Faculty (P-12 and college) and prospective teachers are engaging in technology-rich learning experiences both on campus and in fieldwork settings. A major factor in this change is a laptop lease program required for all prospective teachers. The belief is that using computers and associated devices should become as natural as using books, pens and paper. Students will use their laptops for classwork, assignments, and assessments. During fieldwork and student teaching, prospective teachers will prepare lessons, give presentations to students, use a digital camera, and create grade-keeping spreadsheets. Faculty will revise their syllabi, hold monthly discussions regarding standards for technology use, model the use of technology in the classroom, and communicate with students via email and the Department website. (2) An Instructional Technology Specialist (ITS) is providing in- and out-of-class support to both faculty and prospective teachers. The ITS will provide workshops, training, and support for all aspects of the technological changes. She travels to the fieldwork and student-teaching sites and provides assistance to prospective teachers and faculty there. She participates in interdisciplinary faculty study groups to discuss cross-discipline applications, technology-related classroom experiences, and many other aspects of integrating technology. (3) An Instructional Technology Network to be implemented in Year Three will sustain support after students complete the teacher preparation program. Graduates will access technology and pedagogy support that will be monitored by a web-manager. Users will ask questions, share information and pedagogical ideas, interact with others striving to integrate technology, and learn about new resources.

Goals

The goals associated with these three changes are: (1) for faculty and prospective teachers to develop greater potential for infusing technology into teaching and learning experiences by experimenting with a variety of applications both in the college classroom and in the P-12 settings; (2) for faculty in the partner schools and the college of education, as well as the prospective teachers, to use technology to design curriculum that responds to all students' learning needs and styles, and that demands the use of higher-order thinking skills, resulting in more effective problem-solving and decision-making; and (3) for graduates of the teacher education program and P-12 teachers in the partner schools to stay connected and receive on-going support via an Instructional Technology Network. To accomplish the three major goals of the project, the Department will provide technology support for prospective teachers and faculty (college and P-12) throughout the process of closely aligning on-campus classroom experiences, fieldwork experiences, student-teaching experiences, and first-year teaching experiences with the National Educational Technology Standards (NETS).

Examples of the technology-rich learning experiences that faculty and prospective students are engaging in include learning new technological tools such as spreadsheets, digital cameras, video editing, and presentation software techniques. They are also studying content-based software, how the use of technology and related teaching practices can affect student learning, and issues involved in teaching students about technology. Students are keeping ongoing electronic portfolios of their experiences, assignments, curriculum designs, lesson plans, and other products involving the use of technology. The portfolios will serve as assessment tools as well as records of student work and references for their future teaching. Faculty and prospective teachers are currently attending workshops on computer maintenance, Access data base creation and use, Lotus Notes, Excel, PowerPoint, and Publisher. Future workshops will be created based on the needs of the program as it evolves. Through their fieldwork and student teaching in the consortium schools, prospective teachers are learning about the wide variety of technology applications already available for school children. At one partner school, students will experience the limitations of a hodgepodge system of donated computers in need of upgrading as well as the creative ways teachers can capitalize upon even basic resources. At another they will encounter, some standard applications for libraries and media centers, the use of email for communication within a school and district, and software resources in all content areas. At the third they will have the opportunity to use technology fully infused throughout a large school, including specialized equipment and

software for the hearing-impaired, flight simulators and other high-level applications, and sophisticated technology use for all aspects of education.

Research and Evaluation

To assess the success of the project, longitudinal research is being conducted by an external evaluator. During the first year, students beginning the program with the newly implemented departmental changes will be compared to second-year students who were not the targets of the changes. These beginning students will then be followed for three years to look for evidence of continued improvement as the departmental changes become more solidified. In the second year of the program, research will focus on student teachers who have experienced the Department changes, as compared to student teachers from the previous year who did not. In the third year, the Instructional Technology Network will be created to support the first-year teacher graduates who were the beginning students in Year One. These teachers will be compared to previous first-year teachers who did not have access to the Network or other departmental changes.

Prospective teachers' comfort and ability with using educational technology tools and applications will be measured through performance-based assessments, including but not limited to electronic portfolios and observation of their teaching, as well as through self-report surveys. Variables that are expected to modify their success in integrating technology into their teaching include the location and circumstances of their student teaching and fieldwork experiences (e.g., higher- vs. lower-tech schools, focus on immigrant populations, relationship with partner school administrators and mentor teachers), the amount of support and training they receive (e.g., contact with the ITS, workshops, modeling of technology use by faculty), and their attitudes toward technology in education.

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University of Florida Teaching and Technology Initiative

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The University of Florida Teaching and Technology and Technology Initiative is a PT3 funded initiative designed to facilitate and accelerate systemic change related to technology integration in our teacher education program. The initiative involves the collaboration of several organizations within the University of Florida, the School Board of Alachua County, Apple Computer, and the Center for Technology in Learning and Teaching at Iowa State University. In this poster session we will outline the goals of the project, overview the ongoing activities we are supporting to meet these goals, share the implementation strategies we are using to meet the needs of our teacher education program, and discuss our evaluation strategies which are designed to ascertain the effectiveness and impact of the project.

Introduction

In the PT3 trailer movie, Tom Carroll remarked that the PT3 program is about creating teaching and learning environments that promote and facilitate learning with a capital 'L' and technology with a lowercase 't'. This statement captures the essence of the University of Florida Teaching and Technology Initiative (UFTTI). This initiative is a PT3 funded project designed to facilitate and accelerate systemic change related to technology integration in our teacher education program. The UFTTI involves the collaboration of several organizations within the University of Florida, the School Board of Alachua County, Apple Computer, and the Center for Technology in Learning and Teaching at Iowa State University. The goals of the initiative are to:

1. Develop a comprehensive institutional vision for technology integration that will consider new state and national standards involving a variety of stakeholders and enable effective technology integration in our traditional and nontraditional teacher education programs.
2. Design and implement innovative faculty development efforts that will enable professors working with preservice and potential preservice teachers to effectively implement content-specific, technology-based instructional strategies in their courses and model uses of instructional technology in their teaching.
3. Create opportunities for technology-based field experiences that will enable students in the Unified Elementary Proteach and "Project SITE" programs to observe and implement curriculum-focused, technology-based instructional strategies.
4. Facilitate and support college-wide implementation of electronic portfolios designed to promote student-centered assessment.
5. Disseminate project results and resources to our faculty and other teacher education institutions.

Steps Toward the Goals

Upon notification of PT3 funding beginning in July 2001, we began to implement our action plans for each of the goals previously listed. With streamline budgetary and personnel resources at the University of Florida as a part of our teacher education environment, our action plans are designed to not only be grounded in theoretical frameworks but to also take advantage of existing programs, resources, and

personnel. We will briefly share some of our action plans in this paper and will expound in more detail events occurring in the UFTTI at our poster session.

Establishing an Institutional Vision

Although the College of Education has made progress in equipping the college with technology, there has not been consistent leadership in the area of instructional technology. We believe it is critical that the foundations for establishing a vision for the use of technology in the College of Education begin. We recognized that building consensus and developing a vision for the College of Education will take considerable time and effort. Therefore, to guide us in this process we relied upon the various educational change models found in the book *Surviving Change: A Survey of Educational Change* Models by James B. Ellsworth as well as the guidance from others including our advisory board and external evaluators.

Providing Faculty Development

The faculty development initiatives in the UFTTI are categorized into general faculty development and content-specific faculty development. This action plan has been based upon research that suggests innovative faculty development models which focus on individuals are most effective in producing educational change, that exemplary faculty development prepares teachers to use technology in their discipline, and that effective faculty development efforts enable teacher educators to enhance their instruction so that future teachers are prepared to advance student learning with technology. The UFTTI developed a cohort of Teaching and Technology fellows to provide specialized, content-specific assistance to faculty members in the Colleges of Education and Liberal Arts and Sciences. Also created was the Teaching and Technology Incentive Program for faculty members to conceptualize and implement innovative strategies for integrating technology into their teacher education courses. In addition, we provide an extensive array of technology workshops along with consulting-on demand and a College of Education online support center.

Technology-based Field Experiences

In the UFTTI selected preservice teacher education students are paired with an inservice teacher(s). These teams will focus on implementing an in-depth instructional project and/or series of min-lessons in the classroom. The goals of these field experiences are to create more positive relationships with teachers and schools in our district, provide authentic technology-related experiences for students, and to have a mutually beneficial technology-related experience for the preservice and inservice teacher.

Electronic Portfolios

All teacher education students at the University of Florida are required to develop an electronic portfolio to demonstrate mastery of the Florida Accomplished Practices. These portfolios also provide students with a vehicle to reflect upon their learning as well as communicate information about themselves. Each student's portfolio is a dynamic, iterative document that evolves and expands throughout the student's collegiate experience. Although there has been considerable success in the Electronic Portfolio Project, the PT3 grant has allowed this project to develop a stronger infrastructure that prepares faculty and students to evaluate electronic portfolios for mastery of the Florida Accomplished Practices. In addition, we are striving to develop a culture of faculty buy-in that promotes similar beliefs about and compatible strategies for implementation of electronic portfolios.

Future Steps

As we approach the end of our first year in the University of Florida Teaching and Technology Initiative, we know there is much work still to be done. We will continue to work to establish a vision for the use of technology in the College of Education, strengthen our faculty development opportunities and technology-based field experiences, and expand the Electronic Portfolio Project.

Empowering 21st Century Teachers MPS PT3

Kathy Swope, Milwaukee Public Schools, US

The MPS PT3 catalyst initiative formed a consortium to enrich the teaching/learning process by maximizing the integration of technology across the curriculum. New learning resources that assist higher education faculty and future educators will be identified through innovative learning communities developed through the membership of the consortium. Project activities include: establishing a communication loop of effective practices between National Advisory Board and teacher preparation faculty; increasing effective resources for teacher training faculty; training schools of education faculties on tools which effectively bridge the gap between classroom practices, state and local standards, and assessment; and providing interactive video distance learning which allows for live collaboration among master classroom teachers integrating the use of technology into the curriculum, teacher preparation faculty and pre-service teachers. Anticipated outcomes from these efforts are that future teachers will integrate technology across the curriculum.

The interactive demonstration/ discussion will highlight the activities implemented to meet the goals of the project. The Empowering 21st Century Teachers Consortium includes the Milwaukee Public Schools, Marquette University, the University of Wisconsin-Milwaukee, the University of Wisconsin System, and the Council of the Great City Schools.

The Goals of the project:

- Increase national and state collaboration around the integration of technology in teacher preparation
- Improve the technology integration skills of colleges' and universities' teacher training faculty
- Increase the number of graduates of teacher training colleges/universities who have technology integration skills
- Decrease the existing educational gaps between standards, assessments, and the day-to-day classroom lessons using effective practices and technology-based mechanisms.

Activities include:

- Creation of a National Advisory Board to increase access to national expertise and broaden the knowledge base for integrative technology practices in education.
- Train schools/departments of education faculties on tools which effectively bridge the gap between classroom practices, state and local standards, and assessments
- Provide interactive video distance learning which allows for the collaboration among master classroom teachers integrating the use of technology into thee curriculum, teacher preparation faculty and pre-servicc tcachers
- Develop and distribute video tapes of classroom activities which demonstrate effective technology use in K-12 classrooms.

National Advisory Board

This Board guides the paradigm shift to technology-rich learning environments impacting all educational levels. This National Advisory Board works with the consortium to disseminate and publish project results to Institutions of Higher Education across Wisconsin, the region and nation. This initiative assists colleges and universities in tapping the technological resources both human and tangible, already in place in school systems in order to build capacity at the college level and in K-12 systems. In the scheme of Empowering 21st Century Teachers both college and K-12 school staffs are acknowledged. Under the guidance of the National Advisory Board, each learns from the other.

- Provide in-service training opportunities for teacher preparation faculty on engaged learning using K-12 Master Teachers, who integrate the use of technology into the curriculum.
- Establish a communication loop of effective practices between National Advisory board and teacher preparation faculty
- Increase effective resources for teacher training faculty

Curriculum Design Assistant (CDA)
The CDA is a web-based central knowledge database of instructional plans. The MPS Curriculum Design Assistant (CDA) was developed by teachers for teachers. This successful internet curriculum tool is in its' third revision and is now oracle based with a whole new look and feel. The CDA has been proven to be an effective tool for all K-12 educators and pre service teachers. Educators can share successful standards based instructional plans, units, projects or staff development with peers and pre service teachers by entering them into the central knowledge database. The CDA allows for easy access to state and local standards was well as the ISTE technology standards. Many of the instructional plans integrate technology for instruction and assessment. Modifications and accommodations can also be included in instructional plans so that ALL students can be included and successful! Video streaming is a new enhancement to the CDA.

Video
We have a Milwaukee Distance Learning Group. There are over 50 sites within MPS that now have two way video capabilities. This vehicle is used in a number of ways including enrichment of curriculum; providing rich coursework opportunities, staff development, community programming, administrative meetings, virtual fieldtrips, expanding partnerships, maintaining face-to-face relationships, and connecting with university partners. Preservice teachers are able to be involved in instructional experiences never before possible. Several teachers state: "Educating tomorrow's leaders requires today's children to be exposed to the global community, a reality that interactive technology makes possible." And "Interactive video enhances our curriculum in a powerful way. Our students can connect and share experiences with kids throughout the state and beyond."

Technology Thursdays
Our Technology Thursdays are offered twice a month to provide practical and useful professional development opportunities that merge the latest in learning technologies and the best in pedagogical techniques. Most of these sessions represent a pairing of technology savvy and curriculum expertise, and are led by a team of facilitators. Topics focus on the instructional practice, supported by technology. For example; "Writing Instruction Supported By Technology", Participants in this session learn about using technology to facilitate the writing process using word processing, graphic organizers, publishing software, and some research engines. The emphases includes ascertaining when the use of technology is most effective within the context of the writing process for various grade levels K - 5. Other topics include a focus on mathematics, reading, multicultural education, the research paper, and special sessions for educational leaders. These sessions are open to any teacher, preservice teacher or university faculty. There is no cost to participants, or their school and are brief Two-hour overviews. This provides the opportunity to sample a number of topics without committing to an entire semester of workshops.

We will share the results of this work with an in-depth demonstration of the Curriculum Design Assistant, CDA; a web based tool that gives teachers point and click access to detailed standards based lessons and resources, a discussion of the work of both the local and national advisory board, a show and tell of the various video projects and a glimpse of an innovative staff development model known as Technology Thursdays.

If It's Not Online and It's Not Live, What is It?

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John Sfondilias, University of Illinois, US
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There has been a good amount of discussion in the literature (online and otherwise) regarding the pros and cons of live ("bricks and mortar") versus online (distance) education (Dominguez and Ridley 1999; Knox, 2000; Miller, Smith & Tilstone, 1998). These discussions sometime imply a dichotomy between several modes (face to face, mixed media and distance education) or an all or none approach to teaching and learning that infrequently represents most educational environments. Whatever the long-term future, in the current and near-term, teacher education consists of predominantly live instruction with numerous opportunities for the infusion of technology in the curriculum.

In our PT3 project, we take a pragmatic approach and look at what technologies are available, how technology will be used, what makes instructional sense, and what makes political sense (i.e., what will faculty and teachers accept and adopt?). Technology is integrated into the curriculum, as any instructional method would be through curriculum development (Crotty, 1995). Our evaluation plan assesses the impact technology infusion has on achieving learning objectives of a course. We believe that teaching involves a continuum of technology (and always has), and results in a product that can simply be regarded as "instruction and learning," with its associated goals and objectives. We evaluate how well those goals and objectives are attained. Of course, we attempt to break down, as much as it is feasible, the contribution of the various teaching and learning strategies to learning outcomes. A preliminary evaluation is included in this presentation.

Specific courses in Curriculum & Instruction are targeted for the initial phase of the project. We consider technologies based upon a number of factors including ease of integration, cost (both people and $$), existing campus and departmental support, and potential for maximum positive impact upon teaching and learning using a variety of electronic technologies. These technologies include email, discussion boards, comprehensive course management systems, word processors, Powerpoint, streaming audio and video, electronic portfolio development and java applets. Selected examples of such technology integration are included in this presentation.

Ultimately, regardless of whatever else we accomplish in this PT3 project, our project must show promise for improving the teaching and learning process, which (facilitation, instructional design and curriculum) happens in classrooms. We have designed our technology interventions to be consistent with what we know about how people learn and what constitute good teaching practices. Our integrated model for infusing technology selects and incorporates, peer coaching, collaboration, mentoring, problem-based learning and modeling using new technologies based upon their instructional appropriateness. The overall model is presented with particular emphasis upon how project management and evaluation, and specific technology interventions fit within the teaching and learning communities of practice, while realizing that internet and other forms of technology are useful tools that can provide resources just as a chalkboard, overhead projector or video cassette recorder (Rosen, 1999).

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Revised Standards for ISTE/NCATE Accreditation and National Recognition

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DESCRIPTION: Examine revised ISTE/NCATE accreditation program standards for Educational Technology Facilitation (preparing campus technology leaders) and Educational Technology Leadership (preparing district, regional, or state technology leader).

SUMMARY: The International Society for Technology in Education (ISTE) recognizes that educational computing and technology foundations (NETS for Teachers) are essential for all teachers. ISTE also acknowledges educational computing and technology specialty areas beyond these foundations and has established program standards for initial and advanced programs. These program standards assist teacher education units, and professional organizations and agencies in understanding and evaluating the educational preparation needed for specialization within the field.

Lajeane Thomas, Chair of the ISTE Accreditation and Standards Committee and additional members of that committee will present the newly revised NCATE/ISTE Accreditation Standards for Educational Computing and Technology programs. These two sets of standards are designed to identify standards, performance indicators, and performance tasks identifying what candidates prepared for Educational Computing and Technology Facilitation (ECT-F) and Educational Computing and Technology Leadership (ECT-L) should know about and be able to do with technology

The standards presented address the initial and advanced educational computing and technology programs including: (1) the educational computing and technology facilitation initial endorsement; and (2) the advanced educational computing and technology leadership program. Institutions that offer one or more of these programs should respond to the corresponding program standards. Included in the resources provided in the session are rubrics for use in identifying the level performance for candidates.

Educational Computing and Technology Facilitation -- Initial Endorsement Guidelines

Educational Computing and Technology Facilitation (ECTF) endorsement programs meeting ISTE standards will prepare candidates to serve as building/campus-level Technology Facilitators. Candidates completing this program will exhibit knowledge, skills, and dispositions equipping them to teach technology applications; demonstrate effective use of technology to support student learning of content; and provide professional development, mentoring, and basic technical assistance for other teachers who require support in their efforts to apply technology to support student learning.

Educational Computing and Technology Leadership – Advanced Program Guidelines

Educational Computing and Technology Leadership (ECTL) advanced programs meeting ISTE standards will prepare candidates to serve as Educational Computing and Technology Directors, Coordinators, or Specialists. Special preparation in computing systems, facilities planning and management, instructional program development, staff development, and other advanced applications of technology to support student learning and assessment will prepare candidates to serve in technology-related leadership positions at district, regional, and/or state levels.

These programs prepare candidates to keep abreast of changes in educational computing and technology and their impact on education. In addition, candidates are equipped to utilize and integrate a broad range of educational computing and technology applications to enhance student learning. Finally, candidates will be prepared to work effectively as professional leaders to advance their specific fields within a culturally diverse society. Resources including the standards, rubrics, and guidelines for seeking national recognition through ISTE and NCATE for these university programs can be found at the following Internet locations: http://cnets.iste.org and http://www.ncate.org

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SITE Paper 2002 – Abstract

Radical Change in a Traditional Setting: Lessons Learned

In an age when change is a norm, lifelong learning a critical mandate for prosperity, and technology a revolutionizing force, transforming traditional education practice is a central theme at Valley City State University (VCSU). Beginning with the distribution of IBM notebook computers to all faculty in January of 1996 and to all students at the start of the 1996-97 academic year, VCSU became the first notebook university in North Dakota and of a small number across the country.

With the universal access to notebook computers, the teacher education faculty at VCSU altered teaching and learning significantly. Teacher education faculty can walk into nearly any classroom knowing that they will be able to display presentations developed with PowerPoint, ask the entire class to find resources on the worldwide web, work with on-line courses at any time, and receive e-mail documents which they can display as a basis for class discussion.

Technology has provided VCSU faculty in the teacher education unit with tremendous capacity to revolutionize education both on campus and in the public schools. Integration of technology into the elementary education classroom has been a very important goal of the unit the past three years. To help achieve this goal, the VCSU elementary education department has formed partnerships with six other educational entities to strengthen and improve learning with technology. The department is also in the second year of their PT3 Grant that seeks to provide opportunities for VCSU elementary education faculty, preservice teachers and classroom teachers from the Valley City area to work together to integrate technology into their courses and to create a learning community among themselves for the purpose of using technology to improve learning.

The grant goals include creating a learning community and developing complex reasoning and problem solving skills. VCSU faculty, K-6 teachers, and candidates participate in collaborative projects designed to develop complex reasoning and problem solving skills. Cooperating teachers representing the various consortium schools collaborate with VCSU faculty and candidates to restructure learning experiences in their classrooms that reflect current best practices for using instructional technology strategies and tools. Another goal prepares elementary education graduates to use technology to help their future students improve learning by developing complex reasoning and problem solving skills.

The success of the PT3 grant is a reflection of the direction VCSU has been moving the past eight years. VCSU has been a national leader in instructional technologies and the resources available at VCSU ensure that successful efforts continue and the university will be an example for others to follow.

As VCSU has moved in this direction, we have learned many lessons. The collaborative projects have brought a new level of authenticity to the technology training of VCSU students. But this authenticity has required VCSU faculty to be willing to give up control of the learning setting and be willing to share it with the student and the classroom teacher. We have also learned that our students need to know how to be consultants when they work with classroom teachers. The teachers are at varying stages of readiness to integrate technology into their classrooms. Some are already deeply involved while others still feel unprepared. We have sponsored workshops to help the teachers gain skills and brainstorm ideas. We are preparing consultant guides for our students to help them better meets the needs of the teachers, especially those who are in the beginning stages of technology use.

Besides the above, this session will include in-depth results of the evaluations of the workshop and collaborative projects and the strengths and challenges the data reveals.

Developing Interactive Computer Tutorials for Current and Future Teachers

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Increasingly, proficiency in the use of computers is becoming a necessary skill for all teachers. They need to use computers for teaching, class and lecture preparation, class assignments, class management, research, and professional development. However, many current teachers lack even the basic skills for operating a computer, let alone integrating the use of computers into their teaching. As a result, many local and national programs have emerged to offer teacher training on the use of computers and the use of computers in teaching. Alcorn State University and Mississippi State University have received grants from the US Department of Education, Preparing Tomorrows Teachers to Use Technology program, to provide this type of training.

In both programs, the training includes hands on activities and interactive collaborative sessions that allow for exchanges between the teachers and between teachers and trainers. The training targets basic skills as well as more advanced skills and strategies for classroom integration. Teachers attending our workshops have felt that they have learned a lot and their confidence about the use of computers have increased significantly. To help insure that they can carry that newly acquired knowledge beyond the workshop, we found it necessary to provide them with resources that they can use on their own at their own pace. The resources should help them reinforce the skills that they have learned during the workshops and work on more advanced activities than the ones they were able to complete during the workshop.

Our strategy was to insure that the resources are easy to use and that they provide a gradual approach to the learning process. Additionally we wanted them to be interactive and to meet the needs of people of different learning styles and skill levels. Skill Level 1 tutorials are intended to meet the needs of teachers who have little or no computer skills. Level 2 tutorials are for teachers with more advanced computer skills. Another important component was to have some teachers participate in authoring some of these tutorials and to sometimes provide the actual training. A study by the "The Computer Learning Foundation" suggests that training of teachers by teachers is more effective then training by administrators [Alden.] By providing and authoring the training teachers experience the benefits of technology for themselves and get a first hand experience on using technology in teaching.

We currently have developed twenty interactive tutorials. They are compiled into a manual that we started using during training sessions. The interactive version is provided on CD-ROM and on the Web for easy download.

Assessment of Online Technology Modules in Pre-Service Teacher Education Courses

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Abstract: Teams of faculty, administrators and staff at three State System of Higher Education (SSHE) universities in Western Pennsylvania developed online technology modules incorporating the International Society for Technology in Education (ISTE) standards to enhance pre-service teachers' use of technology and provide opportunities for faculty to model effective technology in the classroom. This paper will report the findings of a study on the use of online modules in teacher education courses at Clarion University where 244 pre-service teachers were surveyed on their experiences. Results indicated that the students found the online modules to be a valuable component in their courses, providing new and innovative ways to engage students using technology.

Introduction

In its third year of a $1.7 million Preparing Tomorrow's Teachers to Use Technology (PT3) implementation grant, a consortium of three universities in rural Pennsylvania (Clarion, Edinboro and Indiana) is continuing its success in infusing technology into the teacher preparation curriculum by helping faculty develop appropriate assignments requiring technology use for students and incorporate them into their courses. Building on the National Council for Accreditation of Teacher Education (NCATE) and the International Society for Technology in Education (ISTE) pre-service teacher competencies for technology education, the universities are developing technology integration plans that prepare the faculty as well as the students to infuse technology (NCATE 2001). Findings in a 1998 report for the Milken Exchange on Education Technology indicate that "the biggest challenge facing institutions today is preparing faculty to model the effective use of technology as a teaching and learning tool" (Willis & Raines 2001). In the first two years of the PT3 grant the members designed and implemented a strategy for professional development opportunities for faculty, technology support, and enhancing the pre-service teacher education experiences through technology. In year three, implementation and integration of online course modules in the teacher education curriculum is providing a wide range of educational technology experiences for pre-service teacher education students.

It is no longer enough to have computers in the schools or required courses that teach students how to use computer applications. Faculty need to model appropriate use of technology and effectively integrate technology across the curriculum (Abdal-Haqq 1995, ISTE 2001). At Clarion University the Learning and Technology Center staff and education faculty collaborated to create a professional development experience for faculty on how technology can be used effectively in the classroom. Presented as a hands-on, weeklong immersion in technology applications in the summer, the "Technology Chalkboard" series laid a foundation for the development of the online technology model. Based on a modular approach, each technology application (electronic communication, spreadsheets, multimedia, mindtools, videoconferencing, technology classrooms, digital imaging, online courses, webquests) was presented in a three-hour session incorporating foundation, application, and integration skills that lowered the entry level for faculty and teachers to begin their

investigation of effective uses of technology in teaching and learning. McKenzie (2001) defines the challenge of professional development to "inspire and prepare classroom teachers to launch curriculum rich activities with the tools that make sense." The "Technology Chalkboard" model reinforces this idea by providing a foundation for faculty to model technology integration.

In the fall Clarion, Edinboro and Indiana university faculty, administrators and staff collaborated to develop the model into nine online course components (Electronic Communication and Collaboration, Integrating Electronic Spreadsheets, Mindtools, Digital Imaging to Enhance Instruction, Developing Multimedia Presentations, Videoconferencing for K-12 Education, WebQuests, Developing Instruction Online, Reshaping Classrooms Using Technology) for use in the teacher education curriculum, enabling faculty to more easily integrate technology in their courses and meet the need for future technology proficient teachers.

Methods

Nine faculty teaching education core or methods courses were recruited to develop the online technology modules in collaboration with project directors and support staff. Three faculty developers at each consortium institution selected five faculty and four K-12 teachers in their intermediate unit to implement and assess the modules. The module implementation design included in-service as well as pre-service teachers to provide a common connection for the students' field experiences.

Overall, approximately 1,200 students at the three campuses will use the modules through the spring semester of 2002 to investigate classroom technology applications. Similar to the "Technology Chalkboard" model used by faculty, the modules incorporated three main components. In the first (framework) the students were introduced to the technology, in the second (exploration) the students explored examples of how the technology can be used in the classroom at either the elementary or secondary level, and in the third (integration), the students integrated the technology into a lesson plan incorporating ISTE standards designed for their field experience. The modules focused on how the technology could be used to support the curriculum and designed so that they could be replicated for use at each of the institutions and across courses. Students completed specific assignments for each of the three areas and used electronic communication and discussion boards to share their experiences. To meet the needs of both pre-service and in-service teachers and for future professional development needs, the modules were designed so that they could be integrated into the classroom or used as standalone learning tools, enabling anytime, anywhere learning,

In Fall 2001 faculty at each institution began to integrate the online technology modules into web-enhanced teacher education courses using WebCT and Blackboard courseware. Not all modules were fully implemented in the fall semester, however. Obstacles to completing the modules were the lack of instructional design support in developing the modules and faculty expertise in redesigning content to fit the Web environment. This study will focus on three of nine modules that were implemented and assessed at Clarion University.

The three online modules (WebQuests, Mindtools, and Reshaping Classrooms) were incorporated into six teacher education courses, impacting approximately 400 students. The WebQuest module was used with ELED-324 Teaching Elementary Mathematics (3 sections) and SCED-539 Resource Materials for Science Education (1 section); the Mindtools module was used in ELED-325 Teaching Elementary School Social Studies (2 sections) and ED-327 Instructional Strategies and Management (1 section); and the Reshaping Classrooms module was used in ED-217 Micro Applications in the Classroom (4 sections) and ELED-331 Children's Literature (1 section).

Two measures were taken to evaluate the online modules; the first was incorporated into the module as an assignment consisting of a student reflection of the online module experience (Was it a valuable learning experience? Did it expand your knowledge about the technology or about a concept? How will you use the experience in your classroom? How can it be used to meet standards?) and the second was a 10-item survey on how effectively the technology module was integrated into the course, its ease of use, and whether the module was a valuable part of the course. Out of the 400 education students enrolled in the targeted courses, 117 completed the student reflection and 244 (7 sophomores, 96 juniors, 134 seniors and 7 graduate students) participated in the voluntary survey. The students rated their technology level as: beginner (18), intermediate

user (64), advanced (131), and expert (31). The survey used a five-point Likert scale ranging from 1=Strongly Disagree, 2=Disagree, 3=Neutral/No Opinion, 4=Agree, 5=Strongly Agree. Seven faculty developers, cooperating faculty and K-12 teachers also submitted an online assessment survey following completion of the course module.

Results

Student survey responses are reported in Table 1. Items 2 and 5 dealt with the module's ease of use in the course. The students found that they needed little help in using the online module (3.62) and learning the computer applications (3.81). Each module was designed with clear navigation properties that were consistent among modules and a good foundation for understanding the technology application. For example, the Mindtools module incorporated a tutorial on Inspiration software as well as a free download of the software. Table 2 reports responses based on students' perceived technology level. In general user level was positively related with ease of use and learning the computer application. The more advanced the user the more positively they rated ease of use (beginner, 2.89; intermediate user, 3.55; advanced user, 3.63 and expert user, 4.19) and learning the application (beginner, 3.56; intermediate user, 3.64; advanced user, 3.85 and expert user, 4.13).

Items 1, 3 and 6 focused on the appropriateness of the module and how well it was integrated into the course. These items were positively rated by the students: learning how to use the technology module was adequately discussed in class (3.91), the technology module assignments were appropriate for this course (3.98) and the technology module was well integrated with the rest of the course (3.67). Student reflections indicated that they were enthusiastic about integrating technology into the classroom. Students suggested using WebQuests to enhance content knowledge and enable higher-level student thinking, using the Web for research, creating scavenger hunts as a way to make students discover information for themselves, and using virtual field trips to help students become more actively involved in their learning.

Item 4 rated the amount of time needed to complete the module assignments. Overall, the students did not feel the module assignments required too much time; however, there was variability between user level and how the instructor implemented the online module. Some instructors integrated the technology module more fully into their courses while others used it as a supplement. Further, individual technology modules required different learning skills depending on the learner and the technology application.

Items 7 and 8 reflected the student's understanding and interest in the material. Students' responses indicated that the modules had a positive effect on their understanding (3.47) and enhanced their interest in the course material (3.42). Student reflections confirmed the survey results. Ninety-eight percent (115 out of 117) reported that the module expanded either their knowledge about the technology or classroom content. Recurring comments were that 1) they learned when and how it is appropriate to use technology, 2) it expanded knowledge of standards and made them much easier to understand, 3) they learned how technology can be used for student-centered and discovery approaches, and 4) the module showed the steps to implementing technology as well as strategies and paths for various subjects and various types of teachers. Comments like, "The module opened my eyes to new and innovative ways to help my students learn by using technology," "Before looking at the module, I didn't know much at all about the different [technology] options available" and "[I was] amazed at the information this module has to offer" were numerous.

Items 9 and 10 evaluated the value of the online module for the student. Students positively rated the module as a valuable part of the course (3.67). Student reflections supported this data; 97% (113 out of 117) of students reported that the module was a valuable learning experience. They reported 1) gaining a deeper understanding of what technology can do to enhance children's learning experiences, 2) feeling more secure about using technology in student teaching, 3) learning new ways to make lessons more student centered, 4) realizing the importance of integration of technology in the classroom, 5) acquiring an expanded view of the one computer classroom, and 6) finding the module a great learning experience to discover a new way of teaching. Students commented positively on the importance of technology in the classroom: "[The module] expanded my view on the use of technology." "[I] Now know the important impact technology can have on both learner and teacher." "This online module opened my eyes to the importance of computers in the classroom."

Conclusion

The findings from this study indicate that online modules incorporating technology into the pre-service teacher education curriculum can be valuable tools. Students in pre-service teacher education courses reported that the modules promote the use of technology in their field experiences and expand their knowledge of ways to effectively integrate technology into the curriculum. Through the experience the students were challenged to think about how technology can help their students learn in the classroom. A student described it this way, "One crucial aspect I learned...was that it is so important not to use technology separate from the curriculum, but rather find any way possible to infuse it within the curriculum to enhance learning. I realized that students would be able to understand concepts on a higher level when technology is used in the classroom." Several students in speech and language pathology were especially positive about the online module experience: "I never realized how blind I was when it came to integrating technology into a speech and language therapy session or clinic." "At first I was unable to make a connection between technology and speech therapy, but with more information later on, a light bulb went on and I finally pieced together what I was missing."

On the use of standards one student commented: "Technology can be incorporated in the existing curriculum in almost any subject. Spreadsheets could be incorporated into a math lesson or the students could use an Internet scavenger hunt to learn more about something they are studying in social studies. By incorporating technology into the existing curriculum we can meet both the content standards and the technology standards at once. The key is to begin with the standard and learning objective you want students to achieve and then incorporate technology effectively."

While the use of the online technology modules has been positive overall for the students, faculty will need to further evaluate and improve content in the Spring 2002 semester. As part of the collaborative project, all nine modules will be shared among the institutions to be evaluated and revised for use in the teacher education curriculum at each campus. The students' responses to the online modules indicate it will be well worth the effort.

Table 1: Item Analysis

Questions	Mean (n=244)	SD (n=244)
1. Learning how to use the technology module was adequately discussed in class.	3.91	0.80
2. Learning how to use the technology module required relatively little help from others.	3.62	0.99
3. The technology module assignments were appropriate for this course.	3.98	0.89
4. The technology module assignments required too much time.	2.93	1.05
5. Learning the computer applications for the technology module was relatively easy.	3.81	0.77
6. The technology module was well integrated with the rest of the course.	3.67	0.96
7. The technology module contributed to my understanding of the course material.	3.47	0.99
8. The technology module enhanced my interest in the course material.	3.42	0.99
9. This course would have been better without the technology module.	2.44	1.02
10. Overall, the technology module was a valuable part of this course.	3.67	0.94

1=Strongly Disagree 2=Disagree 3=Neutral/No Opinion 4=Agree 5=Strongly Agree

Table 2: User Technology Level

Questions	Beginner (n=18)		Intermediate User (n=64)		Advanced (n=131)		Expert User (n=31)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
1. Learning how to use the technology module was adequately discussed in class.	3.83	0.83	3.78	0.76	4.05	0.72	3.68	1.06
2. Learning how to use the technology module required relatively little help from others.	2.89	1.05	3.55	0.93	3.63	0.93	4.19	0.96
3. The technology module assignments were appropriate for this course.	3.72	0.65	3.69	1.00	4.14	0.76	4.06	1.08
4. The technology module assignments required too much time.	3.06	0.97	3.09	1.11	2.82	0.98	2.94	1.16
5. Learning the computer applications for the technology module was relatively easy.	3.56	0.76	3.64	0.69	3.85	0.73	4.13	0.98
6. The technology module was well integrated with the rest of the course.	3.78	0.71	3.44	1.04	3.82	0.84	3.42	1.19
7. The technology module contributed to my understanding of the course material.	3.78	0.85	3.19	1.06	3.63	0.86	3.19	1.18
8. The technology module enhanced my interest in the course material.	3.50	0.83	3.11	1.03	3.65	0.92	3.03	1.03
9. This course would have been better without the technology module.	2.72	0.99	2.67	1.08	2.27	0.93	2.55	1.16
10. Overall, the technology module was a valuable part of this course.	3.78	0.63	3.36	1.04	3.88	0.83	3.39	1.10

1=Strongly Disagree 2=Disagree 3=Neutral/No Opinion 4=Agree 5=Strongly Agree

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PT3 (Past, Present, and Potential): Sustaining Existing Technology Integration Efforts While Anticipating the Future

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Donna Weatherholtz, Ohio State University, US
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This proposed panel will offer a cross section of experiences and lessons from the implementation of a Preparing Tomorrow's Teachers to Use Technology (PT3) award in an urban setting at a large Midwestern university. Following a one year capacity building grant, this PT3 grant is currently in the second year of its three year duration. The participants in the panel will include one of the grant's principal investigators, the grant project manager, a faculty member involved in both teaching pre-service teachers technology skills and training teacher education faculty in technology integration, and a graduate assistant who is helping elementary and middle school teacher education faculty and students with technology infusion. The panel participants will address the following topic(s):

1. Project Manager – Overview of the grant including a history of its implementation
2. Faculty member – Pre-service teacher technology course and faculty technology integration training
3. Graduate Assistant – Elementary and middle school teacher education
4. Grant PI – Sustaining Change in Changing Times

A more in-depth description of each panelist's presentation follows:

Presenter 1 – Project Manager (Grant Overview)

This presentation will offer an overview of the current grant structure and its history. The Technology Enhanced Teaching and Learning (TETL) Implementation Grant, awarded by the U.S. Department of Education's Preparing Tomorrow's Teachers to Use Technology (PT3) Program, focuses on increasing the technological knowledge and skills of students in teacher education programs to ensure that every graduate will be able to use technology effectively in the classroom. The emphasis on systemic change and improvement in the College of Education's teacher education programs' curriculum makes use of technology to improve teaching practices and student learning opportunities.

The goal of the Technology Enhanced Teaching and Learning Implementation Grant is:

? to integrate technology thoroughly and effectively into pre-service teacher education programs
? to decrease the "digital differences" in an urban school district
? to build upon the best features of existing teacher education programs
? to involve K-12 teachers in all phases of the project
? to assure sustainability of the resulting revised programs and practices
? to prepare faculty and students to meet the national accreditation technology standards.

The project includes professional development in the uses of technology in the classroom. The professional development and support component targets mentor teachers, clinical educators, pre-service teachers and faculty to increase their knowledge and abilities to effectively incorporate technology into field experiences, school classrooms and pre-service courses. Professional development efforts focus on 1. providing a variety of learning activities including hands-on engagement with classroom technologies; 2. on-going support to promote participants' application of what they learn to their own courses and classrooms; and 3. reflecting on the professional development activities.

The local urban school district and the district education association join the College of Education in this grant as partners in pre-service courses, field experiences and technologically-rich school classrooms. In this partnership, technology issues, such as equity, diversity, and the digital divide in urban schools are addressed.

Presenter 2 – **Faculty member** (Pre-service teacher technology education / Faculty technology integration training)

This presentation will discuss PT3 supported work in a required technology education class for pre-service teachers and faculty technology integration training.

"Media and Technology in Education" is the only required technology course for pre-service teachers in the teacher education program at this university. The course provides students with basic technology skills in web development, Microsoft PowerPoint, and Microsoft Excel while teaching them how to evaluate technology resources (i.e. web sites and educational software), use electronic communication including discussion boards and create lesson plans that incorporate media and technology in teaching high order thinking skills. By the end of the course students leave with a complete web-based teaching portfolio. The course teaches students a constructivist approach in which technology is treated as only one aspect of the classroom ecology. Changes in the course over the past two years and plans for course evolution will be central to this discussion.

In addition to describing this course, the presenter will explain teacher education faculty technology training that is being supported by the grant. This training includes workshops on web development, PowerPoint, Excel, video production, computer graphics, WebCT, and computer troubleshooting. In addition to these workshops, faculty receive individualized training from educational technology faculty and graduate assistants on their office computer. Both workshops and individualized training include technical instruction and suggestions for technology integration that moves beyond using technology as merely an add-on to their courses.

Presenter 3 – **Graduate Assistant** (Elementary and Secondary Education)

The presentation will describe PT3 supported work in technology integration in elementary and middle school teacher education. The elementary and middle childhood cohorts consist of ten faculty members, sixty Master of Education students, five graduate assistants, and fifty public school teachers (i.e., cooperating educators). Their community of learners (COL) holds as its mission the preparation of professionals who are broadly concerned with multidisciplinary approaches to education, and bringing to bear such approaches on problems of teaching and learning for diverse populations of students. This program area is centrally defined by a continuing examination of issues related to integration. Watchwords for the program include "learner-centered" and developmental approaches, holistic teaching, and social construction of classroom culture, inquiry, and informal and experience-based approaches to curriculum.

With the onset of the College's PT3 grant the elementary and middle school cohorts have continually examined and engaged in discovering how technology can become integrated into their pedagogies thereby infusing their program with significant technology experiences. This area has engaged in group and individual workshops, offered student computer labs along with a weekly discussion group surrounding technology in the classroom for the students. Additionally, they've offered workshops and conferences for the cooperating educators in the public schools as well as weekly discussion groups surrounding technology and education.

This presentation will describe a variety of projects underway that explore various technologies and how these technologies can improve and enhance current pedagogies. Currently a number of the elementary and middle school faculty, cooperating educators, and all of their graduate students have and maintain websites for electronic portfolios, course support, classroom display, and school information. A group of cooperating educators and a faculty member are exploring ways to use their websites as a means to engage in deeper thinking about their practice. Another group of cooperating educators with a faculty member are exploring the use of wireless technology using HandSpring Visors to find ways in which ubiquitous computing can facilitate thinking and learning. Another group is exploring video and how this can improve individual practice.

Presenter 4 – **Grant PI** (Sustaining Change in Changing Times)

With a year of capacity building and nearly two years of PT3 implementation, the TETL projects have effected considerable change, heightening faculty knowledge and use of technology, increasing pre-service teacher experience using technology instructionally, and generally making technology an integral part of the meaning of teacher education at this University. Are the changes strong enough to flourish in times of fiscal restraint? Or, will these changes whither and die in the institutional storms of budget restructuring, economic recession, new forms of faculty and program accountability, and other factors impacting teacher education?

This presentation summarizes, first, the ways in which the we sought to assure sustainability of change in the design of the TETL projects, and secondly, the nature of the institutional and state-mandated threats to

sustainability on the immediate horizon. The dangers to sustainability and potential means of assuring continuity are examined in detail and various ways we are addressing them are described. The paper then argues that due to the way the TETL project is structured, any external funding for technology will have greater change value in times of fiscal crisis than in "good times." As we continue in a deepening recession, any new monies ear-marked for integration of technology into pre-service teacher education programs will constitute a larger percentage of the total funds available for state or institutionally mandated curriculum revision. The result will be a more thorough integration of technology into all other changes, thus increasing the probability of sustaining PT3 induced changes.

Teaming with Technology: Faculty Design Teams for Technology Integration in Teacher Education

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Background/Introduction

Connecting curriculum and technology is a goal of the McKay School of Education teacher preparation program. As part of the federal Preparing Tomorrow's Teachers to Use Technology (PT3), the McKay School of Education is supporting graduate and undergraduate students, technology specialists, public school teachers, and university faculty in a collaborative effort to create technology-enhanced curricula. The key feature of these efforts is the development of faculty design teams which are organized and supported to create technology-enhanced and problem based curriculum. Successful support of these faculty design teams requires providing training for individuals concerning theories of integration, instruction on how to use a particular technology, as well as support for the team to develop a common purpose.

From our analysis of the initial activities of the PT3 support staff and the faculty design teams, we have discovered basic principles that have led to successful personal and institutional change. First, early efforts must be made to understand the needs of key stakeholders involved in the teacher preparation program. Meeting the needs of key stakeholders and building buy in from them is crucial for the early success of the implementation of the BYU PT3 grant activities. Second, a core team, led by faculty must be organized and function to initiate the institutional change activities. It is crucial

that these change efforts be seen as organic and originating from the faculty. Indeed, faculty members occupy a unique place as mediators between administrators, students, and district support staff and as such are important change agents. Third, faculty design teams should be organized according to naturally occurring alliances in the Teacher Education program. This requires understanding these alliances and using them to bolster reform initiative. Fourth, flexible support structures including access to instructional technologies and training must be constructed to support the various needs and interests of teacher education faculty and design team members. A "one size fits all" approach to reform will not be successful in the context of Teacher Education programs. Fifth, for faculty design teams to be successfully they must be committed to the idea of technology and system reform. Sixth, it is important to foster collaboration between and among faculty design teams. It is only through this collaboration that systemic reform can take hold and lead to institutional change (Fullan and Stielgelbauer, 1991).

In this presentation, we provide detailed case studies highlighting the ways in which these principles are realized in the formation, development, and support of faculty design teams. In addition, these case studies demonstrate the ways in which the "faculty design team model" facilitates systemic reform within the BYU College of Education and how these reforms reach affiliated schools and districts. In this way, change is seen as multiply embedded in a system of relationships, rather than the possession of an individual or an institution Case study research has a long history as a qualitative research method for capturing the complexity of systemic reform and institutional change (Fullan, 1996; Merriam, 1987; Stake, 1988; Yin, 1979). We also hope these two case studies will serve as a model for other Teacher Education programs interested in adopting

the use of faculty design teams for accomplishing technology integration and systemic reform.

Case study one will focus on the efforts of a faculty design team to develop electronic portfolios for pre-service students. This design team consists of tenure track faculty, clinical faculty associates, and technology support staff. This case describes the ways in which support from the PT3 initiative raised awareness among individual design team participants concerning the need for technology integration and facilitated alignment among team members on the utility of electronic portfolios. Case study two focuses on a design team in the area of history and social science curriculum who prior to the PT3 initiative did not have the technical or conceptual understanding to integrate technology into their teacher education courses. This case describes the ways in which support for individual team members and facilitation of team alignment has led to systemic reform within this content area. Through this case study we demonstrate the ways in which changes in faculty uses of technology have led to changes in the technology use of pre-service teachers.

We conclude this presentation by discussing the extent to which the six principles of successful technology integration and systemic reform are realized within the context of these two case studies.

Knowledge Innovation for Technology in Education (KITE)

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Abstact. The Knowledge Innovation for Technology in Education (KITE) project is funded by US Department of Education to build a knowledge repository with case-based reasoning capabilities to capture and disseminate the best practices and lessons learned of technology integration experiences by teachers and teacher educators. The project's overarching mission is to build a K-16 community of practice through this knowledge repository that enables learning through sharing, communal understanding through storytelling, continuous exchange and creation of new knowledge, and collective problem solving.

"Today's students live in a global, knowledge-based age, and they deserve teachers whose practice embraces the best that technology can bring to learning" (Lemke, 1999, p.i of ISTE study).

As the face of American classrooms continues to change with rapidly increasing technological changes, greater diversity, and a projected need for 2.2 million new teachers in the next decade, teacher training institutions are faced with the challenge of graduating new teachers who will be adept at keeping pace with the technology explosion in the classroom. A 1999 study entitled *Will New Teachers be Prepared to Teach in a Digital Age?* —commissioned by the Milken Exchange on Education Technology and conducted by the International Society for Technology in Education (ISTE)—documented that while teacher preparation programs are well-intentioned, they are not providing the kind of training and exposure teachers need to be proficient in integrating technology in their teaching.

Issues

To increase the level of technology integration, the ISTE study strongly recommends that "in order to provide models for change, researchers, professionals societies, and education agencies should -- on an ongoing basis -- identify, study, and disseminate examples of effective technology integration ..." The advocacy for sharing examples illuminates four common issues that have hindered teacher education from overcoming problems in technology integration. First, it is important to realize that many problems in technology integration are universal for teacher educators and inservice teachers. However, because of lack of collaboration, many educators and teachers are powerless or inadequate to tackle these problems individually. Second, it is very likely that some educators and teachers have successful experiences in integrating technology. However, their successes often occur in isolation and are not documented and thus are not disseminated to others in any systematic manner. As a result, these hidden experiences cannot be shared across the entire teacher enterprise. Third, for some novice teachers, they need to learn. Probably, the best way to learn is through observing other experienced teachers. This experience transfer helps a novice teacher learn better, faster, and more effectively from successes and mistakes of other teachers. Fourth, experienced teachers are often entrenched with their practices and are not receptive to newer and better strategy, technology, process, and practice. In today's environment of rapid changes and technological discontinuity, even sharable knowledge and expertise often become obsolete quickly. Without constant reflection, successful experiences can easily become "stale" or even the root of failure.

Project Design

The lack of collaboration and sharing experiences between educators and teachers result in tremendous waste of resources on duplicate efforts and loss of valuable knowledge and expertise. In response to these issues, the Knowledge Innovation for Technology in Education (KITE) project funded by the Preparing Tomorrow's Teachers to Use Technology (PT3) program builds upon the foundation set in place by the Technology Integration Process Knowledge Repository Project (TIP-KR) and the TechConnect Project, both of which captured a collection of stories describing teacher education faculty's and inservice teachers' experiences in integrating technology.

The project involves a consortium of 8 teacher education programs collaborating to create and diffuse technology integration knowledge. As the lead institution of this project, The University of Missouri-Columbia (MU) will enhance and continue to support the ongoing development of the knowledge repository, with improvements in depth of analysis, breadth of content, and functionality to strengthen its effectiveness. The knowledge repository applies case-based reasoning, a contemporary theory of human memory and intellect, to describe and index stories and cases as they are added to the repository. It documents and organizes experiences in technology integration as cases. These cases will be categorized and indexed so they can be retrieved easily by all community members. In this way, technology integration problems are solved by finding similar previous experiences captured in the knowledge repository and applying the lessons to the new experience.

MU will provide global access to the repository through the Web, provide training to partner institutions, introduce partners to effective technology integration tools, provide follow-up support throughout the project period, and engage in ongoing project evaluation. Each partner institution will identify 1) a Knowledge Scout who will be responsible for collecting, reporting, and updating technology integration cases from his/her institution in the knowledge repository; and 2) a Technology Integration Specialist who will serve as the local change agent and project coordinator.

Project Goals

Adopting a knowledge repository approach and case-based reasoning, the Knowledge Development Consortium seeks to expand and enhance its initial efforts in the TIP-KR and TechConnect through a collaborative partnership for innovation and change involving selected teacher education programs and K-12 schools. The project's overarching mission is to build a K-16 community of practice through a knowledge repository of technology integration that enables learning through sharing, communal understanding through storytelling, continuous exchange and creation of new knowledge, and collective problem solving. In the context of the technology integration community, its significance is manifested by the following project goals:

- Create a community memory to preserve the intellectual asset of the community of practice;
- Engender a process for continuous knowledge creation;
- Build professional excellence through knowledge sharing;
- Form a virtual learning community beyond time and space boundaries;
- Establish a conducive environment to effective knowledge creation and diffusion; and
- Assess effectiveness of new knowledge produced from this project.

Inside a Community of Learners: Case Studies of Learning Circles of the Southwest Mississippi Center for Educational Technology

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Abstract: Six learning circles were formed to pilot study the technology integration and collaborative learning initiative of Southwest Mississippi Center for Educational Technology (SMCET), a PT3 Implementation Grant project. The learning circles consist of pre-service teachers, university faculty at Alcorn State University; and in-service teachers and K-12 students from four school districts. University professors and their partner teachers jointly develop activities based on K-12 curriculum. University students (pre-service teachers) assist K-12 students to complete the activities using variety of technologies. The goal was to find out what kinds of human-technology interaction promote learning among different level of learners in the learning circles, and how that might contribute to an understanding of how best to use technology in the classroom. As a result of this project, faculty and teachers are rethinking their teaching strategies and exploring a model of teacher education that involve stronger university-K-12 collaboration and technology use in the classroom.

Introduction

Many of today's educational technology initiatives are focusing on integration, as it is becoming evident that training in basic technology skills alone has not been enough to get teachers to automatically plan for the use of technology in the classroom. According to Robert Tinker, President of the Concord Consortium, "In spite of the decades that computers have been in schools, we have yet to see the revolution they could cause in learning." Teachers need training on implementation and integration that is based on tested models. Several models of technology integration are being developed to help educators make the transition from the traditional lecture method to creating technology -rich learning environments for their students. The Tri-Rivers Educational Computer Association (TRECA)'s Summer Academy (TSA) was developed to help teachers learn how to integrate technology by experiencing integration both as 'students' and teachers. Through a two-week professional development, teachers experienced learning and teaching with technology tools such as online discussion forum, taking fieldtrips and recording events with digital cameras, and producing multimedia projects in several subject areas (Crohen, 2001). Another model of technology integration is the Virtual High School, which delivers online instructions to 8,000 students in 150 high schools across the United States and in 10 foreign countries (Allen, 2001).

Learning Circles is a model of learning with technology developed by Margaret Riel and colleagues, and sponsored by AT&T for several years. It has been used successfully in several settings to explore learning issues, and evidence abounds that it promotes student achievement. According to Riel (1990), students in a Learning Circle use better grammar and syntax when they collaboratively author newspapers and booklets with peers from around the world. Learning Circles are usually organized around specific projects, which may involve online activities. "The best Learning Circles have clear work activities specified that require planning, execution, and reporting, followed by comparison and collaboration across sites" (Jonassen, Peck, & Wilson, 1999). Jonassen (2000) contends that collaboration in Learning Circles is easier among known rather than imaginary audience.

The learning circle concept is based on the constructivist approach, where technology is seen as a tool with which learners think and learn. The constructivist views learners as constructing their own reality by interpreting life experiences. These interpretations assume meaning through social negotiation that takes place through active collaboration (Jonassen, Peck, & Wilson, 1999). The role of the teacher in this collaboration is to create environments in which learners can actively construct their own knowledge rather than recapitulating the teacher's interpretations of the world. This environment also assume that the teacher becomes a learner in some instances, especially since technology is a relatively new tool to the teacher while it is a tool that the student is growing up with. The Learning Circles in the current study were adapted to fit local conditions, but assumes many of the elements of the ones created and tested by Riel and colleagues.

The Learning Circles

Six Learning Circles were formed in Fall of 2001 to pilot study the technology integration model of the Southwest Mississippi Center for Educational Technology (SMCET), a project of the "Preparing Tomorrow's Teachers to Use Technology", sponsored by the U.S. Department of Education. Each Learning Circle was awarded a mini-grant of $2000, which was matched by the four partner school districts in equipment and other resources, such as teachers' time and lab hours.

Establishing the learning circles served a two-fold purpose of enabling us to explore how technology can enhance learning in the classroom at both university and K-12 levels, and to provide environments in which pre-service teachers learn to become technology-using teachers. The goal of the Learning Circles is to promote effective learning and students' achievement through technology integration into the classrooms of the participants. Among the expected outcomes of the Circles' activities are that all levels of learners in the circles develop: a) technology literacy skills, b) reading skills, c) higher-order thinking skills, c) collaboration skills, and d) research skills. We believe that these skills are the key to school achievement. Each Learning Circle designed curriculum-based activities to be completed by student participants within the context of the regular classroom, supplemented by out-of-class experiences. The following table contains the composition and activities of the Learning Circles:

Learning Circle #1 **Project Name**: Mainstream Integrated Technology (MIT). **Participants Description:** One 4th grade class and teacher at Wilkinson County Elementary School, Woodville, MS; One Professor of History and a pre-service teacher majoring in History Education at Alcorn State University **Project Description:** Immerse students in technology-rich, project-based learning environment. As students rotate through work centers to complete project tasks, they also acquire skills required in the curriculum framework. The university student serves as a facilitator for the 4th graders, developing project ideas on Social Studies topics. **Role of Technology:** Word processing to type reports of class activities; Taking virtual field trips; Researching various topics on the Internet; Creating class website and electronic portfolios of students' works; Creating digital images with scanners and digital cameras.
Learning Circle #2 **Project Name:** Enhancing Mathematics and Language Arts Learning with Technology in a Special Education Classroom. **Participants Description:** One Special Education Teacher & class (Grades 9-12) at Franklin High School, Meadville, MS; One Special Education professor, and pre-service teachers enrolled in a Psychology of Exceptional Children course at Alcorn State University. **Project Description:** Technology is seen as a tool for facilitating learning of targeted skills and remediation of deficiencies in reading, mathematics, and life skills in the Special Education classroom. Pre-service teachers become E-pals to the students in this class, engaging them in online discussion of books read, providing corrective feedback on students' writing through e-mail messages, and finding materials on the Internet to reinforce concept taught in class. **Role of Technology:** Handheld calculators and spreadsheet for learning mathematics skills; Reading Pens to enhance reading skills; Internet for researching topics; E-mail with E-pals to facilitate reading and writing skills.
Learning Circle #3 **Project Name**: Technology Integration in a High School Science Classroom. **Participants Description:** One High School Science teacher and a class of 10th -12th grade students in Human Anatomy, Physiology, and Botany courses at Natchez High School, Natchez, MS; One Biology professor and two pre-service teachers majoring in Biology Education at Alcorn State University. **Project Description:** Main focus is technology integration into the instruction of three science courses as a way to motivate students to learn the subjects. The university professor and the science teacher jointly explored and selected materials including software, equipment, and Internet sources. This is supplemented with weekly presentations and experiments led by the University professor. The high school students are assigned projects and reports in which pre-service teachers serve as facilitators and peer-collaborators. **Role of Technology:** Researching science topics on the Internet; Developing presentations in PowerPoint; Using standalone software, such as A.D.A.M. to explore science topics; Laboratory equipment for experiments; Large screen TV with AverKey attached to a computer for whole class instruction and presentations.
Learning Circle #4 **Project Name:** Using Technology to Enhance Reading Performance of Third and Fourth Grade Students. **Participants Description:** One 3rd & 4th grade reading teacher and students at A.W. Watson Elementary School, Port Gibson, MS; One Reading Instructor and three pre-service teachers enrolled in a Reading course at Alcorn State University. **Project Description**: Emphasis on collaboration between pre-service teacher education students and students in 3rd and 4th grade reading class, and implementation of intervention strategies from the Mississippi Reading Initiative. Using the reading intervention strategies learned in their reading class, pre-service teachers work with the elementary students to develop book reports in PowerPoint. Books read will be compiled into an electronic database. **Role of Technology:** Developing book reports and biographies of authors in PowerPoint; Illustrating book report using graphics and clip arts; Concept mapping using Kidspiration; Creating an electronic database of books read by students; Publishing students book reviews on online sources such as the Cyberzine.
Learning Circle #5 **Project Name**: Working Together to Connect Curriculum and Technology with Learning Inside and Outside of the Classroom. **Participants Description**: One 5th grade class and teacher at A.W. Watson Elementary School, Port Gibson, MS; One Professor of Elementary Education and 15 pre-service teachers enrolled in two method courses at Alcorn State University. **Project Description:** Grouped into subject areas, prospective teachers from the university form partnership with groups of fifth graders to investigate topics in Language Arts, Mathematics, Science, and Social Studies. They assist the 5th graders to set up e-mail accounts through which they shared information, exchange ideas as they jointly complete the projects they set up for themselves. Among the topics being explored are: 'Get to Know Your Favorite Authors', Probability', 'Harriet Tubman'. **Role of Technology:** Researching authors and historical figures from the Internet; Searching for Lesson plans and grading rubrics from the Internet; E- mail communications between university and fifth grade students; PowerPoint presentations of book and project reports.

Learning Circle #6 **Project Name:** Integrating Technology in a Science Classroom. **Participants Description:** One Science teacher and a class of high school students in Botany and Environmental Science courses at Natchez High School, Natchez, MS; One Biology professor, and Pre-service teachers majoring in Biology Education at Alcorn State University. **Project Description:** This program focuses on using technology to facilitate learning of Botany and Environmental Science to meet the Mississippi Science Framework. The teacher selects course-related web sites for students to explore, supplemented by presentations and experiments led by the University professor, assisted by the pre-service teachers. Strong collaboration with Learning Circle 3 in several activities. **Role of Technology:** Researching course materials from the Internet; Reading Daily Science news from the Internet; Preparing class presentations in PowerPoint; Using large screen TV with AverKey hooked up to a computer for whole class instruction and presentations.

Table 1: Learning Circles Description. See http://smcet.alcorn.edu/LearningCircles for more descriptions.

Monthly Meetings

Collaboration across sites takes the form of exchange of ideas during monthly meetings and participation in weekly online chats in the Circles' online community. Faculty and teachers share information about the progress in their Learning Circles, teaching issues, problems, and solutions. As illustrated in the extract below, Circle members learn classroom tips from one another:

> trena : I think all of this is great! I just have questions about the management of your class in using the technology. How do you arrange for all of your students to have access to the technology?
> **Bosede** : I guess Belinda can answer that better than I
> Belinda : Trena my students are grouped in three's and we rotate every twenty minutes. I have three computers, so when they get to the computer, they have a task to do as a group or an individual. It depends on what I want them to do.
> Belinda : One time, they had to do Sequential Events. "How to Make a Ham and Cheese Sandwich." We had practiced earlier in the week on paper and through discussion the words they should use and what I will be looking for. Well of course they loved it.
> trena : That's sort of like the arrangement I have planned for my class. It works fine for individual tasks and projects; I just wondered how you were incorporating the technology in the delivery of your lessons. Before long I will be able to supplement my ... delivery with the smart board in our school media room.
> Belinda : On cooperating groups, they had to write up their paragraph in one center and type it when they rotated to the computers.
> trena : Do you have all your computers networked to one printer? ***(Online Chat, October 18, 2001)***

Reflection is emphasized during the meetings and in online chats. Faculty and teachers are encouraged to ask questions such as what does this new teaching approach mean to my students and me? How am I coping with the intellectual disequilibria that the approach represents? What does my role as a facilitator of learning entail? What am I learning from this experience? The afternoon session of the monthly meeting is devoted to training on specific technologies being used in the Learning Circle classrooms.

Conclusions

It is too early in the pilot year to begin to look for specific impacts of the Learning Circles. However, some interesting patterns are emerging that may be of interest to educators and technology advocates. One such pattern is that university and K-12 educators in the Circles are beginning to realize the advantage of pre-service teachers making early connection between their teacher education curricula and real life classroom events. The Learning Circle provides opportunity for more intensive, integrated and longer practicum experiences for students that have not been possible before.

> ".... I had no idea that it was going to have such an impact on the students as it did, both groups of students really – the college students and the public school students. Once they got into the classroom, once we've finally decided on how many hours they would do and what days they would go, they bonded with the students there. As they bonded, they really got more work done than anticipated. So they did work with the students by e-mailing them, not only that, they developed PowerPoint presentations, and they presented their PowerPoint [presentations]. And students, both the university and A.W. Watson students were very excited. It was really a learning situation for the students. It was really a learning situation for me because I found that students were very enthusiastic about going back to the public school and working with students there..." ***(Doris, University faculty, Learning Circle 5, Interview Fall 2001)***

Rethinking teaching. Teachers and faculty in the learning circles are rethinking their teaching strategies. The learning circle approach, with the integration of technology, forced participants to begin to look critically at what they do in the classroom, to face issues of own and students' learning. They are realizing that traditional teaching strategies seem to underestimate the intellectual abilities of children, and their natural capacity for motivation through exploration. Even though developing a book report in PowerPoint may be regarded as low-end use of technology, it represents a major shift in the way these students used to learn. Having to organize information in presentation format, selecting appropriate slides and illustrative graphics enable deep processing of information that may not have occurred in the traditional book report. Also, by becoming learners themselves, teachers and faculty members are more sensitive to learning concerns of their students. In addition, the faculty and teachers are learning to balance the need to hold on to what is familiar and trying something new, something that is not safe, perhaps, but may be more rewarding. Some of the educators are able to make this shift easily while some are making it gradually. Student participants seem to take the changes in stride. University students (pre-service teachers) found that they enjoyed the time they spent in the school with the children (K-12 students). It further confirmed the reasons they wanted to be teachers.

Action Research

Action research was built into this project to enable us answer the question of what makes educational technology effective in the six situations under study. We wanted to find out the skills and knowledge that students gain by using technology as a tool of learning; how using technology changes organization of learning environment, and the outcomes that can reasonably be expected at different stages and forms of technology implementation. Some of the baseline data we have collected include, 1) students scores on the Terra Nova tests for current and previous years, students scores on teacher made pre-test based on the Terra Nova format, and scores on first 9-week examination. These will be analyzed to establish baseline information about students' achievement level at the beginning of the project. During the year, other data will be collected for formative and summative evaluation purposes. Quantitative data will be supplemented with qualitative information from students, teachers, and faculty. These include journal and reflection notes, sample products, sample e-mail conversations, online chat and discussion transcripts, interviews, and analysis of videotaped classroom events.

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Evaluating PT3

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Abstract: This paper discusses issues learned while evaluating 12 PT3 projects in various stages of the grant's funding period. Although many issues can be discussed we have chosen to focus on issues related to gathering data from faculty and the efficacy of self-reported technology skills. As external evaluators, we bring a unique perspective on PT3 and will share our thoughts on how the evaluative data assist project directors with program development.

Overview

Rockman Et Al is an independent research and consulting firm, specializing in the study of technology's role and impact on education. We are currently serving as external evaluators of 12 Preparing Tomorrow's Teachers to Use Technology (PT3) projects, funded by the U.S. Department of Education to support the efforts of schools and colleges of education (SCOE) to integrate the use of technology into pre-service teacher education. The projects we are evaluating include Implementation and Catalyst grantees in various stages of the funding cycle; they represent large and mid-size public and private SCOEs in the West, Northeast, Mid Atlantic, and Southern regions of the country. While each project brings its own perspective to preparing its pre-service teachers and transforming teacher education, we have found that there are also common themes related to the implementation and evaluation of the PT3 projects. It is with this lens that we share our unique perspective as external evaluators and discuss our lessons learned.

In reviewing the data we found a number of common themes related to evaluating PT3 projects, however, in this paper we focus on some of the challenges we faced as external evaluators, including: developing instruments that measure technology skill, using self-reported data to inform project development, identifying barriers to project implementation, and helping project directors revisit their project timelines.

Issues and Challenges

Many of the PT3 projects we evaluate are seeking to transform teacher education programs by educating faculty about how to model the meaningful integration of technology into pre-service teacher education. Typically this transformation begins by supporting faculty in the use of technology in their own courses. To provide project directors with meaningful data we developed a series of pre- and post-survey questions that require faculty to rate their technology skills on a 5-point scale, (ranging from 1 = "cannot perform" to 5 = "I can teach others"). These skills questions focus on basic computer operations, use of telecommunications, use of productivity tools (word processing, spreadsheets, data bases), use of the Internet, and developing Web pages and multimedia presentations. The challenge in developing this instrument was using terminology that was understandable for all faculty whether they were technology users or not. Our assessment of these skills was focused on basic operations and not the integration of these skills. The purpose was to set the stage for project directors about what skills faculty participants were bringing to the project and to help guide the development of faculty training workshops.

We have found that faculty participants are comfortable with basic computer operations and using the computer for basic productivity such as word processing, sending and receiving email and searching the Internet.

Faculty, on average, did not consider themselves to be skilled in desktop publishing, creating Web pages and multimedia presentations, and troubleshooting.

While we rely heavily on faculty members' self-reported data in our reporting, we acknowledge that there are limitations to doing so. We have found that faculty tend to overrate their ability to use various technology applications. They tend to rate themselves higher when they are not proficient users of technology because they are not aware of what they do not know. We have found that faculty self-ratings on the post-survey remain the same or even decrease. This we feel is attributed to faculty, through participation in the program, gaining a true understanding of the various technologies. Whereas, on the pre-survey they may have overrated their skills due to lack of knowledge, the post-survey appears to be a truer measure of their technology skills. This poses a challenge for evaluators because in reporting the data it appears that the project is not having a meaningful impact on project participants.

In addition to the aforementioned difficulties in using data gathered from the faculty members, we learned that certain unanticipated issues developed for the project directors. Project directors are required to establish project goals and objectives and set timelines for meeting them. Given that many of the project directors are the technology innovators on their campuses, they believed at the outset that they could have an impact on the teacher education faculty at a rate that would meet the timelines.

In looking at how our PT3 clients began implementing their projects, we found that the majority of directors did not anticipate the time that would be needed to train the faculty in basic technology skills. This is consistent with Wisniewski's (2000) finding that three years is often insufficient to truly impact the acquisition of skills and knowledge that lead to a change on the part of individual faculty members. Project directors were surprised that while faculty support was embedded into the project (e.g. technology training, tutorials, and technical support) that they still faced faculty resistance to full cooperation and participation. Our evaluation activities identified that a number of the tenured faculty members lacked sufficient skills to become early adopters of technology, thus limiting their ability to understand how to integrate it into their courses. This finding led directors to refocus their initial efforts from integration of technology into pre-service course work to technology skill development.

The most difficult barrier to overcome was that of time. A challenge for evaluators was to help the directors redesign their original timeline and goals in order to accommodate the difficulties they faced. As evaluators we helped the directors review what they first hoped to accomplish and how they could refocus their efforts to accomplish many of their original goals. Our data included feedback on perceived barriers to integrating technology. Using a 4-point scale, with 1 = never a barrier and 4 = often a barrier, responding faculty, on average, rated *lack of time* (M=3.2) as the greatest barrier to technology integration, with 74% of the faculty indicating that it was *sometimes* or *often* a barrier. This was followed by inadequate equipment (M=3.0), the uncertainty of how to infuse technology into teacher education courses (M=2.8), and the lack of personal technology skill and knowledge (M=2.7). With these data we helped the project directors face some of the issues they may have overlooked in writing the grant proposal. For some of the grant projects this required a narrowing of activities, for others it required expanding their original target group to include additional faculty (i.e. adjunct, Arts and Sciences).

Our evaluation goals this year are to show that while technology integration occurred at a slower rate than intended, that realized change and shifts in attitude have begun and will continue. We are in the process of helping to design and support the ways in which these PT3 grants will continue to affect participating faculty in the goal of supporting teacher candidates.

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Restructuring Teacher Education: Lessons from Evaluating Preservice Teacher Products Using NETS

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Abstract: PT3 implementation grant funds have been used to restructure a teacher education program to meet the National Educational Technology Standards (NETS). Technology-enhanced unit plans written by preservice teachers were coded to see which NETS were met. Technology as Productivity tool was met most often followed by Technology as Research Tool. The results of this study seem to indicate that our preservice teachers are using these higher level thinking skills in the unit plans they write. It also indicates that enhancing units planning with technology encourages these types of activities in the units developed by our students.

Introduction

Preparing Tomorrows Teachers to Use Technology (PT3) implementation grant funds have been used to restructure a teacher education program to meet the National Educational Technology Standards (NETS) defined by the International Society for Technology in Education (ISTE). Grant related activities include (1) the creation of curriculum design teams to develop technology-enriched curriculum for both the teacher education program and K-12 schools and the mentoring of BYU faculty and BYU students in the use of the technology-enriched curriculum; (2) collaboration with arts and science departments, five public school districts and the State Office of Education in the development of K-12 technology-enhanced curriculum, and with the two other PT3 grant recipients in Utah to share resources and efforts; and (3) evaluation of the process and products supported by the PT3 funds. This paper will discuss the products developed by preservice teachers in redefined courses by reviewing which NETS standards they have met.

Theoretical Framework

Researchers, parents, and politicians have called for reform in K-12 education to include the integration of learning technologies (Fullan and Stielgelbauer 1991; Means, 1994). One approach of reform in teacher education programs includes providing in-service training to practicing teachers designed to help them change their teaching practice (Fullan and Stielgelbauer, 1991). A second approach includes reforming

preservice education to include the use of learning technologies in the context of problem based teaching and learning. The PT3 project in this study focused on both approaches. Teacher education programs often perpetuate the isolation of technology from curriculum and instruction. In many instances, prospective teachers take a computer literacy class separate from content methods classes and rarely engage in real collaboration on how school teachers could integrate technology into authentic learning experiences. Likewise, many public school classrooms do not link instruction to real-life situations or technology integration so the practica experiences of preservice teachers are limited (Pappillion & Cellitti, 1996)

The PT3 funded re-structuring efforts outlined here are designed to alleviate these weaknesses in traditional teacher preparation through simultaneous re-design of teacher preparation and K-12 curricula enriching both with technology integration. Preparing tomorrow's teachers to integrate technology into their instruction requires university faculty to provide preservice teachers with examples and experiences of learning enhanced with technology. These goals are being achieved through creating curriculum design teams composed of School of Education faculty, content specific methods teachers, cooperating teachers, and instructional design and technology specialists who together will re-design our current teacher preparation curricula with the purpose of integrating technology.

Data Collection

The large research agenda for this PT3 grant is to study the systemic change of a preservice program. This paper will address a smaller agenda that of evaluating technology-enhanced unit plans developed by preservice teachers in three teacher education classes. Which NETS standards do the unit plans meet? Do they meet more than one standard? If so, which standard is the most commonly uses with other standards? How does this evaluation of products help teacher education faculty mentor preservice teachers in the development of technology-enhanced curriculum and instruction?

The three instructors of the courses introduced unit design and discussed enhancing the purpose of the unit plans with technology. They selected direct instruction, inquiry learning, and problem-based learning examples and discussed the different uses of technology in each type of unit. They assigned the preservice teachers to write a technology-enhanced unit plan. Each unit was coded by other students and by faculty members on the evaluation team of the PT3 grant as to the type of instruction used and which NETS standard for students it supports. The NETS standards are: (1) Basic Operations and Concepts, (2) Social, Ethical, and Human Issues, (3) Technology Productivity Tools, (4) Technology Communication Tools, (5) Technology Research Tools, and (6) Technology Problem-Solving and Decision-Making Tools. Results were tabulated for total number of standards met, for which standards correlated to other standards, and for a relationship between standards met and the type of instruction used.

Results

Currently 47 unit plans have been written and coded by 3 students each for a total of 141 evaluations. Students only circled the Standard that they felt was addressed in the unit plan. They did not evaluate whether or not the Standard was essential to the unit plan. Of the 141 evaluation 1% coded a lesson with only one standard being met, 4% marked two standards, 7% marked three standards, 51% marked four standards, 35% marked five, and 2% marked all six standards. "Basic operations and concepts" (marked 124 times) and "productivity" (122) were the most common standards met followed by "research" (112), "problem solving and decision making" (88), "communication" (78) and "social, ethical and human issues" (66).

The researchers were surprised to see so many evaluations marked with 4 and 5 standards being met. They wondered if the students understood what it meant to mark a standard so they asked them why they had marked so many. The students said that if the students were using technology in any way they marked basic operations, even if the instruction was not in computer operations. They also commented that they marked technology productivity tool when the students used any software package to produce something, a

report, statistically results, a PowerPoint presentation, etc. Again the instruction in the lesson was not about using the tools, but the assignments in the unit plan were.

Three faculty members have coded 52 unit plans using the following rubric:

	Not present in the unit plan	Present but not essential to the unit plan	Present and improves the unit plan	Present and very essential to the unit plan
Basic Operations and Concepts	**0**	**1**	**2**	**3**
• Students demonstrate a sound understanding of the nature and operation of technology systems. • Students are proficient in the use of technology.				
Social, Ethical, and Human Issues	**0**	**1**	**2**	**3**
• Students understand the ethical, cultural, and societal issues related to technology. • Students practice responsible use of technology systems, information, and software. • Students develop positive attitudes toward technology uses that support lifelong learning, collaboration, personal pursuits, and productivity.				
Technology Productivity Tools	**0**	**1**	**2**	**3**
• Students use technology tools to enhance learning, increase productivity, and promote creativity. • Students use productivity tools to collaborate in constructing technology-enhanced models, preparing publications, and producing other creative works.				
Technology Communications Tools	**0**	**1**	**2**	**3**
• Students use telecommunications to collaborate, publish, and interact with peers, experts, and other audiences. • Students use a variety of media and formats to communicate information and ideas effectively to multiple audiences.				
Technology Research Tools	**0**	**1**	**2**	**3**
• Students use technology to locate, evaluate, and collect information from a variety of sources. • Students use technology tools to process data and report results. • Students evaluate and select new information resources and technological innovations based on the appropriateness to specific tasks.				
Technology Problem-solving and Decision-making Tools	**0**	**1**	**2**	**3**
• Students use technology resources for				

solving problems and making informed decisions. • Students employ technology in the development of strategies for solving problems in the real world.				

Table 1: Rubric for Coding Unit Plans for NETS Met

Standard 1 (Basic Operations and Concepts) and Standard 2 (Social, Ethical and Human Issues) were coded as a zero for every unit plan by every evaluator. The unit plans were not about learning to use technology or the ethical issues of technology. Figure 1 summarizes the coded scores of the other 4 standards.

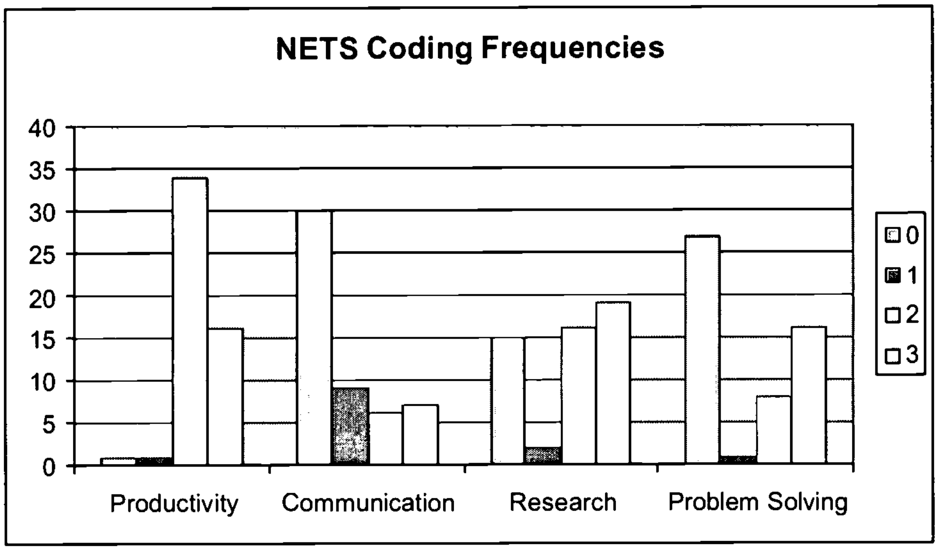

Figure 1: NETS Coding Frequencies

The "Technology as Productivity Tool" standard had the fewest "0" ratings and the highest "2" ratings. "Technology as Research Tool" standard had the highest "3" ratings. "Technology as Problem-solving and Decision-making tool" was very close in "3" ratings. "Technology as Communication Tool" had the most "0" ratings and was low in the other three ratings as well. Productivity and research coded together 38 times followed in frequency by productivity and problem-solving (25), and research and problem-solving (25). Productivity and communication were coded together 22 times. Communication and research matched 17 times. Communication and problem-solving matched 16 times. One more interesting finding was that when research and problem-solving were coded "3" then productivity and communication were almost always coded as a "2" or more.

Summary

The researchers were not surprised to see "Technology Productivity Tools" as the most common standard met. Most preservice teachers had assignments in their unit plans for students to create reports using presentation software. The researchers were surprised and pleased to see "Technology as Research Tool" as the next most frequent standard met. Many of the unit plans required students to gather data on an website and then analyze it in some way. The teacher was doing less lecturing and was acting more as a guide to the students as they researched topics in groups. This seems to indicate that technology-enhanced unit plans include inquiry learning that requires problem solving and communication. Research, problem-solving and decision-making require higher-level thinking skills of students. Our teacher education program encourages this type of lesson and unit planning. The results of this study seem to indicate that

our preservice teachers are using these higher level thinking skills in the unit plans they write. It also indicates that enhancing units planning with technology encourages these types of activities in the units developed by our students.

The researchers will continue to review the units that were coded to meet research, problem solving and communication to see if they are based in inquiry instruction and problems-based learning. They will also review those units that had the fewest standards met to see if they are based in direct instruction. Finally the researchers will review those units that met the "social, ethical, and human issues" standard to see how this standard can be brought to other units.

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Preservice Teachers, Technology, and Information Literacy in the English Literature Classroom

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Abstract: This paper reports the results of a survey we conducted to assess our preservice teachers' use of technology in the English classroom. These survey results, in conjunction with our experience teaching preservice teachers, suggest that preservice teachers are frequently uncritical readers of the web pages that a search engine or directory provides, and that they need assistance in linking their current technological skills to the study of literature and language -- two skills necessary for meeting the new performance standards for technology in the K-12 language arts classroom. We then report the results of our pilot program designed to foster information literacy in our preservice teachers. By incorporating a writing-based technology curriculum composed of online discussion, online research, and web projects, we found that the literature classroom offers an excellent opportunity for preservice teachers to develop information literacy and to see instructors model the teaching of literature through technology.

As many scholars and teachers have noted in journals such as *Contemporary Issues in Teacher Education*, faculty who teach preservice teachers have an obligation to incorporate technology into course curriculum (Pope & Golub, 2000; Willis, 2001; Willis & Raines, 2001). This obligation, however, must extend beyond the borders of the Education classroom. As two professors of English literature who regularly incorporate technology into our English courses, we see a rich opportunity to foster the critical reading and writing skills that preservice teachers need in order to meet the new national emphasis on technology in the K-12 classroom. We also see the opportunity to fulfill many educators' calls to model strategies for incorporating technology into the study and teaching of literature (Pope & Golub, 2000; Willis & Raines, 2001; Carroll & Bowman, 2000; Jonassen, 2000). Our paper argues for the advantages of a writing-based technology curriculum for preservice teachers, especially for those in Language Arts. We seek to establish what David Jonassen (2000) has called "intellectual partnerships" between students and their computers (p. 4); while Jonassen posits this theory for students in the K-12 classroom, we see a need for such pedagogy in the college preservice classroom as well. Today, we will first provide the results of a survey assessing our Education majors' use of technology. Second, we will introduce and summarize the results of a technology-intensive pilot course designed to help preservice teachers meet the performance standards for the K-12 classroom. Only by using "computers as mindtools" (Jonassen, 2000, p. 1) can we help preservice teachers attain the higher level thinking skills they must, in turn, impart to their students.

If, as Cynthia Bowman (2000) points out, "information literacy requires students to conduct searches, evaluate, and create new ideas" (para. 14), we must prepare our preservice teachers to assist their future students with these tasks. Indeed, information literacy is not only recommended for preservice teachers, but increasingly required of them. In the year 2000, National Council of Teachers of English and the International Reading Association mandated that K_12 teachers should be prepared to foster students' technological abilities. Standard 8 of the twelve "Standards for the English Language Arts" reads, "Students use a variety of technological and information resources to gather and synthesize information and to create and communicate knowledge"; other standards implicitly refer to technology as a component ("List of Standards for the English Language Arts," 2000). In our own state of Kansas, the teacher licensure standards now include a new emphasis upon instructional technology, particularly in preparation for language arts. We must be sure, then, that our preservice teachers attain a high level of information literacy as well as a facility with technological resources. A recent survey of 255 Education majors in our English classrooms at Kansas State University reveals, however, that we are falling short of our goal: our preservice teachers show some facility with technology, but they lack information literacy.

The results of our survey indicate that a high percentage of preservice teachers recognize the importance of current technologies both to their success in their college courses (72%) and for their chosen profession (86%). Many also show a high level of competence with current technologies such as word processing, even if knowledge

of other technologies remains low (only 49% have designed a web page or PowerPoint presentation, for instance). In our survey, 84% of Education majors reported using the internet primarily to access their e-mail; only 7% cited research as the primary reason for using the web -- the same percentage who reported using the web for sports, entertainment, or business information. These use patterns suggest that preservice teachers may not have much experience critically evaluating the materials they find. This conclusion is supported by the fact that 74% of the Education majors surveyed reported using an internet search engine such as Yahoo, Excite, Google, or Infoseek to research information for their English classes *before* any other online resource, such as electronic full-text or abstract databases available through the library or a catalog of library print materials. Most preservice teachers are using the internet for research, but are they familiar with its wide range of resources, if they primarily use the web for email?

This high number -- 74% -- therefore attests to our students' ability to *access* the Internet, but we wonder about our students' ability to *evaluate* the sources they encounter and to *apply* their skills for a larger audience. There's no question that the internet is perceived by Education majors to be an important resource for the study of English at the college level: 47% of students surveyed found online resources "helpful" and another 23% found them "very helpful." When queried about the kinds of internet resources they found most useful for their study of English, 32% reported accessing primary texts, 24% retrieving critical essays, 19% researching historical and cultural backgrounds of texts, and 13% using writing style handbooks. While we do not know what students "count" as critical essays -- for example, do our students perceive teacher-resource guides from a publisher to be "critical essays"? -- these figures suggest that we need to make sure our students know how to evaluate a primary text, a critical essay, and other web-based documents, since they are seeking them out. If preservice teachers are not able to evaluate resources now, how will they be able to assist their own students? In addition, the ability to research and evaluate historical and cultural background would be an extremely helpful use of the internet for their future profession; however, as our survey results show, it is by no means our students' primary motive for consulting web resources, garnering only 19% of the responses. Finally, when asked which online resources they would like to know more about, students evenly spread themselves over the four categories: 23% selected primary texts, 25% critical essays, 24% historical and cultural background materials, and 26% writing style manuals. This remarkably balanced breakdown suggests that students are aware of the importance of all four categories but may not feel confident that they know enough about how to find, evaluate, and use these sources.

These survey results, in conjunction with our experience in the English classroom, suggest that our Education majors are frequently uncritical readers and interpreters of the web pages that a search engine or directory provides, and that they need assistance in linking their current technological skills to the study of literature and language -- two skills necessary for meeting the new performance standards for technology in the K-12 language arts classroom. As English teachers, we know that not all editions of primary texts are equal; therefore, we need to alert students to the elements of a primary text that will be most accurate and helpful to their study. We know that critical essays published online are not *necessarily* as authoritative or as reputable as print essays, while at the same time recognizing that an increasing number of critical essays are indeed being published in this format.

In addition to alerting our students to the differences of quality and implied audience among journals, we need to be offering them the same guidance for documents which appear on the World Wide Web. *We* may know, as David Jonassen states, that the world wide web is not a mindtool (Jonassen, 2000, p. 17), but many of our preservice teachers do labor under the misconception that they "download ... thinking" when they print a web page (Healy, qtd. in Jonassen, 2000, p. 188). The Internet and the Web offer a tremendously rich variety of historical and cultural background materials -- a course in Indian and Pakistani literature, for example, can link directly to English-language Indian and Pakistani newspapers for information about contemporary issues in those countries. However, students also need to be able to distinguish the reliable material from the less reliable, the obviously biased from the implicitly biased. In one children's literature class, for example, students offered as background to a study of Pippi Longstocking David Nagel's web page "The Evil of Pippi Longstocking: the Red-haired Harbinger of the Apocalypse" without any awareness of its parodic critical stance. Other students have quoted as scholarship the teacher guides from publishers' websites, showing little awareness of the potential conflicts of interest between the site's commercial and educational goals. Even style manuals may differ in authority and scope.

We are hardly the first to identify these problems: Cynthia Bowman (2000) and Carol Pope and Jeffrey Golub (2000) have raised similar concerns about information literacy in the preservice classroom. However, we believe that the problems we have described are more systemic than those scholars suggest. Even to create a WebQuest for Cynthia Bowman's class, as she describes for us in her essay "Infusing Technology-Based Instructional Frameworks: A Response to Pope and Golub" (2000), requires a degree of higher order thinking and critical evaluation skill than many of our students have demonstrated in our English classrooms. Clearly, there is much to be done in helping our students to use such resources efficiently and reliably, so they can in turn teach

others.

In the time remaining today, we will outline several writing-based strategies designed to foster information literacy in preservice teachers. Our claim for the advantages of a writing-based technology curriculum develops from the results of our survey and the results of a pilot course here at Kansas State University that integrates technology into the teaching of a required literature course for Elementary Education majors, English 355 "Literature for Children." We initiated this pilot program with one section in June, 2001 and added two sections in Fall 2001; the pilot program continues with one section in Spring 2002 and 2 sections in Fall 2002. Each section caps at 23 students; the class meets in a computer lab classroom designed so that students sit at the computers or at a large seminar table. A ceiling-mounted projector allows the instructor to project images and text on a screen from a computer at the instructor's podium or from a visual presenter.

The course design emphasizes three components which are easily transferred to the K-12 classroom: computer-mediated writing practices, online research, and web page construction. In designing the course, we wanted to test our hypothesis that these three components foster the critical writing and reading skills necessary for information literacy. We also wanted to see if these interactive skills would demonstrate how to transfer essential technological skills to the teaching of literature. Preliminary results from student evaluations indicate the success of the pilot program. Through observation and hands-on projects, many of our preservice teachers have indeed increased their information literacy and acquire both "academic" knowledge and "tacit" knowledge (Willis, 2000) about integrating technology into the teaching of literature.

First, synchronous and asynchronous online discussions encourage our preservice teachers to be self-reflexive about the act of written communication and the audiences for whom they write. Our instructors asked their students to use real-time collaborative small group discussions during class and to post to a threaded bulletin board discussion outside of class. These two forms of online discussion emphasize features of group exchange which students often take for granted as they use words. Unable to rely on facial expressions, tone of voice, and gestures as they would in face-to-face conversations, students must exercise their linguistic resources and use written cues in order to communicate successfully with their peers and instructor, their intended audience. Our results indicate that synchronous and asynchronous discussion is even more of a "mindtool" than David Jonassen suggests (2000, p. 239). Since both the real-time chats and the threaded bulletin board postings are archived, students can return to these documents for review and further development of their ideas. The written conversations students have about the course material can then become stepping stones to more formal writing projects.

Though some students greeted these two technologies with skepticism, by the end of the course many students rated these components as "highly valuable" for analyzing class reading assignments, particularly because they were able to hear each classmate's analysis of the material. Recursive use of postings by instructors during class time not only connect online discussions to face-to-face discussions, illustrating a symbiotic relationship between traditional and technological pedagogies; it also offers various models for students to use in their own classrooms. In sum, these online discussions highlight the crucial role *written* communication plays in a technological society, where email, listservs, and text-based documents are the dominant forms for the exchange of ideas. To be literate in the information age, one must be able to communicate effectively through text-based technologies.

The second component, online research for a group web project, most directly addressed our concerns about information literacy in the preservice classroom: students work collaboratively to research and compose a biography and bibliography for one of the children's authors on the syllabus, drawing upon online and print resources. The resulting documents become part of their web site for their author. As instructors, we quickly learned that many students did not know the criteria they should use to evaluate resources available through the internet. Our preservice teachers were unfamiliar with strategies for directed searches in online subscription databases and on the web, and many were unable to identify the qualitative differences between a source located through a library database and one a search engine had retrieved. Our students' confusion was most evident when they were asked to create the bibliographic citations for the information on their computer screens: they did not know where to look on the web page for the requisite information, or why they might need to include an author or sponsoring organization, or why they should note if the resource was first published in print and then made available through a database or on a web page.

By instructing and modeling the evaluation process for students during class time, instructors could demonstrate the critical tools that the students would need for their own research. Knowing that their biography and bibliography would not only be read and graded by their instructor but also available to a general audience on a web site provided a strong warrant for their efforts. Held responsible for their research methods and the resulting information, our students wished to present themselves as credible and informed authors. After completing this part of the pilot course, our preservice teachers say that they are ready to apply those criteria to the many web pages they

encounter now as students and to the pages they will help their own students evaluate. Even though we might hope or expect our preservice teachers to learn such critical reading skills in another course -- and some do -- it seems crucial to integrate these skills into a literature course, so that students connect a *skill* to its *application* in their work as teachers of language arts. Not only do they develop their own information literacy, but they also see the instructor modeling the process for a class of students.

The third component of our technology intensive pilot program is a group web project for which five to six students design and upload a series of linked web pages devoted to an author on the syllabus, such as Shel Silverstein or L. M. Montgomery. Web projects which receive high marks become part of the department's online resource site for children's literature. As David Jonassen notes, citing D. N. Perkins, K. E. Hayes and others, hypermedia offers yet another process-based learning strategy, one which facilitates learning by constructing knowledge (2000, p. 206; p. 211). Just as putting together a traditional research paper brings awareness of the processes of selection, inclusion, and elision that determine the resulting document, so, too, does constructing a web page and a web site. For the web project assignment, students create a site for an author, providing a researched biographical narrative (500-700 words), a two-part bibliography which includes works by the author and an annotated list of 8-10 sources about the author's work, and a series of "Critical Context" essays (400-500 words) on such topics as "History of Literary Production," "Style of Illustration/Art," and "Theme." Our preservice teachers are therefore asked to pay attention to the audience, the visual composition, the selection of content, and the location of the pages they create, as they enter an existing conversation about children's literature.

As earlier research studies would suggest (Lehrer, 1993; Carver et. al., 1992; Jonassen, 2000), student response to this component of the pilot class was overwhelmingly favorable; the web project was most frequently cited as the "most valuable skill" learned in the technology intensive course. In their evaluations, two students noted how the web project helped them research an author, and three stated it helped them learn more about an author. While a more traditional research project may have achieved similar results, the imperative to write for and persuade an audience beyond the classroom walls played a significant role in the project's success, motivating student performance. The project also boosted our students' confidence in and comfort with using technology -- important hurdles to overcome for many Education majors. "I am no longer afraid of web-building," announced one preservice teacher in her written evaluation. Web page design was also cited as one of the technologies which preservice teachers could already imagine adapting for their own classrooms, either as a tool to teach their students about selecting and presenting resources or as a way to communicate information to students and parents.

The study of literature, with its emphasis upon interpretation and implied readers, is the ideal setting for modeling applications of information technology. Our preservice teachers are able to experience, from their dual role as student and future teacher, how technology can enhance appreciation of literature and language. The instructional methods employed in this pilot course provide a model for Education majors' own use of technology in their future classrooms. Students' increasing comfort with and control over technology allows them to experience technology as a vital learning and teaching resource, a link between the written and spoken word.

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Trek 21 PT3 Project: Evolution of Professional Development

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Abstract: The West Virginia University PT3 grant (U.S. Department of Education's Preparing Tomorrow's Teachers to Use Technology) entitled "Trek 21-Educating Teachers As Agents of Technological Change" is a three-year grant designed to build, within the educators participating in West Virginia's Teacher Education program, the capacity to use and integrate instructional technologies for teaching and learning. Trek 21 professional development constituents include PK-12 teachers in five West Virginia counties. The Trek 21 model of professional development includes a sequence of annual events including a summer institute, continuity meetings, site visits, and mini-conferences. Details from Trek 21 events have evolved to formulate a durable and sustainable professional development model. Trek 21 aims to refine the design, implementation, and evaluation for the professional development delivered during the 2002 three-week summer institute. This paper examines how lessons learned from first and second year institutes impacted the professional development process and guided essential design revisions for year three.

Introduction

As educational technology continues to evolve from a supplemental skill to a fundamental requirement, educators are being challenged to integrate instructional technology into lessons. In order to make the best use of technology in the classroom, teachers are required to exceed simple proficiency in existing and emerging computer technologies. They must be capable of determining how to integrate this technology appropriately for classroom use.

Professional development with instructional technology as a focus is complex. Design and delivery must be flexible enough to accommodate the wide range of computer expertise and the variety of environments in which teachers work. In addition, this specialized training must be geared toward creating self-sufficiency and sustainability of skills for practicing teachers. The three-year design of the Trek 21 project provides a unique opportunity to gather both short-term and long-term feedback from project participants, resulting in a continuously evolving design of professional development.

Trek 21 PT3 Project

Grants from the PT3 Initiative provide funding for innovative programs to develop technologically proficient educators who are well prepared to meet the needs of 21st century learners. "Trek 21: Educating Teachers as Agents of Technological Change" is a 3-year PT3 implementation grant from the U. S. Department of Education designed to prepare educators involved in West Virginia University's five-year teacher preparation

program to integrate instructional technologies into their teaching. The grant was awarded to the College of Human Resources and Education at West Virginia University (WVU) in 1999.

Trek 21 looks to impart lasting change in the culture of teacher practice. The Trek 21 professional development model is sequenced in such a manner so as to ensure long-term adoption of new practice, continuous support and feedback, and sustainability beyond the project. To help accomplish this change, the Trek 21 project includes an annual cycle of professional development events for PK-12 teachers. The cycle of events includes professional development institutes during the summer, continuity meetings in the fall and spring, school site visits, and mini conferences.

Summer Institutes

PDS Institutes address genres of instructional technology applications (Harris, 1998), target technical training, and prepare instructional technology materials and resources necessary for immediate integration into classroom instruction. The final outcome of this three-week institute is a teacher-developed, web-based instructional unit, which is implemented in the fall by the teacher in collaboration with a pre-service student intern.

Continuity Meetings/Site Visits

Following the summer institutes, Trek 21 holds continuity meetings with PDS faculty once each semester (fall and spring) to address issues related to the successful integration of instructional technologies at their location. School site visits occur throughout the year to provide continued support and gather data on unit implementation and local concerns.

Mini Conferences

Scheduled to occur twice each academic year, a mini-conference is held in partnership with West Virginia's "Technology, Teacher Education, Tomorrow" (T3) non-profit organization whose mission is to share best practices, receive technology enhancement training, and deliver presentations of activities related to the integration of instructional technologies. These conferences serve as our opportunity for state-wide dissemination of Trek 21 research results and presentation by participants of best practice where the integration of instructional technologies is central.

Year One

The institutes were designed to take place over a three-week period, to allow adequate time for technical training and unit development. A total of 47 participants were divided into three groups attending three separate institutes. The instructional technologies targeted were primarily web page development, electronic presentations, and conversion of paper-based to digital materials.

Prior to the summer institutes, participants received a packet containing surveys relating to computer use. Participants were asked to answer a series of questions about their current use and knowledge of computers. The data were analyzed, classifying participants as novice, intermediate, or advanced computer users. During year one, the majority of participants self-reported as novice computer users. As a result, the institutes were designed to provide clear expectations, concise instructions, and only the basics of each instructional technology targeted during the training sessions.

Week one of each institute emphasized pedagogical instruction, including topics such as reviews of teaching, lesson development, storyboarding, and examples of instructional technologies. Mid-week, participants were given a laptop computer and were trained on the fundamentals of computer use. By the end of week one, participants were introduced to basic web page creation. Week two included one or two training sessions per day on instructional technologies followed by development time, allowing participants ample opportunity to practice new skills and to develop their web-based units. Week three was devoted entirely to development time, with participants receiving individual help with the completion of their web pages and

integration of instructional technologies into their units. At the end of week three, participants presented their units to the group.

Three reviewers (two from inside the project and one from outside the project) evaluated participant units using an externally-developed rubric. Initially a low percentage of teacher units passed the evaluation and were posted. The teachers whose units were not posted were notified of essential modifications. After revisions made during the fall continuity meeting, all 47 teacher units met the requirements of the rubric and were posted to the Trek 21 web site.

Year One Findings

A review of the year one institute showed that preparing for and implementing three separate summer institutes strained both staff and facility resources. Additionally, feedback from participants revealed a need for both consistently available technical assistance and sufficient pedagogical expertise as it relates to instructional technologies during unit development. Participants particularly stressed the need for more time for unit development. However, analysis of lessons brought to the institute by participants revealed that only 30% had come prepared with complete lessons plans, 32% had partially complete lesson plans, and 38% arrived with no lesson plans, requiring the allocation of critical development time to be put toward planning of content and lessons.

These findings emphasized the need in year two to design for optimal allocation and organization of time and resources, particularly in the areas of facility planning, staffing, organization, and communication.

Year Two

To better utilize available resources, the three institutes were combined so that 27 participants attended one three-week institute. Graduate assistant roles were restructured with emphasis on providing instructional design guidance, training on use of various instructional technologies, and technical support. In year two Instructional Leaders (ILs), made up of university faculty and PK-12 expert teachers, were added to perform the following functions: (1) provide participants with pedagogical expertise throughout the institute and establish comfort levels needed for progress, (2) bridge the knowledge gap between potential and actual implementation of a given instructional technology in participants' lessons, (3) serve as quality control by discussing with participants the connections between goal/objective statements as a classroom teacher, their chosen method of assessment, and their selected instructional technologies, and (4) serve as reviewers for completed units.

Efforts were taken to ensure that participants were adequately prepared before arriving at the institute. Packets of information completed by participants pre-institute were reviewed to make certain that each teacher arrived at the institute having fully documented lesson plans, thus allowing for the maximum allocation of institute time to be used for instructional technology training and integration. Templates were designed to assist participants in detailing units and lessons. A Leadership and Planning Committee, consisting of several first year participants and Trek 21 staff members, was established to provide suggestions for year two of the institute. The emphasis of the committee was the finalization of the unit/lesson templates. Institute participants were asked to complete the templates and submit copies prior to arriving at the institute. This pre-organization of units and lessons allowed the institute focus to be on the instructional technologies rather than on organization of content, as originally intended.

In addition, web page templates were designed to assist participants with the proper design and navigation of their web pages. Teachers could focus more on developing the content of their web pages and spend less time on the web-based instructional design issues.

During week one of the institute, participants were introduced to the project, as well as to topics such as reviews of teaching, lesson development, storyboarding, and examples of instructional technologies. Later in the week, participants were introduced to their notebook computer and the basics of web page development. Monday and Tuesday of week two included morning group instruction and afternoon development time. The same instructional technologies as year one were targeted, with the addition of concept mapping software. Participants were also instructed in the use of a File Transfer Protocol (FTP) application to enable them to independently post their information to the server. The rest of the week was devoted to development, with optional breakout sessions on various topics. Week three was devoted entirely to the development of units. This

flexible design provided special-interest training and offered returning participants the opportunity to learn advanced topics while allowing other participants to concentrate on basic skills and unit development

Units were evaluated based on an internally-developed rubric. Seven unit reviewers were tasked with evaluating all units independently. Based on averaged scores from the seven reviewers, units were either posted to the Trek 21 web site or revisions were suggested. Of the 27 participant units, only four required minor revisions before posting. A Trek 21 representative met with the teacher, explained the necessary changes, and provided support in revising the unit.

Year Two Findings

Year two participants arrived with a greater range of skills due to the experienced status of year one participant returnees, as well as advances in computer use by many of the participants, as reported on computer use surveys. The greater number of units passing the initial review demonstrated the importance of pre-institute preparation of lessons and units by participants and the value of the Instructional Leaders' assistance and support. Participant feedback was largely positive. However, some participants pointed out inconsistencies between the terminology used in the templates and rubric and that used by PK-12 teachers. Planning for year three would emphasize refining pre-institute preparation, additional Instructional Leaders, standardizing the language used in the templates and rubric, and the scheduling of basic skills training with more advanced topic breakout sessions.

Year Three

Year three will accommodate a maximum of 60 participants attending one institute. In order to accommodate the expected range of technology skills, participants will be divided into three separate groups based on skill level.

The template packet has been revised to include simplified and clearer instructions for the participants. Revisions include a revision of the terminology on the unit/lesson templates to better represent the language used by PK-12 educators. The evaluation rubric has also been slightly modified to align the rubric with the changes made to the unit/lesson templates.

Year two strategies will be employed again, although clearer daily and weekly goals will be communicated by the Instructional Leaders, ensuring that participants can reach benchmark accomplishments throughout each week of the institute. The same technology skills as year two will be presented.

During week one, examples of successful integration of various instructional technologies will be demonstrated by Instructional Leaders. This will assist participants in gathering ideas on the instructional technologies that will be appropriate for their particular units. In addition, a greater amount and variety of topics will be offered in both group and optional breakout sessions. These sessions will allow participants to focus on the technologies that they choose to learn and accommodate returnees who want to expand their existing skills. Early in the institute, teachers will be provided with a rubric checklist and encouraged to frequently review their web lessons during development. Instructional leaders will be instrumental in facilitating this process. This will provide additional guidance regarding expectations of the teacher units and help participants create units that will pass initial evaluation.

Conclusion

Because technology is an integral part of everyday life, educators have an added responsibility of utilizing instructional technology in their classrooms. Through durable and sustainable professional development, instructional technology can be successfully and appropriately integrated into teaching.

Professional development in the area of instructional technology requires effective communication and flexibility to meet individual teacher needs. As Trek 21 moves into its third and final project year the design and instruction of professional development has continually evolved to best facilitate the integration of instructional technology into lessons. The integration of experienced Instructional Leaders, the development of a Leadership and Planning Committee, the utilization of unit/lesson templates, the scheduling of breakout session

on various topics, and the use of an evaluation rubric by both participants and external reviewers have all led to the specification of clear and distinct roles and appropriate support mechanisms for project participants. These refinements in design and implementation have resulted in a steady growth in the number units that can pass initial review, an increase in participant satisfaction, and as we enter the project's final year, a significant increase in the number ofPK-12 teachers wishing to participate in this professional development.

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"Building Partnerships: Creating the History Teaching Institute at Ohio State"

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Abstract: This paper will examine the process involved in creating the History Teaching Institute at Ohio State (http://ohioteach.history.ohio-state.edu), an outreach project between the Department of History at Ohio State and Advanced Placement U.S. and European history teachers in Ohio. It serves as a positive, yet cautionary tale for those interested in creating outreach and engagement efforts between universities and K-12 schools, as well as those who want to encourage greater use of new technologies and media in the history classroom.

Introduction

The History Teaching Institute (HTI) is a program designed by faculty, staff, and graduate students in the history department at Ohio State University to foster partnerships between historians in the academy and in-service Advanced Placement high school history teachers in Ohio. It focuses upon content development and use of new media in the classroom. Gregory Wilson, now at the University of Akron, directed the first year of the program and Brad Austin, the current director, took over in 2001. HTI has been funded through two $50,000 grants from the Battelle Endowment for Technology and Human Affairs. This paper addresses the process of conceiving, creating, and directing a program that seeks to leverage the resources of a large, nationally ranked history department to build a partnership with the K-12 community. It elaborates on the process of creating a user-friendly web site, complete with web reviews, lesson plans, and helpful links to other useful sites. It will focus particularly on the limitations and benefits of creating a community of practice between university staff and teachers through the mechanism of an on-line platform. Finally, by showing the pleasures and pitfalls of cooperative ventures between history faculty and teachers, the presentation will add to our understanding of both outreach and engagement between universities and K-12 teachers as well as teaching history with technology.

Context

Before discussing the details of the History Teaching Institute, it is necessary to place its creation in the larger public discourse regarding higher education and the K-12 system. From several directions, there is a growing concern with fostering partnerships between college faculty in specific disciplines and K-12 teachers. Many cite a crisis in K-12 education as a reason for such interest. For example, in the 17 August 2001 edition of the *Chronicle of Higher Education*, Vartan Gregorian, president of the Carnegie Corporation noted that higher education institutions "must accept much of the responsibility for the dismal state of public-school teaching today" (Gregorian, 2001, p. B7). He also pointed out that high numbers of teachers majored in

education, not in a subject area, compromising the education of students in the K-12 system and leaving them unprepared for college (Gregorian, 2001, p. B7). The degree to which there is a crisis in education is perhaps debatable, but there is no doubting the benefits of closer cooperation between faculty and K-12 teachers to faculty, teachers, students, and our communities.

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Did all this help students with the AP test? We don't know. Given the difficulty of sustaining interest in the program over one year, it was impossible to measure in any statistically significant way the impact of technology on AP scores. Presumably, there exists potential for a research project that does this; but such a project would require a larger amount of money and a longer time frame then was possible under the BETHA grants that funded HTI.

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In the end, programs like the History Teaching Institute have as their goals to improve teaching, enrich student interest and knowledge about a subject, and to improve student performance in class and on various tests like the AP exams. The HTI has accomplished some of the first two goals and could not assess the third. While it has been successful, it has not been a complete success. However, it does provide an example of both the promises and pitfalls of cooperative ventures between faculty and K-12 teachers and provides the groundwork for future, more sustainable projects that should receive support and funding from universities and K-12 personnel.

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"Building Partnerships: Creating the History Teaching Institute at Ohio State"

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Abstract: This paper will examine the process involved in creating the History Teaching Institute at Ohio State (http://ohioteach.history.ohio-state.edu), an outreach project between the Department of History at Ohio State and Advanced Placement U.S. and European history teachers in Ohio. It serves as a positive, yet cautionary tale for those interested in creating outreach and engagement efforts between universities and K-12 schools, as well as those who want to encourage greater use of new technologies and media in the history classroom.

Introduction

The History Teaching Institute (HTI) is a program designed by faculty, staff, and graduate students in the history department at Ohio State University to foster partnerships between historians in the academy and in-service Advanced Placement high school history teachers in Ohio. It focuses upon content development and use of new media in the classroom. Gregory Wilson, now at the University of Akron, directed the first year of the program and Brad Austin, the current director, took over in 2001. HTI has been funded through two $50,000 grants from the Battelle Endowment for Technology and Human Affairs. This paper addresses the process of conceiving, creating, and directing a program that seeks to leverage the resources of a large, nationally ranked history department to build a partnership with the K-12 community. It elaborates on the process of creating a user-friendly web site, complete with web reviews, lesson plans, and helpful links to other useful sites. It will focus particularly on the limitations and benefits of creating a community of practice between university staff and teachers through the mechanism of an on-line platform. Finally, by showing the pleasures and pitfalls of cooperative ventures between history faculty and teachers, the presentation will add to our understanding of both outreach and engagement between universities and K-12 teachers as well as teaching history with technology.

Context

Before discussing the details of the History Teaching Institute, it is necessary to place its creation in the larger public discourse regarding higher education and the K-12 system. From several directions, there is a growing concern with fostering partnerships between college faculty in specific disciplines and K-12 teachers. Many cite a crisis in K-12 education as a reason for such interest. For example, in the 17 August 2001 edition of the *Chronicle of Higher Education*, Vartan Gregorian, president of the Carnegie Corporation noted that higher education institutions "must accept much of the responsibility for the dismal state of public-school teaching today" (Gregorian, 2001, p. B7). He also pointed out that high numbers of teachers majored in

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"Building Partnerships: Creating the History Teaching Institute at Ohio State"

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Introduction

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Context

Before discussing the details of the History Teaching Institute, it is necessary to place its creation in the larger public discourse regarding higher education and the K-12 system. From several directions, there is a growing concern with fostering partnerships between college faculty in specific disciplines and K-12 teachers. Many cite a crisis in K-12 education as a reason for such interest. For example, in the 17 August 2001 edition of the *Chronicle of Higher Education*, Vartan Gregorian, president of the Carnegie Corporation noted that higher education institutions "must accept much of the responsibility for the dismal state of public-school teaching today" (Gregorian, 2001, p. B7). He also pointed out that high numbers of teachers majored in

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Teachers

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Second Year Adjustments and Conclusions

The first issue in assessing this experience relates to grant funding. Grants are critical to fostering projects, but their limited nature can make it difficult to sustain a program. This was true for the HTI, which had $50,000 for one year to hire a staff, create a web-based communication system, recruit teachers, hold workshops, visit classes, and assess progress. In the meantime, the staff constantly scanned the horizon for additional funding; fortunately, the Board for BETHA granted a one-year extension. This provided some reprieve, but to truly make a difference, projects need the security of longer-term funding. Grants can also constrain the project in certain ways that may make it difficult to alter the methods or details. In this case, BETHA required a series of lesson plans based on the role of technology in U.S. and European history. By itself this is a worthwhile effort, but not all teachers were able to make use of these lessons, especially when they did not fit into the plan for the upcoming AP exam.

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In the second year of our project, we have tried to address many of the problems that we identified during our first year. First, we altered the History Teaching Institute's structure, eliminating the group leader positions and hiring a full-time director to coordinate all aspects of the Institute's operations. We also added European history. Second, in response to what our first-year participants had recommended, we lengthened the summer workshop to four days. Simply put, we had placed too much faith in the ability of our one-day summer session and our web site to create a community of practice. Teachers and staff wanted more time to get to know each other, and the absence of a sense of camaraderie hurt the program for the rest of the year. During our second summer session, we scheduled 7 meals together and built into our agenda plenty of discussion time. This fostered group spirit, but more importantly it allowed teachers the time to share their experience and insights from the high school classroom – something college faculty could not provide. Even so, in their evaluations of the workshop, the teachers recommended even more time to share ideas face-to-face.

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Did teachers gain from this project? In interviews and surveys at the end of the first year of the project, those that stayed with it said yes; and two expressed a desire to be part of the second year project underway now. The evaluations at the end of our second summer session were even more positive. For example, one teacher thought that it was "fantastic that OSU is reaching out to the high school teachers in Ohio" and was "truly impressed by the enthusiasm and dedication to teaching of all involved instructors (I

could name them all as being outstanding)." Another participant captured the open and collegial atmosphere of the most recent seminar with his comments: "I was at first skeptical that I would learn a great deal, yet I was surprised by how much I actually gained from the institute. First of all, the instructors were excellent. All previous academic experience with history professors had left me with the impression that condescension and pretentious attitudes were prerequisites for the job. However, the professors at the institute were intelligent, enthusiastic, and truly concerned with advancing the technological teaching methods. The instructors were sincerely a breath of fresh air as they showed their dedication to teaching (as opposed to dedication to research)." This teacher concluded, "In sum, the HTI emphasized practical and realistic technological teaching methods that I can and will utilize in the classroom as opposed to theoretical/philosophical issues that do not advance teaching and learning. The HTI gets an A+ and should be expanded in order to reach more of Ohio's history teachers."

Our experience shows that teachers enjoy being part of a community of practice, sharing ideas, and being seen as professionals. This point is crucial for any cooperative venture between faculty and K-12 teachers. Teachers in the HTI also gained ideas about using new media in the classroom, even if they did not completely overhaul their teaching methods or lesson plans. Most often they used images located on the web site as well as those exchanged through e-mail to supplement their lectures and discussions. Teachers also made use of the readers given out at the beginning of the program. Finally, as faculty educated themselves about the AP process and what was and was not useful for teachers, they were able to discuss their ideas with teachers, enriching the dialogue for all involved.

The structure of the HTI reflect some of the best practices of professional development for teachers (Corcoran, 1995). Giving teachers time to debate and discuss both during workshops and on-line models constructivist teaching. Providing a four-day workshop, as well as classroom visits and virtual discussions, offers teachers the opportunity for deep, intellectual engagement. Finally, throughout the program, we demonstrated a respect for teachers as professionals and offered opportunities for teachers of various degrees of experience to share their expertise and understanding.

Clearly there are still areas we need to improve. Certainly the attrition rate was too high in the first year, and although it is much better in the second it is quite clear that we underestimated the difficulty of sustaining interest and commitment to the program. We also need to recruit and maintain contact with more teachers from under-served districts, including inner cities and rural communities. Rather than a statewide effort, with such a small staff and budget, having all teachers be in a local district may have helped sustain interest. Not only would doing so reduce travel costs and time, this more concentrated and focused project would have the added benefit of creating a more natural cadre of interested teachers who would be more likely to stay in contact and continue sharing resources and ideas after their participation in the program.

In the end, programs like the History Teaching Institute have as their goals to improve teaching, enrich student interest and knowledge about a subject, and to improve student performance in class and on various tests like the AP exams. The HTI has accomplished some of the first two goals and could not assess the third. While it has been successful, it has not been a complete success. However, it does provide an example of both the promises and pitfalls of cooperative ventures between faculty and K-12 teachers and provides the groundwork for future, more sustainable projects that should receive support and funding from universities and K-12 personnel.

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Did all this help students with the AP test? We don't know. Given the difficulty of sustaining interest in the program over one year, it was impossible to measure in any statistically significant way the impact of technology on AP scores. Presumably, there exists potential for a research project that does this; but such a project would require a larger amount of money and a longer time frame then was possible under the BETHA grants that funded HTI.

Did teachers gain from this project? In interviews and surveys at the end of the first year of the project, those that stayed with it said yes; and two expressed a desire to be part of the second year project underway now. The evaluations at the end of our second summer session were even more positive. For example, one teacher thought that it was "fantastic that OSU is reaching out to the high school teachers in Ohio" and was "truly impressed by the enthusiasm and dedication to teaching of all involved instructors (I

could name them all as being outstanding)." Another participant captured the open and collegial atmosphere of the most recent seminar with his comments: "I was at first skeptical that I would learn a great deal, yet I was surprised by how much I actually gained from the institute. First of all, the instructors were excellent. All previous academic experience with history professors had left me with the impression that condescension and pretentious attitudes were prerequisites for the job. However, the professors at the institute were intelligent, enthusiastic, and truly concerned with advancing the technological teaching methods. The instructors were sincerely a breath of fresh air as they showed their dedication to teaching (as opposed to dedication to research)." This teacher concluded, "In sum, the HTI emphasized practical and realistic technological teaching methods that I can and will utilize in the classroom as opposed to theoretical/philosophical issues that do not advance teaching and learning. The HTI gets an A+ and should be expanded in order to reach more of Ohio's history teachers."

Our experience shows that teachers enjoy being part of a community of practice, sharing ideas, and being seen as professionals. This point is crucial for any cooperative venture between faculty and K-12 teachers. Teachers in the HTI also gained ideas about using new media in the classroom, even if they did not completely overhaul their teaching methods or lesson plans. Most often they used images located on the web site as well as those exchanged through e-mail to supplement their lectures and discussions. Teachers also made use of the readers given out at the beginning of the program. Finally, as faculty educated themselves about the AP process and what was and was not useful for teachers, they were able to discuss their ideas with teachers, enriching the dialogue for all involved.

The structure of the HTI reflect some of the best practices of professional development for teachers (Corcoran, 1995). Giving teachers time to debate and discuss both during workshops and on-line models constructivist teaching. Providing a four-day workshop, as well as classroom visits and virtual discussions, offers teachers the opportunity for deep, intellectual engagement. Finally, throughout the program, we demonstrated a respect for teachers as professionals and offered opportunities for teachers of various degrees of experience to share their expertise and understanding.

Clearly there are still areas we need to improve. Certainly the attrition rate was too high in the first year, and although it is much better in the second it is quite clear that we underestimated the difficulty of sustaining interest and commitment to the program. We also need to recruit and maintain contact with more teachers from under-served districts, including inner cities and rural communities. Rather than a statewide effort, with such a small staff and budget, having all teachers be in a local district may have helped sustain interest. Not only would doing so reduce travel costs and time, this more concentrated and focused project would have the added benefit of creating a more natural cadre of interested teachers who would be more likely to stay in contact and continue sharing resources and ideas after their participation in the program.

In the end, programs like the History Teaching Institute have as their goals to improve teaching, enrich student interest and knowledge about a subject, and to improve student performance in class and on various tests like the AP exams. The HTI has accomplished some of the first two goals and could not assess the third. While it has been successful, it has not been a complete success. However, it does provide an example of both the promises and pitfalls of cooperative ventures between faculty and K-12 teachers and provides the groundwork for future, more sustainable projects that should receive support and funding from universities and K-12 personnel.

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Moving K-12 Teachers into 21st Century Science with 21st Century Technology: Building the Educational Grid for Pre-Service Training

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Appeals to citizens about global warming, alternative medicine, and water quality indicate the need for citizens to understand the models presented to them, to sensibly evaluate predictions, to consider validity of models, and to understand the power and limits of modeling. The sheer complexity of policy questions settled by models from this or that agency in the body politics calls for citizens to understand scientific models. For the sciences and the humanities alike the underlying goals of education form a democratic liberal tradition that promotes freedom of the individual and requires an awakening and deep application of critical thinking (Nussbaum, 1997). The revolution in computational modeling and computer intensive informatics such as data mining have become essential new 21st Century methodologies of deep critical inquiry. Teachers in training need to know how to use these new tools in the classroom and to make them available to our next generation of students. Through computer simulations, 3D models and extensive web-based resources designed for the learner we can make concepts available to students that twenty years ago were only understood by those upper 5% of students skilled in the formal mathematics.

A major recommendation of the report Setting a Research and Planning Agenda for Computer Modeling in the Pre-College Curriculum (Final Report: NSF RED-9255877) is that "[c]omputational modeling ideas and activities should have a key and central role throughout the science curriculum - not peripherally, and not only as part of a special or optional course." Models help "abstract from reality key features that enable us to gain insight into the fundamental processes underlying external complexity." Relationships between variables must be made explicit in both a qualitative and a quantitative sense. Observation, measurement, graphing, curve fitting, modeling, and visualization are all part of a continuum of doing science. Curriculum issues are also addressed in this report. "There is a need for a set of guidelines and models for use in integrating models and simulations into locally-relevant curriculum in a way that allows students to achieve the new goals."

The AAAS Benchmark science standards also indicate the need for computer-based modeling. The benchmark common themes emphasize connections between seemingly disparate science content. In using and creating computer models, student attention can be focused on similar structures and behavior. For example, a predator prey interaction model and a physical spring model share the oscillation structure. Disruption and resumption of equilibrium can be found in both biological and earth systems. Assimilating an understanding of such structure and behavior leads to acquisition of the "schemas" of science content which have been shown to distinguish experts from novices. (Chandler, & Sweller, 1991)

The PT3 funded EdGrid program sponsors seven teams to explore various models of integrating modeling and visualization as methods of discovery and scientific analysis into teacher preparation. This panel will present what we have learned and focus on some the most promising strategies. The teams include:

University of Alabama in Birmingham
The School of Education at the University of Alabama at Birmingham (UAB) and the ASPIRE program at the University of Alabama at Huntsville are collaborating in the formation of an EdGrid team to accomplish three objectives in the pre-service teacher education program at UAB. First, concepts of modeling and visualization are being infused in existing teaching methodology courses for the K-12 curriculum that will provide training for all students in the secondary mathematics and science pre-service program. Second, a course in mathematics modeling is being developed by the mathematics department faculty that will replace an existing course. The new course will be required for all secondary education majors. Finally, a new advanced technology course emphasizing advanced topics in the use of Excel and Web-based tools is being developed. Planning is underway for a senior research

project using modeling and/or visualization for those who wish to complete a project.

Biology Student Workbench
Biology is increasingly becoming an "information-driven" science. Biological research involves constructing meaning using the vast amounts of information compiled from experiments in the laboratory and observations in the field. The application of information technology to molecular biology research is evolving into a new discipline, bioinformatics. Biology Workbench, a bioinformatics tool, provides access to biological databases and analysis tools through a web browser. Biology Student Workbench is a growing collection of education enhancements to the Biology Workbench including, tutorials, inquiry-based laboratories and resource materials, all of which help high school students and teachers to conduct open-ended investigations in molecular biology. The project specifically addresses a pre-service teacher audience, and it supports the use of the inquiry-based learning and teaching approach to science education. The project objectives are to:

- Develop inquiry-based bioinformatics curricula in collaboration and cooperation with the faculty and students in the teacher certification programs.
- Integrate the curricula into science and math methods courses.
- Disseminate the curricula nationwide.

Lesley University
Currently, the Technology-in-Education Program at Lesley University is the only pre-service education program at the University that requires its students to take a course in computer modeling. The goal is to have computational science formally included in all pre-service education programs at Lesley University. The intended audience is students enrolled in non-science, non-technology teacher training programs. One product of this project is the development of a module, "Introduction to Computational Science," that will be used in Lesley University undergraduate and graduate teacher education programs. The module is being adopted for use in all teacher education programs as part of the on-going curriculum revisions. As with K-12 classroom teachers, university instructors need opportunities for professional development to support their learning how to teach science. A module training and mentoring program for the education faculty has been created and is being implemented.

Maryland Virtual High School
The MVHS EdGrid Collaborative Team intends to influence the secondary mathematics and science teacher preparation programs in the state of Maryland and beyond by demonstrating that computational modeling and scientific visualization can be incorporated successfully into existing mathematics, science, and teacher preparation courses at community colleges, independent colleges and state universities. Team members, which include college faculty, science and math teachers, and pre-service teachers, are developing and field-testing instructional materials which use modeling and visualization. In-service teachers provide real-world feedback for the materials being developed for pre-service teachers. These modules take advantage of existing computational tools and materials and will incorporate constructivist instructional strategies.
The project has four main objectives. They are to:

- create two-week modules that include modeling and visualization tools as essential components of the module, complete with teacher support materials, student activity materials, and performance assessments, and that encourage higher thinking skill development.
- hold design institutes whose product will be at least one, two-week module each year that will be used in appropriate college courses and K-12 classrooms.
- participate in regional and national workshops to share expertise, ideas and materials.
- foster broad scale dissemination of materials into teacher preparation programs in the state of Maryland and nationally.

Shodor Education Foundation
Building on the award-winning courseware, Project Interactivate (http://www.shodor.org/interactivate/), this project has developed additional lesson materials that incorporate computational technology integrated with the content of the middle school mathematics curriculum. These materials are currently indexed to the leading NSF standards-based curricula. Links to each state's specific curricular guidelines will be made. Each campus has identified one or more courses for specific modification to incorporate modeling and visualization to both content and methods courses. Finally, inter-institutional exchanges are supported; faculty from each campus travel to other campuses to

share their experiences and to lend assistance with modeling and technology.
The project has three main objectives. They are to:

- create summer institutes for faculty that focus on modeling and visualization in undergraduate curriculum.
- develop curriculum for middle school mathematics education that includes lesson materials, incorporates computational technology with middle school mathematics content, is indexed to standards-based curricula, and provides links to each state's specific curricular guidelines.
- facilitate and design inter-institutional exchanges for faculty on each campus to lend support and assistance to other faculty and institutions who will spread the reforms across both states.

SRI International
Advances in 3D visualization have led to the development of scientific tools that allow complex data sets to be rendered in ways that facilitate the discovery of patterns. Research in education has shown that these tools can be adapted for use by middle and high school students. In the Earth Sciences curriculum at the high school level, California state standards specify that students gain an understanding of Energy in the Earth System: solar radiation, movement of heat, and climate. Each of these areas of Earth Science involve working with data and mo dels. Measured and derived data such as incoming solar energy, carbon release, ocean currents, plant green up, and temperature differences can be displayed and analyzed by students to ask questions for inquiry and understand patterns and models. SRI Intemational has developed TerraAnalysis, a terrain visualization tool that can allow a viewer to discern patterns that are terrain dependent. The visualization being mapped usually represents a variable related to the terrain such as a remotely sensed image, temperature, or vegetation growth.

The project has three main objectives. They are to:

- Develop at least two, online learning modules that show how visualization and modeling can be used for learning.
- Write a "lessons learned" document that describes the barriers and affordances to adoption by preservice teachers.
- Infuse the concepts of modeling and visualization into the existing CalStateTEACH Technology Enhancement Project (CSTEP) in the development of indices to relevant visualization and modeling resources.

University of Illinois at Urbana-Champaign
The goal of this project is to develop materials to assist pre-service and in-service secondary mathematics and science teachers to learn to incorporate visualization technology into their teaching, and to integrate mathematics and science. Several faculty members of the College of Education in collaboration with the National Center for Supercomputing Applications are focusing their efforts on developing activities that will prepare teachers to use visualization technology to enhance and extend students' learning of integrated mathematics and sciences. Teachers can use technology effectively to present information, search for information, keep records and communicate, and such uses of technology by teachers can result in improved student learning. However, the most direct and effective way to bring about enhanced student learning of mathematics/sciences through visualization technology is to prepare teachers to incorporate it into their teaching.

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Towson University PT3 Mentoring to Master Technology Integration Project

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There is little doubt about the ubiquitous nature of technology use in our culture. What has followed is a call to infuse technology within schools as an essential tool to enhance instruction and provide vivid, useful and creative learning experiences. A range of educational organizations such as the CEO Forum, SITE, ISTE, NCATE, and most content specialty associations recommend the use and infusion of technology within teacher preparation programs. Technology offers possibilities for solving "emerging" educational problems, but only if teachers are prepared to use the technology in support of student learning, thinking and problem solving. The Towson University teacher preparation program requires pre-service teacher candidates to become active participants in meeting this challenge. The purpose of this FY2002 PT3 Implementation project entitled, **Mentoring to Master Technology Integration Project (MM-TIP),** is to enhance teaching and learning through the increased use of technology within the University teacher education program and regional consortium. The University views the appropriate integration of technology as a vehicle to enhance learning and to change the nature of the learning community associated with the University. This mentoring project is centered around three major goals: first, to assist faculty in developing their own skills in using technology; second, to encourage faculty to utilize and integrate those technology skills into their teaching in effective and meaningful ways; and, finally, to model best practices in teaching with technology and to guide pre-service teacher candidates in incorporating technology into their own lesson planning and teaching.

The teacher education program extends across multiple colleges within the university framework, including faculty from the College of Education (COE) at Towson University, the Colleges of Liberal Arts (CLA), and Mathematics and Science (CMS) who teach pre-service teacher candidates in their classes. The members of the regional consortium are from several of the Professional Development Schools (PDS) Network associated with Towson University within two public school systems in the Baltimore area (Baltimore and Howard Counties), and faculty members at Harford Community College, a two-year institution which transfers a large number of teacher education candidates to Towson University each year. In addition, the Towson University Center for Instructional Advancement through Technology (CIAT) and the Center for Technology in Education (at Johns Hopkins University) serve as partners for this project.

The vehicle for infusing technology into teaching and learning in this project is a mentor-protégé staff development model with additional targeted staff development and on-going electronic communications. The keys to success in the FY2000 PT3 Capacity Building grant project were (a) the ongoing work and assistance of a mentor to help each faculty integrate technology into their teaching, (b) a supportive environment for collaboration and learning for each protégé, (c) all faculty involved as protégés were required to use technology in their teaching with a focus of student learning, and, (d) clear and specific rewards for integrating technology into teaching. As a result of that successful project, there is an improved system that supports faculty initiative and innovation with technology. Enthusiastic educators at Towson University and in the Professional Development Schools (PDS) K-12 classrooms are using technology on a regular basis for a variety of activities.

The results of the mentor-protégé model implemented in the FY2000 Capacity Building PT3 project serve as the motivation in extending the focus of that project beyond the original 20 University faculty and 8 PDS K-12 faculty to include the current eight consortium partners. In addition, we have expanded our faculty support efforts by providing an electronic learning community (ELC) for on-going discussion, sharing of best practices, and technical support for the consortium partners.

Our conference presentation will include an overview of the MM-TIP project including its goals and objectives, procedures for developing and monitoring the mentor/protégée partnerships, the framework for moving protégées from learning skills to modeling best practices, and the data collection and evaluation processes. In addition, we will share some of the projects that have been developed by faculty who participated as protégés in the project.

Toward Improving Reflective Practice: An Online Model for Student Teaching

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Abstract: This paper discusses how the University of Texas-Pan American's PT3 Grant program extends the field-based teacher preparation program to include new modes of online communication to improve reflective practice. The formation of action research teams and their online activities are explained. Initial results are discussed and plans for quantitative and qualitative analysis of the interaction process and project effectiveness are presented.

The University of Texas – Pan American (UTPA) is the largest producer of teachers in the State of Texas and graduates more than 1000 teachers annually. The undergraduate teacher preparation program includes a field-based component that comprises 50% of student activity. The program is based in the concept of a Professional Development School as defined by the Sid W. Richardson Foundation. "The Professional Development School borrows heavily from the tested medical model of teaching hospitals, where practitioners, researchers and clinical professors work together to expand the knowledge base of medicine, improve medical services to patients and prepare future practitioners." The ideal outcome of the Professional Development School model is that university faculty, pre-service teachers, teacher intern, and mentor teacher practitioners collaborate in the investigation of learning and instruction, the implementation of effective teaching practices, and the dissemination of their findings. But unlike the teaching hospital, the separation resulting from dispersing interns into area schools isolates the constituents. The task of supervising the growing population of UTPA's pre-service teachers at multiple sites tended to reduce substantive interactions between university researchers and field practitioners.

A desire to correspond as closely as possible to the Professional School Model led to an analysis of the standing program. During pre-service teacher internships a field supervisor from the field observation office has the primary responsibility to maintain contact with university faculty. Field supervision is an especially time-consuming task given the number of interns and the size of the service area. It was found that little time existed for the field supervisor to consult with university teaching and research faculty and that there was no formalized mechanism to maintain personal contact between interns and professors. The program followed the typical linear model of preparation in which the student moves forward through three distinct phases, from general studies to major and minor studies, and then on to pedagogical preparation. The departmentalization innate to university structure limits opportunity for close collaboration among faculty units to actually follow students through the preparation cycle. The effect is that the three preparation phases appear as "ends" unto themselves. It is assumed that intern teachers engender the theoretical connection from phase-to-phase, into the internship classroom, and finally into professional practice. The communication breaks at the end of each phase do not project a holistic model of successful teaching perceived as a continuum of interaction between content, theoretical and pedagogical knowledge. These thoughts turned attention to the process of reflective practice as an activity that focuses on skills necessary to this desired ongoing interaction.

State teaching standards follow the trend to identify reflective practice (Schon, 198,1987) as an essential skill for teachers. Some feel that only a strong foundation in reflective practice supported by a theoretical foundation will adequately equip teachers with the skills that promote the adaptability needed to meet the challenges of changing contemporary classrooms (Norton, 1994). However, there appears to be no agreed-upon definition of the skills that contribute to reflective practice. Students voiced a need to know precisely "what to observe, how to observe, and how to reflect on the information from observations and how do something about the information." It is commonly accepted that the skills for reflective practice are developed through dynamic activities that involve ongoing observation, modification and evaluation of learning. The writers feel that professional interpretation and evaluation of observation data is dependent

not only upon personal creative insight but also on a connection to theory. Methods associated with action research seem to provide a practical mechanism to connect data from classroom observation to theory as well as provide formats for follow-up activity. Parsons & Brown (2002) state than an "action researcher engages in a process of observing-doing-observing-adjusting and doing again." The writers felt that clear identification of the steps in action research and practice with that process could potentially strengthen teachers' mental models to support reflective practice and sustain professional activity toward ongoing solution of learning problems. "Action research offers teachers and teacher educators an opportunity for individual professional growth through ongoing dialogues with people and texts and an equally important opportunity to create a learning community within a school" (Squire, 1999). Obvious societal factors like rapid globalization, technological, social and economic changes have a dynamic impact on education that demand ongoing professional development among practitioners and researchers. The stated considerations intensified interest to insert an explicit model for reflective practice based in action research that would include experienced faculty researchers in the internship phase of the teacher preparation program. It was determined that to support such a model a means to bridge the physical distance between field interns and university research faculty was needed.

The PT3 Grant provided resources to develop technological skill among pre-service teachers and faculty. Grant activity and also presented the opportunity to explore Web-based communication as a tool to bridge the physical distance between university faculty and field placement sites in the standing teacher preparation model. These investigations stimulated the initiation of the infrastructure for an online learning community to provide a virtual place for collaboration and training. This infrastructure supported the initiation of the online student-teaching component that enables frequent communication between university faculty and mentor-intern teams at remote sites. It is important to state that the new online student teaching activity is an enhancement to the standing successful internship model and not a substitute. The goal of the online component is to strengthen intern teachers' skill in reflective practice through action research activities that extend university researchers' expertise to situate practical theoretical applications in the remote classrooms during the internship phase of preparation. The use of an online environment provided means:

1. To ease communication and consultation among university faculty, mentor teachers and interns separated by distance;
2. To collaborate to conduct action research activities that models skills innate to reflective practice;
3. To affirm the essential relationship between content, theoretical and pedagogical knowledge as the basis for reflective practice;
4. To support development of technological skill and an understanding of technology-supported learning;
5. To encourage technology-supported instructional activity in order to expand possibilities for innovative instructional solutions; and,
6. To demonstrate a broader process for professional consultation that provides example of collaboration empowered by web-based communication.

To implement the online student-teaching component action research teams are formed in the following manner. Questionnaires are distributed to identify mentors, interns and faculty who have expressed interest in technology-supported learning. Once identified, a faculty content specialist from a teaching discipline is teamed with a COE faculty. They are then matched with five mentor-intern teams that have expressed specific interest in learning issues related to faculties' research agenda. The criteria for participation are that team members must have a genuine interest in collaborative research and demonstrate willingness to develop necessary technology skills. Targeted technological skills include use of Web browsers, email, uploading and downloading documents, file transfer protocols, online library resources, Internet search engines, discussion boards, chat, video conferencing, and instructional design procedures. Support systems provided by the PT3 project include the Web-based infrastructure, individualized just-in-time technical assistance from PT3 staff, consultation with an instructional designer, and online tutorials. Additionally, each intern-mentor team is issued a laptop equipped with a wireless modem to assure capability and ease of Web access. To maintain consistency with the approach of the UTPA PT3 Grant, that technology is best learned when it becomes a tool for learning, explicit instruction in the use of technology is embedded as team activities indicate need. The PT3 Instructional Developer

handles the daily activities necessary to mediate the online environment. The PT3 co-directors and Instructional Developer survey team activities to insure that team needs are met in a timely manner.

Once activated, the comprised team follows an agreed-upon routine common to action research: observe, identify a learning issue for treatment, research, analyze, design instructional treatment, apply, evaluate student performance, assess effectiveness, and report findings. All team communication takes place in a private space provided within a Web-based environment called the Electronic Learning Community (ELC). By substituting online communication for physical meetings at remote sites, time spent for team collaboration ranges from one to three hours per week for an eight-week period during the internship. An eight-week period is specified to contain the activities within a practical time period that allows the teacher intern the opportunity to realize all the steps of the research project and to participate in authoring the final report. Varied online technologies support communication, email, file transfer protocols, video conferencing, etc., so that faculty members can virtually join the mentor and intern in an analysis of the content covered at the placement site during the internship.

The team begins collaboration through online discussions about the content to be covered at the placement site in order to identify a learning issue relevant to the instructional setting and of interest to faculty. When an issue is identified, they develop a research agenda that includes a timeline for observations and investigations. The analysis of observation data and research findings assists the team to develop a hypothesis and a plan for instructional treatment. In the case of this project, at least one technology-based instructional activity must be included in the plan. The PT3 instructional developer is available to assist the team with instructional design processes and the creation of the technology-based lesson. Teaching strategies and lesson activities derived from the analysis and design are applied in the classroom. Data regarding student response and performance during the instructional treatment is recorded according to agreed upon protocols. Video of actual student activity is recorded and field supervisors also provide valuable on-site observations. The team analyzes the recorded results to evaluate the effectiveness of the instructional treatment. Finally, a report of team activity and findings is collaboratively authored, and posted to the public area of the ELC. The video is included with the analysis so that other teachers can view the authentic examples as well as access the theoretical and instructional design information.

The end products of the online student-teaching component are; a demonstration of action research skills to support reflective practice, a higher technology skill level among participants and a growing archive of best teaching practices. The project report and video become part of faculty's research information and are also included in the teacher intern's electronic portfolio.

Important to implementation of any change is the stakeholders' motivation to participate. That motivation is dependent upon perceived benefits. By using Web-based communication to eliminate the time-consuming travel to field sites the online student-teaching component appears to comprise significant benefit to all stakeholders in the following ways:

1. It establishes and strengthens the professional relationships among collaborating members.
2. Content and pedagogical experts acquire a closer connection to the real classroom.
3. The action research model provides the interns and mentors with a clearly defined format for reflective practice that reinforces the relationship between theory and practice.
4. The results provide faculty with ongoing acccss to practitioners and field data not readily accessible through traditional means.
5. The mentor teacher, intern and field supervisor have access to content and research expertise when developing instructional activities.
6. All participants improve technological skills while using technology to learn about learning and to enhance instructional treatment.
7. A growing online archive of best-teaching practices is available to other researchers and practitioners.

Another implicit goal of the online student-teaching component is that participation in the online learning community will be extended beyond the internship period. Reports from beginning teachers that relate a feeling of isolation compel interest in providing formats for broader communication models. With this in mind, the online student-teaching component presents Web-based communication as an activity that can easily be extended into professional life. Though at this writing the online student-teaching component is in the first semester of implementation, it does demonstrate potential to benefit team members and the larger teaching community by providing a precise model for reflective practice that demonstrates a process for continued collaboration and professional growth. Formal assessment of the project includes both quantitative and qualitative evaluations. The following records are maintained; team logs to measure time

input, records of training, frequency and type of technical assistance; and questionnaires to measure participants satisfaction. A count and evaluation of final reports and archived examples will be conducted at the end of the semester. Surveys to measure continued use by participating intern teachers of the online community are planned during their first year of professional practice. These studies and resulting best practice archives will provide data to assess the overall effectiveness of the project.

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Student Teachers Supported by Technology

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Student Teaching Technology Sites (STTS) are student teaching placements that are equipped with a media cart. On the media cart is a laptop, projector, scanner, digital microscope, printer, and digital camera. Each laptop is ready to run *HyperStudio*, *Inspiration*, *Timeliner*, *PowerPoint*, and more. It is very simple to install other software. The Friedsam Library on campus at St. Bonaventure University has an extensive software collection, and STTS sites are located within a reasonable distance from campus– so borrowing software is not difficult.

The STTS student teachers are required to incorporate technology into their lessons as much as possible, but there is not a required number of times to use technology per placement. The student teacher's goal should be to have the students use as much technology as possible in the classroom.

The STTS program offers a great deal to everyone involved. First, teachers in the student teaching placements must have an interest in taking a student teacher who will be working and incorporating technology. It is beneficial to the cooperating teacher because he or she will learn from the student teacher how to incorporate technology into lessons.

The students benefit from this experience because they are presented with more technology, and they have the opportunity to become actively involved with technology. In my student teaching experience, the students used Microsoft *Word*, *Inspiration*, *PowerPoint*, *National Inspirer*, a short vowel interactive game, *Story Maker Deluxe*, and a digital camera. The students are excited about having a media cart in the classroom, and they are eager to get involved in the lessons when technology is being used.

The student teacher benefits from STTS because she has more access to technology as a result of the equipment provided with the university's PT3 grant. The student teacher learns right along with the students. The student teacher also has the opportunity to see her students become engaged in an interesting lesson. Another benefit is being closer to campus, which means a shorter drive (a real advantage in rural NY where some student teachers must drive up to an hour each way)!

In my personal experience as a student teacher, I have learned that it is harder than it looks to fit everything planned into one day. Using technology requires more time in terms of planning and class time. It takes dedication to teaching and technology to be a part of STTS. For example, in my third grade placement I presented a slide show, on Monarch butterflies, using *PowerPoint* to the students. After doing their own research on different aspects of the Monarch the students, in pairs, created their own slide. We compiled the slides together and the students presented their work. This took a fair amount of planning on my part, as well as class time. However, it was well worth it, as the students gained something from this lesson. The students were so proud of their own work, but they were also eager to discover what their peers had to present. The day following the students' presentation, the daily journal prompt was "I learned Monarch butterflies..." It was incredible to see how much the students got out of a *PowerPoint* slide show. Students who had never become engaged did this time. This was a very rewarding experience for a student teacher.

In some cases it does take a lot of preparation to use technology in the classroom. However, some times it takes little preparation at all. For example, in a third grade class I was reviewing short vowel sounds. I used *Short Vowel* software as an anticipatory set. The students were eager to use the laptop and projector in the classroom. Each student had the opportunity to come up to the laptop, call on a peer, and use the mouse to categorize objects according to the short vowel sounds in the objects' name. In this

situation, the prep time for this activity was very short. To prepare for this anticipatory set I had to obtain the software from the library and download it onto the laptop.

Another wonderful way to incorporate technology into the classroom is by using the Internet. I use the Internet frequently when writing lesson plans; there are wonderful ideas for teachers on the Internet. Even more importantly I encourage my students to use the Internet as a resource. When completing a reading unit on discovery I took my fifth grade class to the computer lab to research a place they would like to "discover". The places ranged from Colorado to the Bahamas. The students were given a short time to learn something about their place using the Internet. They were allowed to print one page of information. Next, the students had to practice their public speaking skills and present one interesting fact that they "discovered" about the place to the class. This lesson was very easy to plan and it encouraged students to use technology as a resource.

One of the most incredible pieces of technology we are provided with at STTS is a digital camera. When teaching a lesson on Descriptive writing in fifth grade, the student had to work in groups to create a list describing the Oreo and how to take it apart. Each student was given an Oreo to manipulate. I took pictures of the students completing the activity. The following day the students were required to take their list and put it into paragraph form. Before giving the second half of this assignment I felt is was important to review Descriptive writing. I created a *PowerPoint* presentation that included the steps to writing a descriptive piece and the pictures of the students working with the Oreos the previous day. The students were so excited to see their peers working together. I had their full attention during the presentation. The pictures of the students working in cooperative groups are beneficial to me because I am able to import the pictures into my electronic portfolio.

The pictures taken while the students are learning may also be used in a classroom newsletter that may be sent home to the parents. My cooperating teacher was eager to learn how to import pictures taken with the digital camera into Word documents. We used several pictures from a variety of lessons that I taught to be in the newsletter sent home. It really helps parents to see that their children are constructing their knowledge and interacting with one another.

Students are also able to use the digital camera. The camera conveniently comes with a strap to hang the camera around the neck. In both third and fifth grade the students in my classes were able to use the digital camera confidently. In third grade the students took pictures of one another to display on a bulletin board for open house. In fifth grade the students wrote and typed their goals. On the final copy of their goals they took pictures of one another to import into a Word document. These were also put on display. In both situation the students were able to learn from one another and demonstrate their ability to use the digital camera.

I realized that it is a little easier to do more with older students with technology. They are able to use a word processor fairly quickly. When using *Inspiration* with fifth graders, I was able to pick a "student helper" to guide students at the laptop. In my third grade experience using Inspiration, I had to be there to guide the students at the computer.

Overall, being a student teacher in an STTS has been a wonderful experience. I feel more prepared to use technology in the classroom. However, it has been a realistic experience for me as well. Even though it has been a good experience for me, I am confident that it has been a learning experience for the children too, and that is what is most important.

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