Meeting the ISTE Challenge in the Field:

An overview of the first six distinguished achievement award winning programs

Terri Teal Bucci, Anthony J. Petrosino, et al.*

The 2002 National Educational Technology Standards (NETS) Distinguished Achievement Awards, sponsored by the International Society for Technology in Education (ISTE), were awarded to six teacher education programs across the United States. The awards recognize institutions that exemplify successful integration of the National Educational Technology Standards for Teachers (NETS•T) into teacher education programs. Institutions across the country completed an extensive application process to be selected one of the first six recipients of the ISTE Distinguished Achievement award. This process included online documentation that demonstrated the program's implementation of the NETS•T models and practices. To see the electronic documentation, go to http://cnets.iste.org/netsawards/index.html.

This writing provides a means of uniting various programs and program developers (teacher educators and instructional technologists) by looking at the most common obstacles we face in the pursuit of appropriate infusion of technology into teacher education programs and workable solutions for overcoming those obstacles. In addition, one goal of this writing is to spark the creative notions within each of us by reading about the innovations that are working.

Review of Relevant Literature

In a review of recent literature concerning technology infusion and field experiences, four themes emerged: experiences, connections, preparedness, and modeling. These four categories provide grounding for knowledge construction with respect to technology and the field. Through this, you can interpret and utilize the remainder of this writing.

Experiences

Research has shown that often times, teachers teach the way they are taught (Schifter, 1997; Scholz, 1995; Russell, 1997). Because of this, the issue of experiences for students in preservice teacher education programs, both as preservice teachers and as students using technology, are of utmost importance. Nevertheless, teacher preparation programs are sometimes lacking in terms of actual technology experiences for their preservice students (Diegnueller, 1992; Sudzina, 1993; Turner, 1989).

Because the best way to prepare teachers for careers in teaching is to provide a variety of experiences and opportunities to use computers and technology (Wetzel, 1999), it is up to the program designers and teacher educators to provide these experiences, through assessments, projects, and requirements of technology infusion in lessons. Cuban (1995) explains that teacher's experiences with technology will inevitably affect their use of and instruction with technology in their own classrooms. Because of this, it is not only important that teacher educators use technology in their teaching, but that they use technology in appropriate and meaningful ways. Collaboration with instructional technologists, content experts, and instructional designers is vital to providing a rich technology experience for preservice teachers. Through such collaborations, teacher education programs can be designed to foster understanding, development, and applications needed to acquire a meaningful understanding and use of integrated technology throughout the entire program (Barone, Berliner, Blanchard, Casanova, & McGowan, 1996; Willis & Mehlinger, 1996).

Connections

Although it is imperative that teacher education programs provide early experiences in the uses and appropriate management of technologies in the schools (Milbrath & Kinzie, 2000), integration of technology across teacher education courses is essential (Balli, Wright, & Foster, 1997; Blubaugh, 1997; Merkley & Schmidt, 1996; Schmidt, Merkley, Strong, & Thompson, 1994; Smaldino & Muffoletto, 1997; Wetzel, 1993). Some researchers have chosen to integrate technology into courses by modifying the course content to include technology infusion (Cherup & Linklater, 2000). Others choose to integrate activities into course content, objectives, and assignments (Vannatta & Beyerbach, 2000). Halpin (1999) found that the integration of technology experiences into methods courses did provide preservice teachers with the foundation and confidence to use computers in the classroom.

Preparedness

A considerable amount of research demonstrates that teachers feel they are not prepared to use technology effectively in their classrooms (Barksdale, 1994; Bosch & Cardinale, 1993; Davis, 1994; Topp, Mortensen, & Grandgenett, 1995). Not only are teachers feeling inadequately prepared, but they also know very little about how to use technology effectively in the classroom (Willis & Mehlinger, 1996). It is from these lessons that teacher educators find direction for the technology component to methods and field courses.

Modeling

"If teacher education is to meet its responsibility to prepare teachers for the information age, then teacher educators have a professional responsibility to provide leadership in developing the full potential of existing and emergent technologies in teacher training" (Brook & Lopp, 1989, p. 2). Modeling appropriate uses of educational technologies for our preservice teachers must be a priority if we have a common goal of producing technology-savvy teachers. If we do not model the integration of technology in our methods courses and in field experiences, then future teachers will not include technology in their own classrooms (Zehr, 1997).

Six Models of ISTE Standards Integration in the Field

Methods

The six institutions receiving the first round of awards in February 2002 were each invited to prepare a field experience case. After receiving the six cases, they were read and re-read to flush out a consistent presentation. Through this process, it became apparent that each institution highlighted a particular aspect of their field experience program. This unique component is highlighted on an individual basis for each institution. After reorganizing the cases in a consistent format, they were returned to the authoring institution for revisions and comments. The cases were then returned and compared for similarities and differences across the six cases. A second round of revisions came after comments reflected a need for a "next step" component. This is reflected in each case write-up under "work-in-progress." This provides the reader with ideas about what the authoring institutions believe will come next in their pursuit to meet the ISTE standards for appropriate and effective technology infusion into teacher education. The intent of this article is to highlight the unique and differentiating methods of incorporating the ISTE standards into teacher education. What follows is a presentation of cases from the first six winners of this award.

Mutual Goal

Throughout these cases, the primary goal is to infuse technology throughout field experiences so that beginning teachers are prepared to integrate technology into their K–12 classroom teaching. This goal is connected to the axiom that technology is only to be used when it is appropriate to do so, appropriate meaning a means through which learning is enhanced in ways that cannot be managed without the inclusion of technology. Each program represented has endeavored to find the best means specific to their particular situation to meet this goal. In addition, each program represented has attempted to establish procedures that will lead to the institutionalization of their efforts. Finally, each case provides a look to future projects and goals for the particular institution.

Arizona State University West

Context

Arizona State University West, an urban commuter campus, started 15 years ago. Today it has 5,000 students, with 800 enrolled in teacher education. During each of four semesters, students complete a field experience associated with their coursework. The fourth field experience is student teaching. Many of the students are nontraditional and about 20% are members of minority groups. Students are admitted to the College of Education at the beginning of their junior years. At this point, they have had one course in computer literacy. This case focuses on the subgroup of students who enroll in the specialization area of Early Childhood.

Virtually all Early Childhood preservice students have access to computers at home or work and approximately 70% have Internet access at home. All students have access on campus. Although many preK–3 field experience sites have 2–3 computers per classroom, access to technology in public school classrooms varies.

The Early Childhood faculty met to plan for the integration of technology across the program. As a team, they discussed the National Education Technology Standards for Teachers (NETS•T) and used them as a guide for technology integration efforts. A curriculum matrix was developed to show the alignment of courses and field experiences with the NETS•T (see matrix at http://westcgi.west.asu.edu/pt3/publications/NETSTsc.htm).

Since 1999, support from a Preparing Tomorrow's Teachers to Use Technology (PT^3) funded project, Teacher Educators Classrooms of Tomorrow Today (TECOTT), has provided the resources to implement a cohesive effort to ensure that students experience models of technology-infused teaching in their field placements. It has provided support for change in field experiences through (a) a Practicum Plus program, (b) an Arizona Classrooms of Tomorrow Today (AZCOTT) program, and (c) technology-friendly field placements.

Field Experiences

The first strategy, Practicum Plus, helped current K–12 teachers learn to use technology in their classrooms by providing them with training before and during the semester they spent with their practicum students. Significantly, these mentor teachers were paired with their practicum students for these workshops, so that they learned together how to develop curriculum units integrating technology. Each unit addressed NETS•T IIA: Develop lessons that integrate technology for students to work in various groupings. The preservice students, with the collaboration of their mentor teachers, then implemented these technology-rich units during their practicum experience. The units were published on Arizona Learning Interchange at http://azli.asu.edu. In addition, the university has collaborated with the Child Develop-

ment Center Preschool on campus. Each semester, approximately 25 Early Childhood preservice students participate in the Practicum Plus program with preschool teachers.

The second strategy was to take highly skillful technology-using teachers and give them the tools and training to construct exemplary classrooms in which interns, student teachers, and other teachers and administrators could observe models of good instruction integrating technology. These AZCOTT classrooms were established through a partnership with K–12 school districts. Three of the AZCOTT teachers are in primary grades. They participated in more than 90 hours of professional development classes focusing on the infusion of technology into the curriculum. These teachers created units of practice that use the NETS•T standards-based curricular framework. Preservice students are invited to complete field experiences in these classrooms. In addition, a language arts methods instructor takes her students to visit an AZCOTT classroom twice each semester. They observe second graders using technology, interact with them, and debrief the observation by discussing their observations and questions with the teacher. In addition, preservice students exchange e-mail with the students and use this exercise to study children's written language development.

The third strategy involved working with 50 school principals to identify technology-friendly K–12 classrooms for student placements. Although this took some time, it resulted in a greatly expanded list of suitable field placements for preservice interns.

Electronic Portfolios

Two Early Childhood cohorts have completed electronic hiring portfolios as a requirement of the student-teaching seminar. Plans are underway for preservice students in other certification area to create electronic portfolios. These electronic portfolios reflect the state teaching standards and the NETS•T as outlined in the program matrices, sample curriculum units, teaching and classroom management philosophies, and a digital clip from their student-teaching experience. Students use their electronic portfolios for employment searches.

Overcoming Challenges

These accomplishments have not come easily. There are many obstacles to placing students in field experiences with good teachers who also use technology with children in appropriate ways. For example, most primary grade teachers in the area did not necessarily feel confident in their ability to use technology in the classroom. Consequently, the program provided opportunities for preK–3 mentor teachers to participate in workshops along with preservice students. Perhaps the most powerful strategy was having the mentor/preservice teacher pair develop a technology-rich unit that was later implemented in the field experience. This was accomplished largely because the on-campus university preschool had a director committed to the program's vision.

A Work-in-Progress

Although the Arizona State University West Early Childhood program has made significant progress towards meeting the NETS•T, much remains to be done. First, the program needs to prepare part-time university instructors. Part-time instructors teach about 40% of courses, including the Student Teaching Seminar, a course that is taken concurrently with a field experience. Generally, it has been difficult to institutionalize change with part-time instructors. They find it more difficult to attend faculty planning meetings and participate in faculty development technology workshops, thus it is harder for them to model technology integration in their classes and make technology-use requirements in the field experiences that accompany each course. Presently the curriculum is being reorganized, with a common syllabus for each course to increase the likelihood that all faculty will address the common course objectives. Second, preservice students typically participate in one technology-friendly field experience out of their four field placements. The next step is to ensure that students are required to do two field experiences in such a classroom. Efforts to identify such classrooms should aid in making this possible. Finally, the program is transitioning away from PT^3 funding by meeting with the school-district partners to plan for the continuation of the technology-rich AZCOTT classrooms to a district-led administrative council.

University of Texas: UTeach

Context

The UTeach Program constitutes a joint effort between the College of Natural Sciences, the College of Education, and the Austin Independent School District to recruit, prepare, and support secondary mathematics, science, and computer science teachers. Following two one-hour introductory courses, students follow a three-course sequence plus a revised student-teaching internship. This undergraduate program can be completed in as little as three semesters or can be stretched over four years. All students in the program produce a preliminary portfolio before they enter student teaching and must pass a final portfolio review by outside experts before they are recommended for certification.

Field Experiences

In accordance with national guidelines for teacher preparation, UTeach students begin carefully supervised classroom teaching in public school classrooms during their first semester in the program. Preservice teachers progress from teaching science lessons to elementary students to teaching lessons in their discipline at middle and high schools. This gives preservice teachers first-hand experience with the scope of the curriculum and positively challenges their notions of student capabilities. Field-based experiences take place primarily in inner-city schools with high-minority, low-socioeconomic student populations.

Mentor teachers—classroom teachers who work with preservice teachers in the field—provide written feedback on performance. Mentor teachers are selected based on their willingness to adopt reform-oriented approaches to instruction and their reliability in assuming mentor duties. All mentor teachers receive training in inquiry approaches and the mentoring process. These training sessions are held once a semester on Saturdays and mentors are paid to attend.

Master teachers—former classroom teachers employed by the university—work with College of Education faculty to place students in the field, to monitor fieldwork, and to provide professional development for mentor teachers.

Preservice teachers are expected to effectively use technology in the classroom. To accomplish this goal, model technology use is integrated into all UTeach courses, mentor teachers receive professional development in technology integration and technology tools for their classrooms (e.g., handhelds, laptop computer carts, and CBL probes), and preservice teachers are required to use technology during their field experiences.

To ensure that UTeach meets the national standards for technology competencies of preservice teachers, the technology goals for each course and field experience were mapped to ISTE's NETS•T. Students were then surveyed to determine the extent to which they used technology in their courses and field experiences. The survey indicated that some field sites lacked sufficient technology resources for students and that some courses did not sufficiently emphasize technology integration. To alleviate these problems, a mobile laptop cart was procured for one field site and an additional 24 laptops have been made available for student check out. Additionally, course requirements have been revised to better reflect the NETS•T. Preservice teachers are now required to demonstrate their use of technology in the field as part of their final portfolio review.

Collaboration Between Colleges

Because UTeach professional development courses are offered through both the colleges, communication between colleges is essential so that students experience a seamless curriculum rather than disjointed courses. Because courses are taught in both colleges by a rotating group of faculty, an iterative process of curriculum-mapping and student surveys is used to ensure that courses continue to meet the NETS•T. All courses are evaluated based on the stated objectives in the syllabi, and those evaluations are used to determine staffing. Additionally, faculty who will be teaching UTeach courses in future semesters co-teach the course the semester before they are assigned to teach it. Co-directors govern UTeach, one from each college, and a steering committee comprised of faculty and staff from both colleges and from the school district meets weekly to discuss curriculum and policy issues.

Overcoming Challenges

UTeach has experienced exponential growth since its inception in 1997, when the first cohort of 28 UTeach students was selected. By the fall of 2002, UTeach enrollment had grown to more than 250 students. This growth has required intense recruitment of mentors and has required negotiations with other programs (most notably elementary education). Master teachers monitor the quality of mentoring, and UTeach students evaluate their mentors at the end of each semester. Mentor teachers who do not meet program expectations are provided opportunities for remediation or are requested to seek other professional opportunities outside the program.

Most of the mentor teachers who work with the UTeach program lack up-to-date professional development in technology integration. Moreover, many campuses lack adequate technology resources for those teachers who are technology literate. To ensure that field experiences align with university expectations, the College of Education and the Austin Independent School District procured a PT^3 grant, which provides inservice staff development for UTeach mentor teachers as well as hardware for classroom use. Additionally, the College of Natural Sciences obtained funding for a laptop cart, CBLs, and professional development for mentor teachers at one of the field sites. The College of Natural Sciences has also procured additional laptops and CBLs for use in the field.

A Work-in-Progress

One of the goals of the UTeach program is to reach a steady state enrollment of 500 so that the program will produce 100 secondary mathematics and science teachers per year. This growth will continue to challenge UTeach to find quality mentor teachers, experienced faculty who ascribe to the ideals of the program, and technology resources for student use in the field. It will require additional collaboration with the Austin Independent School District to provide professional development for their teachers. As the field changes, iterative curriculum mapping and evaluations must continue to assure that the program meets the NETS•T. One area of immediate concern is the integration of technology-infused curricular units into student teaching. In their final course before student teaching, UTeach students develop a project-based unit that is infused with technology. However, to date, those units have not been successfully incorporated into student teaching. During Fall 2002, UTeach students worked with their student-teaching mentors during the semester before student teaching to develop the units. By collaborating on the units, student-teaching mentors may "buy into" them and allow student teachers to implement the units during student teaching. Additionally, this collaboration may provide student-teaching mentors with professional development in project-based instruction and technology integration.

Curry School of Education, The University of Virginia

Context

In the mid-1980s, the Curry School of Education reorganized the education school and its associated teacher education program. Educational technology was one of three strands designated for integration throughout the program.

The Curry School preservice teacher education program involves both the College of Arts and Sciences and the School of Education in a five-year joint degree program. Teacher education graduates receive a BA from the College of Arts and Sciences and a Master of Teaching (MT) degree from the Curry School. A physics teacher, for example, would receive a bachelor's degree in physics, as well as a MT degree in teaching.

Field Experiences

The teacher education program incorporates a philosophy that effec-

tive teacher education programs integrate classwork and field experiences. Teacher education students begin field experiences during their first year in the program and continue those experiences in subsequent years. Each year's field experience is directed by a full-time teaching faculty member and is related to coursework taken during that term.

A major focus addresses ways in which technology can be used to teach the respective content areas (science, mathematics, social studies, English and language arts, special education, and foreign languages) more effectively. Ongoing collaboration with classroom teachers ensures that technology use is consistent with needs and conditions found in schools. Integration of technology is not a specified element of field experiences for methods courses, because the intent is that technology should be in the background rather than the foreground and used only when appropriate. Teacher education faculty model appropriate use of technology in methods classes and then provide support as students employ technology in appropriate ways during field experiences. This approach, based on intrinsic motivation, has worked well. Assessments of teacher education students demonstrate that they consistently use technology during their student teaching in ways that enhance learning (Bell & Tai, in press).

The Curry School formed a technology partnership with the local schools and the Virginia Department of Education that has lasted nearly two decades. This partnership lies at the heart of technology integration. The Curry School benefits by increasing the chances that preservice teachers have an opportunity to observe effective uses of technology in the classroom throughout their field experiences. The school systems benefit through access to resources that would not otherwise be available to them.

These collaborative efforts are designed to ensure that the university programs and practices in local schools support one another and are in alignment. For example, the Curry School, local K–12 schools, and the Virginia Department of Education collaborated on design and development of the nation's first statewide K–12 Internet system. This alignment of university programs and school practice was extended to ISTE's NETS•T when they were developed.

The Curry School's Technology Infusion Project (TIP) linking teacher education students with local teachers is one example of school–university collaboration that has been cited as a model in the NCATE study, *Technology and the New Professional Teacher: Preparing for the 21st Century*. The TIP program pairs preservice teachers with local classroom teachers. The preservice teachers are enrolled in an educational technology course that requires them to implement technology practices in real classrooms, following NETS•T guidelines.

Underlying Philosophy

A core philosophical principle underlying integration of technology in the Curry School teacher education program is that technology makes it possible to reconceptualize how the discipline is taught, and that many such uses are specific to a particular discipline. For example, graphing calculators are an essential element of modern high school mathematics classes, and access to primary sources in digital archives can potentially change the nature of history classes. For that reason, educational technology is embedded throughout the teacher education program, but is incorporated in different ways depending on the discipline. Preservice teachers are required to take an introductory educational technology course designed for their content area (elementary, secondary humanities, secondary math/science, or special education). This introduction is then expanded upon throughout the foundational and methods courses.

At the same time, some guiding principles that govern appropriate uses of technology in the Curry School teacher education program are applicable across all content areas. Both classes and field experiences apply the following guidelines for use of technology (Garofalo, Drier, Harper, Timmerman, & Shockey, 2000): Introduce technology in context, use technology to address worthwhile content with appropriate pedagogy, take advantage of the technology, and use technology to incorporate multiple representations.

A Work-in-Progress

Based on current trends, many Curry School faculty believe that the majority of students in public schools will have wireless portable computing devices (PWDs) by the end of the decade (Bull, Bull, Garofalo, & Harris, in press). Therefore, following Goodlad's (1994) model of simultaneous renewal, the Curry School is simultaneously preparing faculty to incorporate PWDs into their teaching practice and working with small-scale handhelds with teachers in local schools. For example, faculty members have initiated a joint venture with the local county schools on the effect of ubiquitous computing. This project explores the effect on classroom practice of providing every student with a portable, handheld computer.

The transition from a few minutes of access to school computers each week to a world in which every child has portable, personal access to the Internet 24 hours per day will represent a watershed event. The challenge will be to realize the educational and social potential of emerging technologies when this era arrives. This can only be accomplished by working directly with teachers and students in actual classroom practice in K–12 schools to identify best practice, and by translating subsequent findings into practice in teacher education programs.

Ohio State University at Mansfield

Context

The Ohio State University at Mansfield is a regional campus and provides preK–3 and grades 4–8 degree licensure through a five-quarter master's degree program. The campus serves traditional and nontraditional students, and was originally a commuter school but has recently provided on-campus living. Students come from predominately suburban and rural backgrounds. The students in the program are primarily White and female, which presents a challenge when addressing issues of diversity in the classroom, and travel in a cohort of 15–24 students for the duration of the program. On the average, 20 students complete the program each winter quarter.

Field Experiences

During the two methods block quarters (quarters three and four), students are arranged in teaching pairs. Students participate in part-time weeks (six weeks in which they are in the field for approximately one to two days a week) and full-time weeks (three weeks in which students are fully responsible for the teaching in a particular classroom). Students develop and teach units with a focus on integration, developmentally appropriate practice, technology, and literature across the content areas. The fourth quarter is student teaching.

In an effort to increase the appropriate use of technology in student lessons and units, students are now required to attend a technology teaching lab as a component of the methods courses. During this lab course (two hours each week), students experiment with the latest educational technologies. Student are encouraged to "learn through play" and to develop appropriate lessons that utilize a variety of technologies, including flex cams, dissecting microscopes, smart boards, computer calculators, digital balances, presentation software, and canned software. The instructor's role in a constructivist-based lab course is to facilitate student-designed efforts (Bucci, 2002). Because of this, it is imperative that the instructor of the lab component of the methods block be a coach, not a director. The lab instructor is a member of the education department and collaborates with methods instructors on assignments that will encourage student growth in the uses of technology. The lab is truly a lab—students work on a multitude of assignments and lesson developments.

The students are required to use the technology in an appropriate and educationally sound way in all methods courses for at least one lesson a quarter. Some students choose to use the technology as a teacher tool, while others choose to use the technology as a student tool. After completing their technology-enriched lesson, the student teachers write and submit a lesson reflection paper. In addition, the students complete a questionnaire at the end of each methods block quarter indicating their failures and successes with technology-rich lessons. The results of this survey provide formative feedback for the technology teaching lab program.

Issues of Assessment

In keeping with the ides of backward design, the department sees the need to provide students with assessments that not only evaluate, but also provide students with opportunities to learn about technology and experience technology-enhanced lessons as a student. A few such assessments are MST projects (importing digital video as a means of reflection on lessons), backyard history project (importing digital and scanned documents into presentation software), digital posters, case study project (using Web CT and practicing teacher collaborations to promote professional relationships and growth), and the summative technology template.

The technology template is created using ISTE's NETS•T, specifically the professional preparation performance profile. Students download this template, with the competencies in table form, and write a short narrative addressing how they hit each of the competencies, including a hyperlink to electronic evidence of their work. This evidence also provides documentation to the faculty of the uses of technologies in the students' teaching and preparation. For example, if a student wanted to demonstrate that she wrote and taught a lesson using HyperStudio, she might use two forms of evidence. First, she might hyperlink the lesson portion to the text document of her write-up of the lesson. Second, she might hyperlink her teaching evidence to an example of a student's presentation. Additionally, many students use electronic evidence of their technology-infused lessons for their template.

Overcoming Challenges

The primary obstacle in the implementation of this technology-rich program was the technology itself. Students needed time to play, and the lab provided for this. They also needed to be able to field-test their technology-rich lessons in the field placements. Often, schools had inadequate or incompatible technologies, causing problems with students who were developing technology-rich learning experiences. To overcome this lack of hardware and software, the department purchased four technology packs. Each pack contains a portable projector/laptop set, a flex cam, a digital still camera, and a digital video camera. The packs remain in the field-placement building for the entire full-time teaching period. In addition, the campus maintains two sets of computer calculators, a digital balance, a portable smart board, a dissecting microscope, and a variety of software programs for students to check out during their field placements. The students use the technology and are observed by a field supervision team: one GTA, one staff member, and four faculty members—one from each of the primary content areas.

A Work-in-Progress

Although the program has made great progress toward meeting the ISTE professional profile through the technology teaching lab and the technology template, and the general preparation profile through the prerequisite undergraduate technology courses with a similar template, the program is now pursuing the student internship performance profile. In this endeavor, the program is experiencing some of the well-documented complications of reaching this goal: equipment and time. The student teachers can still check out the equipment provided by the university, but it is time consuming and takes a great deal of planning (which is in the development stage in terms of student teachers). Another problem is the addition of another content area (technology) to be developed and taught during the already full student-teaching quarter. Finally, although it is imperative that students provide documentation and evidence of their inclusion of the profiles in their student teaching, this is during a time in their professional lives when they are already feeling overwhelmed at the task before them: student teaching.

Hope College

Context

Located in Holland, Michigan, the mission of Hope College is to

offer with recognized excellence academic liberal arts programs, in the setting of a residential, undergraduate, coeducational college and in the context of the Christian faith.

The vision of the Hope College Education Department is to create, nurture, and sustain an exemplary and distinctive teacher education program that is current and integrated with the liberal arts. The program promotes and models six professional roles: effective communicator, professional collaborator, curriculum developer, problem solver, decision maker, and scholarly educator. Teacher certification is offered at elementary and secondary levels. Approximately 150 students graduate each year with teaching certificates.

Field Experiences

By its very nature, the teacher education program at Hope College is developmental; students complete courses with accompanying field placements at three different levels, each level building upon the previous. The first level, Choosing Teaching, introduces students to what it means to teach, so they can determine if they want to pursue a career in teaching. At the second level, Learning How to Teach, students learn the theory and pedagogy of teaching. At the third level, Applying Teaching, students apply knowledge and skills in a student-teaching field placement.

Students complete a related field experience in conjunction with every education class, allowing them to apply knowledge and skills learned in coursework in a practical setting. Each field placement has specific goals, and students progress from systematic observation to planning and teaching lessons and managing the classroom. Each placement requires students to reflect on their teaching skills and professional behaviors and to create goals for the next placement. Students must receive satisfactory evaluations from their mentors to progress through the education sequence. Field-placement locations include private and public schools in urban and rural areas. The population of Holland and the surrounding school districts is diverse, thus offering preservice teachers opportunities to experience that diversity in area classrooms.

Developmental Connections

The NETS•T are imbedded into every course and field placement and are modeled by professors in teaching. Students learn and use the NETS•T throughout the educational sequence.

For example, at Level I, preservice teachers demonstrate NETS•T I, III, IV, and V through Task #3 in the general preparation performance profile: Use technology tools and information resources to increase productivity, promote creativity, and facilitate academic learning. Students sign up for field placements by going to the class Web site, viewing available placements, and making their selections. A requirement of the field placement is that student teachers create a multimedia presentation of their experiences, research, and course connections, including digital photos, digital video clip, and Internet resources. Presentations address technology used in the placements and offer suggestions for additional technologies that could be incorporated in the placement setting. Presentations are given to professors and peers for review and evaluation, and become a part of students' Level I electronic learning portfolios.

Within the field-placement experience, one of the ways preservice teachers meet NETS•T II, III, IV, and VI at Level II is through Task #7 in the professional preparation performance profile: Design and teach technology-enriched learning activities that connect content standards with student technology standards and meet diverse needs of students. In coursework, students at both elementary and secondary certification levels design lesson plans based on content standards and supported by technology applications. These lessons are taught in the accompanying field placements.

At Level III, one of the ways preservice teachers meet NETS•T II and VI is through Task #3 in the student-teaching/internship performance profile: Design, manage, and facilitate learning experiences using technology that affirms diversity and provides equitable access to resources. Student teachers create lessons that meet the individual needs of students, including those students who may require assistive technology. Student teachers must videotape at least one of these lessons.

Overcoming Challenges

There are a few challenges to face with technology-related field placements. The first is difficulty in locating placements with mentor teachers who are skilled in using technology. The second hurdle is a lack of uniformity of resources within the districts and the college. For example, student teachers must be familiar with both PC and Macintosh platforms. In addition to compatibility, location and a lack of resources have caused difficulties. Perhaps the education department's only projection device is at the high school and unavailable to the elementary schools. There is also the problem of zip drive accessibility. Finally, there is also the personality compatibility of the technology support person in the building or district. Many of these challenges can be overcome with surveys given in the field placements the first week of school.

A Work-in-Progress

The program has future goals to help implement technology in the classroom. Faculty must strive to locate quality placements with teachers who are modeling effective technology use. Students must be proficient in using both Macintosh and PC computers; therefore, faculty must plan for this in coursework and require students to complete assignments on both platforms. Field-placement evaluations must reflect the NETS•T, and the program is in the process of deciding how best to do this. NETS•T are fully integrated in Levels I and II field placements. Integration at Level III is the next step. Professors observe preservice teachers working in their field placements. Hendhelds with portable keyboards and digital camera attachments allow professors to complete an evaluation during the observation and beam it to the preservice teacher immediately. The goal is to seek funding for more hendhelds.

Wake Forest University

Context

The Wake Forest University Department of Education graduates 40–50 teacher candidates in elementary and secondary programs each year. Majors and initial licensure are available in elementary, secondary social studies, and secondary Latin. Initial licensure for K–12 is offered in French, Spanish, and German. Enrollment in professional preparation phase courses is often fewer than 12 students per class. Methods and student-teaching courses average five students to each faculty member.

All undergraduate students since the Class of 2000 and all graduate students, beginning 2002–2003, are given an IBM ThinkPad with a printer, a standard load of software, and space on a network server for storage and publishing Web sites. Ethernet connections to the campus network are in dorms, classrooms, offices, and common areas. Efforts to ensure meaningful technology experiences throughout all teacher-preparation phases defined by the NETS•T focus heavily on field experiences. Candidates are able to check out camcorders, laserdisc players, DVD-video players, projection devices, and other A/V equipment to support their instruction in the field if these resources are not available at the school. Twenty-four-hour access to the technology lab is available in the event that candidates need to use specialized hardware or software, and the university technical support help desk supports all candidates. This level of access ensures that candidates meet program expectations for technology use in field experiences.

Field Experiences

Field experiences throughout the preparation programs promote frequent interaction in the classrooms and help candidates develop a familiarity with the resources available in the schools, preparing them to meet the challenges of performance expectations that require integrating technology into teaching. Winston-Salem/Forsyth County Schools support the field experiences of all candidates in the Wake Forest teacher education programs. Meaningful interactions with students are integrated throughout preparation programs building toward the student teaching semester. This structure provides opportunities for candidates to develop their ability to integrate technology into teaching, learning, and professional practice (NETS•T III and IV).

The North Carolina Department of Public Instruction requires all preservice teachers to demonstrate their technology competence in a portfolio as a licensure expectation. Products published in the technology portfolio address all of the NETS•T as well as the North Carolina Basic and Advanced Technology Competencies for Teachers. State-mandated technology performance assessment provides an impetus for innovative approaches to technology integration. Faculty meet these state and national technology expectations by collaborating on authentic teaching and professional assignments and communicating the value of appropriate and ethical integration while promoting technology use in the field.

Course Alignment

Changes in program structure contribute to increases in the use of technology in field experiences. Restructuring the secondary and elementary education programs aligned the methods and technology courses in the semester prior to student teaching. This created an opportunity for faculty to collaborate on instructional design projects that help candidates develop meaningful and relevant curriculum units demonstrating appropriate technology integration. These units provide candidates with technology-enriched plans and resources that can be used during student teaching. Program changes ensure that candidates engage in meaningful and productive field experiences while scaffolding their technology integration skills through all phases of their preparation. Course alignment is designed to help student teachers connect their technology skills to sound pedagogical principles and design instructional experiences that support the needs of diverse learner groups. Departmental commitment to meaningful and balanced technology integration promotes technology use in the field by creating a supportive environment for meeting the challenges of teaching with technology.

Overcoming Challenges

One persistent challenge to seamless technology integration in field placements is access to hardware and software. Efforts to increase the use of technology and to integrate technology throughout teacher education programs continue to focus on access, especially in the field. Meanwhile, changes in program structure and performance assessment unify the approach to technology integration in teacher education programs and help sustain efforts to integrate the NETS•T into all phases of teacher preparation.

A Work-in-Progress

This unified departmental approach has created an environment responsive to experimentation with new technologies. Recent developments in digital video-editing tools and digital storage media stimulated pilot studies of field-based performance assessment. Selected teacher candidates in graduate programs currently use digital video-editing tools to capture and to reflect on practice during student teaching. The long-range goals of this work-in-progress are to promote the development of dispositions associated with reflective practice, to help candidates develop expertise with new instructional technologies, and to identify new methods for documenting growth as a professional.

Themes Across the Cases

Even though we try to integrate technology into programs of teacher education, either through individual courses or program restructuring, there are two major factors that allow for systemic change: (a) college-wide planning for technology integration, and (b) the use of national standards (Strudler & Wetzel, 1999). The programs highlighted in this writing all have one prominent commonality, ISTE's NETS•T. Each program has made strides for integrating the standards into their program and practice.

Equipment

Access to technology is a primary issue in teacher education programs. Issues concerning access in the field and access at university sites were prevalent in the cases provided. Whereas some of the award-winning programs provide individual technologies to their students, others provide portable/mobile equipment for their students to use in the field placements in the schools. Because some of the universities expect their preservice teachers to use the technologies in their field lessons, the technology must be present. The university programs that are represented in this writing have learned that to have students use technology in their field placements, oftentimes the technology must be provided to the schools.

This trend to either supply university students with individual technologies, as in the case of Wake Forest, or at a minimum, supply the field classrooms with technologies, is one that warrants future study. What is best for the preservice teachers, the placement classrooms/ schools, and the universities? What are the issues to raise when making these decisions in colleges of education?

Connections

Connections were a consistent theme throughout the cases. These connections were maintained through university-field practices where university student worked with field teachers to integrate technology in appropriate ways. Connections also appeared in university coursework. Connection built on the premise of technology integration, both into the education courses, but also in the content area courses, seemed prevalent in the presented cases. Award-winning programs aligned the education students' courses both within and outside the colleges of education with the ISTE standards. Although some universities focused on content-specific technologies, the overwhelming reflection of the cases demonstrated a desire to connect on a multitude of levels:

- College of education/University at large course content connections through open communications and technology-rich content courses
- Education course content /ISTE standards connections through surveys and consistent reflection and feedback
- Education program/Field classroom connections through modeling of technologies in field courses
- Education students/Field teachers connections through collaborative technology-enriched lesson planning

Collaborations

Collaboration is a primary factor in each of the award winning programs. The collaborations demonstrated in this writing are not on a superficial level. These collaborations are purposeful and reactive to the needs of (1) the preservice teachers, (2) the field classrooms, (3) the classroom teachers, and (4) the national and state technology and curriculum standards. Collaborations, to be valuable, need to provide opportunities for revision and reflection. That too, is indicated in the cases of the award-winning institutions. Each of these collaborations provides meaningful interactions between the various personnel and programs affected by programmatic descriptors and applications of technology-enhanced teaching.

Specific outcomes of such collaborations are:

- The development of technology-friendly teachers modeling the uses of technology to enhance the teaching and learning of school-age children
- Reflective responsibilities of technology-friendly teachers to reflect on preservice teachers' growth and development as technology-using teachers
- The development of content-specific technologies used in university classrooms for education students and those students in the content courses that are in the education program.
- Collaborations among education faculty from various content area foci to develop enriching applications of generalist technology applications in the classroom, both university and K–12.

Mentoring

Continuing on the issue of collaboration is the issue of mentoring. Mentoring, for the purposes of this writing, is the practice of a "higher knower" helping to guide and direct the "lesser knower" in the area of appropriate technology use in the classroom. The primary levels of mentoring indicated in this writing are classroom teacher-to-preservice teacher. By selecting classrooms for field placements that involve a technology-savvy teacher, the preservice teachers are able to see the technology in action. The are able to live the constant negotiation needed to utilize technology in the classroom for the benefit of student learning.

Another type of mentoring is also apparent in these cases: preservice teacher-to-classroom teacher mentoring. Too often we see the field placements as a one-way learning design. In the case of many of the award-winning programs, the preservice teacher and his or her uses of technology have given the classroom teacher ideas about appropriate (and sometimes inappropriate) applications of technology in the classroom. This mentoring is valuable for both partners. The classroom teachers sees applications that she may not have seen before and the preservice teacher gets to be "expert" in a field—teaching —that often seems overwhelming at the beginning.

Finally, there is evidence from the cases that there is also faculty-to-faculty mentoring. This type of mentoring is demonstrated in the content faculty uses of technology and the resulting exemplars for the education faculty and students. In addition, the education faculty who demonstrates an application of technology in a methods course or generalist education course is modeling that application not only for her students, but for the other faculty as well. Mentoring is a cornerstone of development for a teacher. The institutions in this writing have recognized this and built upon that premise.

Evaluation

Evaluation plays an important role in the cases presented in this writing. Evaluation can be seen throughout each of the programs in the following order: monitoring, planning, implementation, reflection, and exhibition. The programs highlighted in this writing presented some form of observation and many had a reflection of the observation of the technology use observed. That technology was often in a content course, but some were in methods courses or in a classroom. Following the observations, preservice teachers in many of the institutions were expected to plan appropriate technology-enhanced lessons. These lessons were evaluated and revised with the assistance of a faculty member, a fellow teacher, or a peer.

Another evaluation component to many of the institutions programs was the implementation of lessons involving technology integration. These lessons were often observed by field coordinators or evaluated by cooperating teachers. After receiving feedback, the preservice teachers reflected on the experiences they had in infusing technology into their lessons. Finally, a majority of the institutions require some sort of final exposition. This piece, either a portfolio or other summative assessment, presented the preservice teachers' travels and growth with respect to technology in the classroom. This final component varied from institution to institution, but it was an important indicator of the students' ability to integrate technology into the classroom.

Another distinct component to the evaluation in the cases presented was evaluation of program. Several of the institutions used surveys to determine the extent to which their technology use was reflecting the ISTE standards. In addition, institutions used student surveys to determine successes and failures in technology-enhanced lessons. This feedback was used to better the respective programs. Without the components of evaluation, the process of integration of technology in purposeful ways into classroom lessons goes unchecked. As a fairly new component to today's classroom, technology-enhanced teaching and learning must undergo consistent and frequent checks. This is the only true way to measure our growth as educators and developers of innovative teaching strategies.

Conclusion

Through this investigation, readers can discover the successes and concerns of the six award winning programs and use this information to precipitate growth and development in their own programs. By learning of ways in which programs have overcome obstacles, program designers can implement appropriate methods of infusing technology into teacher education. As the field of technology and teacher education continues to grow, communications among programs of education is vital. By learning from each other, we can expedite our venture into the appropriate uses of technology in today's classrooms. Finally, we can also discover together those aspects of technology infusion that need further attention.

Implications for Research

What can be ascertained from the first cohort of the 2002 National Educational Technology Standards (NETS) Distinguished Achievement Awards, sponsored by the International Society for Technology in Education (ISTE)? Certainly, each program has subtleties and nuances that could not possibly be explored in depth in this article. We have tried to structure our descriptions of each program around issues of context, field experience, overcoming challenges, and issues of assessment in order to have some possibility of comparing each program on key issues of implementation.

In 1998, the Expert Panel on Educational Technology was established by the U.S. Department of Education's Office of Educational Research and Improvement (OERI) to develop a framework and process for judging educational technology programs (http://www.ed.gov/offices/OERI/ORAD/LTD/panel.html). The framework sets a standard for the field and insists that educational technology programs be organized around educationally significant goals that can be linked to students' complex learning (Confrey, Sabelli, & Sheingold, in press). The panel's conclusion was that in order to be seen as effective, three programmatic elements must be present: learning, equity, and organizational change. These three components are seen as essential for any program that is to have significant effect over an extended period. In order to help scaffold the assessment process, the Expert Panel suggests six criteria for effective technology-based programs: (1) The program addresses an important educational issue or issues and articulates its goals and design clearly; (2) The program develops complex learning and thinking skills; (3) The program contributes to educational excellence for all; (4) The program promotes coherent organizational change; (5) The program has rigorous, measurable evidence of its achievements for one or more among Criteria 2, 3, and 4; and (6) The program is adaptable for use in multiple contexts.

To add substantively to the body of research on educational technology in general and to teacher preparation specifically, teacher preparation programs must seriously consider assessment components that effectively answer the recent call by the Expert Panel on Educational Technology on learning, equity, and organizational change. Effectively rising to the challenge of incorporating these criteria into a program of research for technology integration is a worthwhile goal for any of the 2002 National Educational Technology Standards (NETS) Distinguished Achievement Awards recipients and for all who engage in the field of technology and teacher education.

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Terri Teal Bucci is an assistant professor in mathematics education at The Ohio State University at Mansfield. Her research investigates issues associated with technology in preservice teacher education. She has also authored a number of manuscripts on the use of expert teachers in teacher education research and has developed a model, Paradigm Pedagogy, which aligns teaching with research paradigms.

Terri Teal Bucci, PhD
Assistant Professor, Mathematics Education
The Ohio State University at Mansfield
1680 University Drive
Mansfield, OH 44906
Phone: 419.755.4243
Fax: 419.755.4362
bucci.5@osu.edu

Anthony Petrosino is a learning scientist in the Department of Curriculum and Instruction at The University of Texas at Austin. His research focuses on children's and teachers' scientific and mathematical reasoning in the context of schooling, with an emphasis on activities and tools for developing thought.

** Contributing authors: (listed in alphabetical order)*
Randy Bell: University of Virginia
Susan Cherup: Hope College
Ann Cunningham: Wake Forest University
Sandi Cohen: University of Virginia
Gail Dickinson: University of Texas
Jeremy Ervin: The Ohio State University at Mansfield
Mark Hofer: University of Virginia
Keith Wetzel: Arizona State University West