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AUTHOR Shoffner, Mary B.; Dias, Laurie B.

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ABSTRACT

This paper details the theoretical underpinnings of one university's approach to technology integration in its pre-service teacher preparation programs, and the results of a continuous, feedback-driven project to evaluate for technology integration through a student portfolio development process. Portfolios are assessed for multiple education and technology standards. Results of the project to date, aw well as future plans, are shared and discussed. Georgia State University received a Preparing Tomorrow's Teacher to Use Technology Grant at the Implementation level during the first year of grant awards. In the first year of the grant, the College of Education, as a whole, worked to put standards and assessment procedures into place to meet state and national technology standards. Due to a reorganization of the project management team prior to the second year of funding, a different approach was deemed necessary to meet the requirements of the grant funding. Mini-grants were awarded to faculty teams to support grass-roots level technology integration projects. This paper reports on the development efforts of one such mini-grant. This PT3 mini-grant had two foci: to continue the development of an online support system to assist preservice teachers in meeting the National Educational Technology Standards for Teachers (NETS-T) standards, and the extension of a portfolio development and assessment process to include assessment for NETS-T standards. (Contains 29 references.) (Author/AEF)

On-line Support and Portfolio Assessment for NETS-T Standards In Pre-Service Programs at a Large Southeastern University

Mary B. Shoffner
.Laurie B. Dias
Georgia State University

Abstract

This paper details the theoretical underpinnings of one university's approach to technology integration in its pre-service teacher preparation programs, and the results of a continuous, feedback-driven project to evaluate for technology integration through a student portfolio development process. Portfolios are assessed for multiple education and technology standards. Results of the project to date as well as future plans are shared and discussed.

Georgia State University received a Preparing Tomorrow's Teachers to Use Technology Grant at the Implementation level during the first year of grant awards. In the first year of the grant, the College of Education, as a whole, worked to put standards and assessment procedures into place to meet state and national technology standards. Due to a reorganization of the project management team prior to the second year of funding, a different approach was deemed necessary to meet the requirements of the grant funding. Mini-grants were awarded to faculty teams to support grass-roots level technology integration projects. This paper reports on the development efforts of one such mini-grant. This PT3 mini-grant had two foci: to continue the development of an on-line support system to assist preservice teachers in meeting the NETS-T standards, and the extension of a portfolio development and assessment process to include assessment for NETS-T standards.

Teacher Technology Integration Skills

Federal, state, and local agencies are investing billions of dollars to equip schools with the technology that may well be the key to improving the learning experience of our nation's youth. Despite these gargantuan investments, only 20 percent of the 2.5 million teachers currently working in public schools feel comfortable using these technologies in the classroom (U.S. Department of Education, 1999; *Technology Counts*, 1997). As reeducating the existing teaching force to take full advantage of these technology tools will require expensive professional development over many years, the preparedness of new teachers entering the field becomes critical to the success of these investments to improve education. As the federal government predicts that 2.2 million new teachers will be needed in the next decade, the time to address these issues is now (Milken Exchange on Education Technology, 1999).

Computer technology has been available for use in educational settings for several decades. According to a survey of U.S. state-level technology officials (Trotter, 1999), 42 states require teacher preparation programs to include technology. One might think that by this time colleges of education (COEs) are successfully preparing teachers to integrate technology into instructional practices. However, this has not necessarily been the case. In 1995, the U.S. Office of Technology Assessment (OTA) published a report on the status of teachers and technology. According to the OTA, teachers were not and did not feel adequately prepared to integrate technology into their teaching practices. One of the contributing factors cited was the lack of technology training available in teacher preparation programs at colleges of education (COE). When technology instruction was provided, it involved teaching *about* technology not teaching *with* technology. In most instances, COE faculty did not model technology integration with their preservice students.

According to a recent survey of 416 teacher preparation institutions commissioned by the Milken Exchange of Education Technology, most faculty members did not model the use of instructional technology skills in their teaching (Moursund & Bielefeldt, 1999). In several studies it appears that faculty who are not modeling are also not requiring students to use technology in their lessons or assignments (Lewallen, 1998; U.S. Congress, 1995; Wetzel, 1993).

However, a report produced by the U.S. Department of Education (2000 revealed refreshing news: less experienced teachers were more likely than experienced colleagues to indicate that college course work prepared them to use computers in their classrooms. "84 percent of teachers with 3 or fewer years and 76 percent of teachers with 4 to 9 years of teaching experience reported that college/graduate work prepared them to use these technologies to any extent, compared with 44 percent of teachers with 10 to 19 years and 31 percent of teachers with 20 or more years of teaching experience" (p. 78). While teacher education programs still face obstacles as they prepare preservice teachers, it is evident they are making in-roads.

Teacher education programs across the country struggle with how to increase the technology integration skills of the students they educate. Not only are standards such as the National Educational Technology Standards for Teachers (NETS-T) (International Society for Technology in Education National Educational Technology Standards Project, 2000) being adopted, states are now requiring institutions to *guarantee* the technology proficiency of their graduates (University System of Georgia Board of Regents, 1998). At the rate of technological innovation, will it make any difference if pre-service teachers are taught simple productivity skills for both themselves and their students once the technology changes? What exactly should we be teaching pre-service educators about using technology in their future classrooms? The answer to these questions might help

teacher educators to focus not only on what content and skills need to be taught, but also on what instructional strategies might be used in teaching about technology integration.

Factors Hindering Technology Use in the Classroom

Several factors have been cited as hindering new teacher use of technology. These include inadequate training in proper technology skills and methods, lack of technology modeling on the part of their university faculty, lack of positive technology experience in school settings, and university faculty out-of-touch with the technology explosion in schools and how it is effecting teaching practice (Kent & McNergnery, 1999; National Council for Accreditation of Teacher Education, 1997; Persichitte, Tharp, & Cafarella, 1997; Office of Technology Assessment, 1995; Byrum & Cashman, 1993). The re-design of entire teacher education programs is called for.

To this end, the Instructional Technology unit at Georgia State University determined to undertake a two-fold approach to increasing the technology integration skills of preservice teachers. First, in order to facilitate preservice training in proper technology skills, and methods, an on-line support system was developed not only for course use, but also to support the preservice teacher throughout student teaching and on throughout the critical induction experience. Secondly, to address teacher education faculty awareness and knowledge of teacher technology integration skills, and to increase modeling to technology integration skills throughout the preservice teacher experience, a portfolio development process was instituted with the Middle Childhood Education unit. Portfolios are assessed throughout the preservice program for meeting first technology standards, and then for meeting new teacher standards.

Early in 1999, Georgia Governor Roy Barnes formed an Education Reform Study Commission to look at ways to improve Georgia's schools. Governor Barnes used the results of the commission's study to produce the A Plus Education Reform Act of 2000 (2002). Out of the act came technology-related initiatives that impact teachers and teacher preparation programs. Primarily the act holds teacher preparation programs at universities and colleges responsible for their graduates' technology competencies. Universities and colleges

> shall require students in such programs to be proficient in computer and other instructional technology applications and skills including understanding desktop computers, their applications, integration with teaching and curriculum, and their utilization for individualized instruction and classroom management. There shall be a test to assess the proficiency of students enrolled in teacher preparation programs in computer and other instructional technology applications and skills. (p. 68)

Prior to the A Plus Education Reform Act of 2000 (2000), the Middle, Secondary and Instructional Technology Department (MSIT) recognized the need to prepare pre-service teachers in the area of technology integration. The Instructional Technology unit has been working closely with the Middle Childhood Education unit for the past four years to develop a WWW-supported resource based learning environment (RBLE)/methods course called *Teachers and Technology*, IT 3210. This course focuses on and models technology integration. It is a required course for Middle Childhood (MCE), Secondary Education (SEC) students and Foreign Language, Art, and Music (FLAM) students seeking teacher certification, and an elective course for Early Childhood Education students (ECE), as well as Kinesiology/Health (K/H) students seeking certification. The pre-service students generate a portfolio documenting the design of technology-supported instructional environment that facilitates student learning through the design and development of student-centered learning activities. The IT3210 portfolio serves as a starting point for middle grades students who continue with the portfolio assessment process throughout their studies at GSU demonstrating they have met INTASC (Interstate New Teacher Assessment and Support Consortium) Standards (Council of Chief State School Officers, 1999).

IT3210 and its web-based resources address the National Educational Technology Performance Profiles for Teachers as well as supports all six of the National Educational Technology Standards for Teachers (NETS-T) and contributes to student understanding of the INTASC Standards. The middle grades portfolio assessment addresses only the INTASC Standards.

Program Issues – Stand Alone Course or Cross Curriculum Integration?

Many teacher education programs focus on either a stand-alone course, or on a model of technology infused throughout all teacher preparation courses. Some schools, including GSU, have opted to do both. Kovalchick (1997) offers, "An approach that I have found useful is to blend elements from both a competency based models and integrative models into a reflexive approach in which students use technology as both learner and teacher. In this way, preservice teacher education students are challenged through direct experience to generate personally relevant conceptions of technology" (p. 31). Smaldino and Muffoletto (1997) also promote a combination approach. "Our model attempts to blend the contents of the existing single course with the need to nurture technology applications within methods and other courses. Thus, students first gain an understanding of the applications of technology in education in the broad sense, with an in-depth examination of how technology supports learning in specific content areas" (p.37).

Technology Integration Support for Preservice Teachers

Course Design History

Prior to 1997, the technology course at GSU was a stand-alone, skills-based course that focused on the use of technology as a teacher tool. Content included such technology usage as word processing, mail merging a letter home to parents, and using a spreadsheet program to calculate grades. Little to no learning theory or instructional methods were included in the lab-based

course. In addition, the technologies covered were basic in nature – telecommunications coverage consisted of e-mail, and in later years, the Internet as a database of lesson plans. As pedagogy played virtually no role in the course, students were allowed to substitute a passing grade on a pencil and paper competency test.

In 1997, at the request of the Middle Childhood Committee, the standard skills-based preservice technology course underwent a major redesign. In the first year, the course refocused from teacher-resource-based, skills-based to a technology-integration-into-the-curriculum approach. This refocus was done in part to address a potential cause of low technology adoption in preservice teachers: deficiencies in technology-integration methods (Leggett & Persichitte, 1998).

In fall semester 1998, the IT unit worked with the MCC to redesign the course to further situate the course content in teaching methods. While maintaining a lecture/lab approach, a WWW-based, resource-based learning environment (RBLE) was introduced as part of the

course (Hill, 1999; Shoffner, 1999). The course, and its related resource laden WWW site, incorporates a problem-centered, activity-based approach where the computer applications are anchored in authentic and familiar contexts in which teaching and learning occurs (Cognition and Technology Group at Vanderbilt, 1991; Vygotsky, 1978). This approach is based on the view of an open learning environment in which learners have direct input on the direction of the course based on their needs (Hannafin, 1999; Hannafin, Hall, Land, & Hill, 1994). In navigating through the environment and tackling challenges, it is proposed that students will also develop self-directed learning skills, which will serve them well as they enter the teaching profession. Along with confidence in using the technology, self-directed learning skills have been identified as a characteristic of successful technology-using teachers (Shoffner, 1996). The RBLE can be accessed at http://msit.gsu.edu/IT/3210/index.html . The site map for the course appears below in Figure 1.

At the same time, the course serves as an introductory teaching methods course, introducing preservice students to such concepts as instructional objectives, lesson planning, evaluation, and assessment. The course offers more than teaching the basic ADDIE instructional design model as a way to develop lesson plans while teaching about technology integration skills. In the *Technology for Teachers* course at GSU, the technology is immersed in learning about what being a teacher entails – briefly, planning, learning theory, instructional strategies, classroom management, and assessment. Our hope is that by introducing the technology and the methods together, early in the program, that a) students will forever forward view technology as natural to the learning process as the textbook and the pencil; and b) both the technology *and* the methods will be reinforced throughout their other courses at GSU. One way in which continuity and reinforcement occurs is in the use of portfolios for assessment. In the *Technology for Teachers* course, preservice students generate a portfolio documenting the design of technology-supported instructional environment that facilitates student learning through the design and development of student-centered learning activities. The use of portfolio development and assessment continues throughout the remainder of Middle Childhood Education program of study.

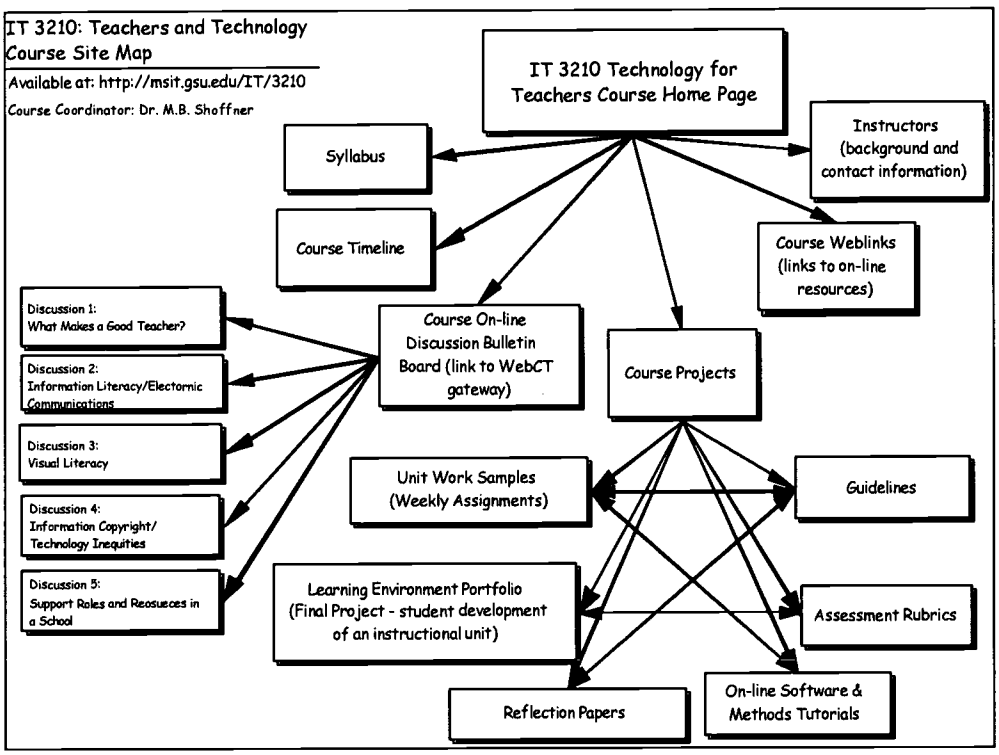

Figure 1. Course Site Map of IT 3210: Teachers and Technology

From Course to On-Line Support System for NETS-T

One focus of this PT3 mini-grant was to expand the IT 3210 *Teachers and Technology* website to provide not only a backdrop for the course but also to serve as a resource for pre-service teachers during their student teaching experience as well as their first year induction period into the teaching profession. To facilitate this continued use, we redesigned the interface of the IT 3210 *Teachers and Technology* resource based learning environment (RBLE). Using the PT3 website development done by the project director in summer 2000, materials were merged into one master RBLE. The interface was changed from a homepage-linked pages interface (http://msit.gsu.edu/IT/3210/index.html) (Figure 2, below) to a frame-set interface (http://msit.gsu.edu/PT3/Shoffner/index.html) (Figure 3, below). The grant team felt this change was necessary to facilitate navigation through what is becoming a very large resource site. When complete, the site will serve not only the IT 3210 audience, but also as a mentoring resource to new teachers in the field. Furthermore, the new frameset navigation will allow users from other universities to more easily access portions of the site for their students (we continue to receive two to three requests for such use each semester). We had hoped the interface frameset would be in place for the entire site (with placeholder pages for approximately on half the content) by the mid March 2001. However, the development of the frameset interface required more time than initially anticipated. Now that the frameset interface is in place, work will resume this fall semester on the authoring and placement of content, as well as the identification of exemplar lesson plans for including in the site.

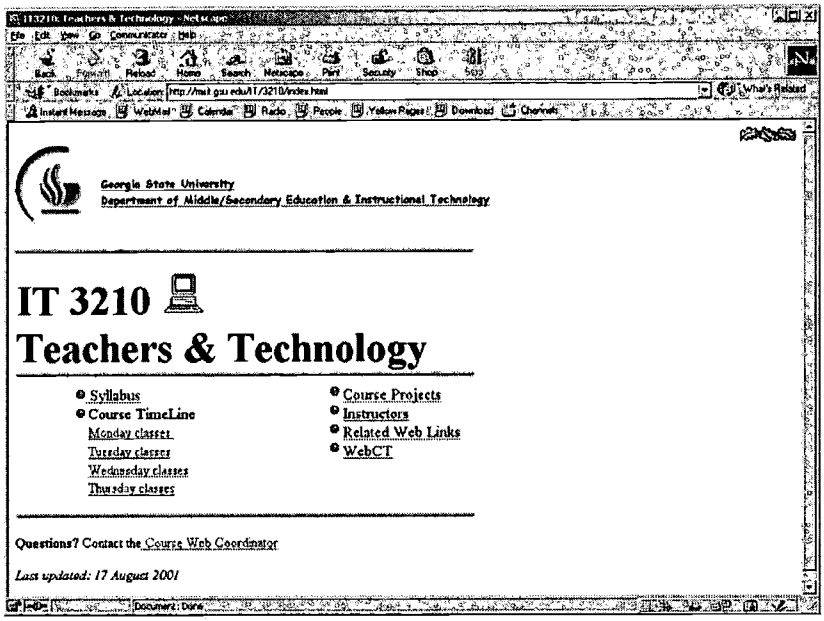

Figure 2. Screen Snap of Current Interface of IT 3210: Teachers and Technology

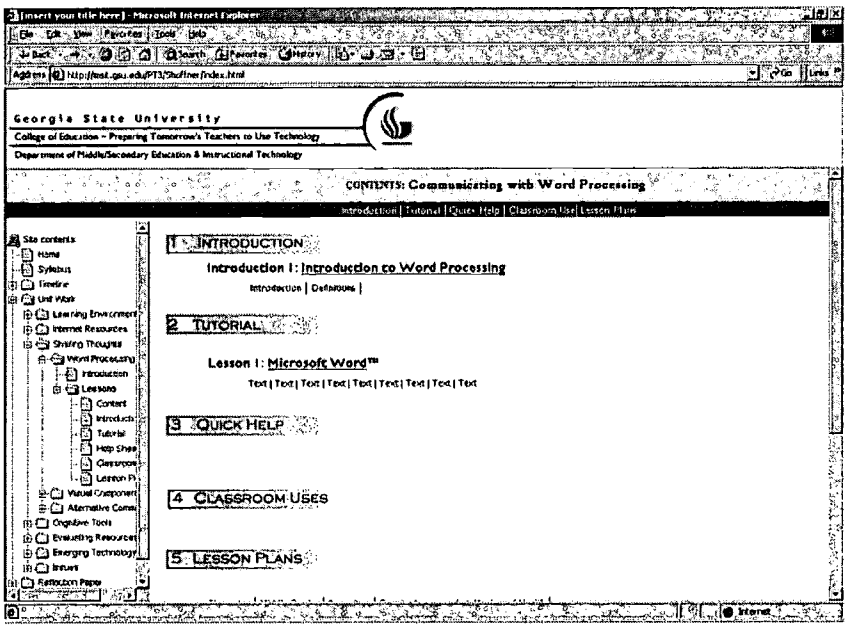

Figure 3. Screen Snap of Frameset Interface of IT 3210: Teachers and Technology Under Development

To assess continued use of the IT 3210 RBLE by preservice teachers throughout their program of study, we planned to mail a follow-up survey to fall 2000 IT 3210 students during the Spring 2001 semester. Informal interviews with fall 2000 IT 3210 students, however, indicated that the time elapsed between the close of the fall semester and the planned mid-March mailing was not sufficient. Students indicated they would be more likely to make use of the RBLE for final semester projects and for field experiences. Due to this feedback, the mailing was postponed to Fall 2001 semester. In spring 2002, fall 2000 IT 3210 cohort students will be surveyed to ascertain their continued use of the RBLE in their GSU coursework. This survey will seek responses to the following questions:

- Do they access the site for support during their GSU class experiences?
- Do they access the site for field-based experiences?
- Do they feel prepared to use computers and the Internet for classroom instruction?
- What are their recommendations for the improvement of the support site?

Performance Profiles and Assessment Instruments

The second portion of the PT3 mini-grant project began more slowly. Assessment instruments were developed for two of the four NETS-T performance profiles: the general preparation performance profile and the professional preparation performance profile. Beginning Spring semester, 2001, all IT 3210 students completed a Likert-type self-report on the general preparation performance profile at the beginning of the semester. As IT 3210 is a part of the professional preparation of middle and secondary education programs, students should meet the general preparation performance profile prior to beginning the course. In the event that a student did not meet the general preparation performance profile at the beginning of professional studies, a second administration occurred upon completion of the IT 3210 course. In addition, all students complete a 24-item self-report on the professional preparation profile at the close of IT 3210. While self-report instruments lack rigor, students who successfully complete the IT 3210 course have been more rigorously assessed for not only the general performance profile, but also 20 of the 24 indicators on the professional preparation performance profile. In time, student self-report results will be correlated to class assignment grades. Sample items on the general preparation and professional preparation self-report instruments appear below in figures 4 and 5, respectively.

Technology Standards for Pre-Service Teachers – General Preparation

Please circle the number corresponding to how well each statement describes you *at this time.*
1 = not at all
2 = a little
3 = somewhat
4 = a lot
5 = very much so!

1. I am comfortable with the keyboard, the mouse, and the basic operation of the computer.	1	2	3	4	5
2. I use the computer for basic tasks on a regular basis.	1	2	3	4	5
3. I use technology tools specific for a given task (for example, graphing calculators, simulation software, and so on).	1	2	3	4	5
4. I use software tools to organize and manipulate data for clearer organization, problem solving, and decision-making.	1	2	3	4	5

Figure 4: Sample Items from the General Preparation Performance Profile Self-Report Instrument

To date, few assessment instruments for NETS-T developed by other PT3 initiatives have been identified. Conference presentations and discussions with colleagues inform us that a comparable assessment instrument for NETS-T is currently being validated at another university. As no other evaluation instruments were reported on, we anticipate using this validated rubric when it becomes available to in turn validate the GSU rubrics.

Technology Standards for Pre-Service Teachers – Professional Preparation

Please circle the number corresponding to how well each statement describes you *at this time.*

1 = not at all
2 = a little
3 = somewhat
4 = a lot
5 = very much so!

1. I can identify the benefits of technology to maximize student learning and facilitate higher order thinking skills.	1	2	3	4	5
2. I differentiate between appropriate and inappropriate uses of technology for teaching and learning while using electronic resources to design and implement learning activities.	1	2	3	4	5
3. I can identify technology resources available in schools and analyze how accessibility to those resources affects planning for instruction.	1	2	3	4	5
4. I can identify, select, and use hardware and software technology resources specially designed for use by PK-12 students to meet specific teaching and learning objectives.	1	2	3	4	5

Figure 5: Sample Items from the Professional Preparation Performance Profile Self-Report Instrument

Summary data collected using the NETS-T general preparation profile and profession preparation profile self-report instruments completed by Spring 20001 IT 3210 students is included in Table 1, below. At the beginning of the IT 3210 class, students showed an average composite score on the general preparation profile of 42 points of a possible 70 points. A score of 42 is the equivalent of students feeling they can "somewhat" meet all 14 indicators. In comparison, at the end of the class, average student composite scores on the general performance profile instrument for those same students increased to 54 points, indicating students felt more adept and comfortable with the technology. A larger net gain in average composite score would be expected; these are skills the student should have prior to entering their professional preparation. One possible explanation for this result is that students overrate their abilities at the beginning of a new course, particularly in the area of technology. Simply put, they don't know what it is they don't know. This theory is supported by the reduction of scores reported on the posttest by some students, indicating they didn't feel as confident in their skills and usage after completed the intensive course.

	General Preparation Performance Profile Self-Report *Pretest*	**General Preparation Performance Profile Self-Report** *Post test*	**Professional Preparation Performance Profile Self-Report** *Post Test Only*
Mean– Composite Score	42.1	54.0	91.2
St. Dev.– Composite Score	13.6	9.8	18.6
# items	14	14	29
Composite Score Possible Range	0 - 70	0 - 70	0 - 145
Composite Score Actual Range	18 - 67	33 - 70	39 – 120

Table 1: NETS-T Self-Report Instrument Summary Data – Matched-Pre-Test Post test Data Only

MCE Portfolio Review

The Middle Childhood Education Unit and the Instructional Technology Unit together formed a program oversight committee, the Middle Childhood Committee (MCC). At GSU, The MCC established a continuous process of portfolio development and assessment for all students (Shoffner, Dias, & Thomas, 2001Shoffner, Thomas, & Dias, 2001). This was a key process for integrating technology across the program and into the content of every course. In response to the Board of Regents guarantee principle, increasing accountability in teacher preparation programs, and the Middle Childhood Committee's recommendation to strengthen the preservice teachers' overall professional development, the committee recommended that the program include an exit assessment that examined the student's ability to apply what they learned in all their courses in some cohesive manner. After examining several assessment models, both traditional and alternative, a portfolio development process with benchmarks throughout the program and final submission as an exit requirement was adopted.

Although most skills and concepts are developed in individual courses, it is important that preservice teachers have command of these concepts and skills with knowledge of how to integrate these concepts and skills into all aspects of teaching. Therefore, a major goal of portfolio requirement was to develop the preservice students' ability to integrate several components of the program across all courses and to develop knowledge and skills in applying these components in all aspects of teaching. Among key skills and concepts under discussion were: integrating technology into learning, developing and implementing lesson plans and assessment strategies, developing and implementing a classroom management plan, working with diverse learners, developing as reflective practitioners, and so on. After a review of the principles of the Interstate New Teacher Assessment and Support Consortium (INTASC), the committee agreed that the principles of INTASC encompassed and addressed all major components of the middle childhood program and could be used to facilitate the development of the preservice teachers. Thus the committee established portfolio guidelines that focused on the ten principles of INTASC.

Through the continuous collaboration of the MCC, guidelines for portfolio development were documented, benchmarks were established, implementation procedures were outlined, and an assessment instrument and procedures were designed. The committee reviewed course syllabi for all MCE undergraduate education courses to determine which INTASC principles were met in each course. The principles were aligned with the program's schedule of course sequence and experiences to establish which principles the preservice students would be able to address at established intervals. These intervals serve as benchmarks to assess the students' portfolios. Portfolio development is introduced in the Teachers and Technology course in the form of the learning environment portfolio. Subsequent submissions are based on the INTASC principles, and occur at the end of the first year of professional studies, prior to student teaching, and at the close of student teaching.

Another aspect of our PT3 mini-grant study was to determine if subsequent MCE student portfolios could be examined to determine preservice students' ability to meet NETS-T standards as they continue through their professional preparation program. A rubric was developed for the 24 indicators of the professional preparation performance profile and applied to Middle Childhood Education student portfolios submitted prior to entrance to the professional sequence of coursework. *(Note: the rubric is too long and detailed to be included within this paper, but can be obtained from the authors upon request.)* The objective of these portfolios was for students to demonstrate six of ten INTASC principles. We were hopeful that data analysis would indicate that students continue to apply the technology integration skills mastered in IT 3210 to other courses in their program of study.

However, that was not the case. Review of six MCE INTASC portfolios submitted in May 2001 showed little student documentation of technology competencies. It was surmised that as students were not specifically directed to demonstrate technology competencies, they simply did not do so. A second factor that might have contributed to the lack of technology demonstrated in these portfolios was timing. Several MCE students were compiling their IT 3210 portfolios at the same time as they were compiling the IT 3210 portfolios. It is conceivable that technology artifacts went in one portfolio, and not the other.

Consultation with MCE faculty indicated that asking MCE students to specifically include technology in their INTASC might dilute the attention they paid to addressing the INTASC principles. Furthermore, it was decided that review of all MCE courses should be conducted to determine when and where students were addressing technology integration skills.

MCE Program Review

In order to determine what NETS-T performance indicators were addressed and reinforced in each of the courses that make up the MCE program, a matrix was developed for MCE faculty in May 2001. The matrix, included in appendix I, maps the NETS-T performance indicators for the general preparation profile, the professional preparation profile, and the student teaching/internship profile against all courses in the MCE program. Faculty were asked mark what performance indicators were addressed in their courses (regardless of indicator level) prior to the October 2001 meeting. To date, data from seven courses in four content areas have been received. The data from the remaining nineteen courses are expected when the MCE faculty meets in early October. Once all courses have been reviewed, decisions will be made to ensure students meet all NETS-T performance indicators in their coursework at GSU. In addition, once coverage of all NETS-T standards has been assured, the MCE INTASC portfolio will be accepted in electronic format only.

Conclusions

Accountability directives for new teacher preparedness are not likely to go away any time soon. Indeed, in his first month in office, United States President Bush proposed education initiatives to increase teacher accountability similar to those in place in the state of Georgia be implemented nationwide. Instructional technology preparation will likely continue to be a critical issue in teacher education for many years to come. Instructional technology units can no longer teach only to their corporate training design and development roots. For colleges of education to successfully prepare teachers for the 21st century, instructional technology will need to be more cohesively included in teacher preparation programs. It is imperative that more cooperative partnerships be established between instructional technology units and initial preparation programs. The authors encourage IT units to initiate and nurture these partnerships, making possible more innovative approaches to this important field of study. While many PT3 initiatives are on too large of a scale to be adopted without a large commitment from teacher education programs, the strategies presented in this paper may be attempted at any institution with little risk.

References

A plus education reform act of 2000. (2000). [On-line]. Available: http://ganet.org/services/leg/ShowBillPre.cgi?year=1999&filename=1999/HB1187

Byrum, D.C., & Cashman, C. (1993). Preservice teacher training in educational computing: Problems, perceptions, and preparation. *Journal of Technology and Teacher Education, 1,* 259-274.

Cognition and Technology Group at Vanderbilt. (1991). Technology and the design of generative learning environments. *Educational Technology, 31*(5), 34-40.

Council of Chief State School Officers. (1999). *Interstate new teacher assessment and support consortium.* [Online]. Available: http://www.ccsso.org/intasc.html (Accessed May 18, 1999).

Hannafin, M.J. (1999, February). *Learning in open-ended environments: Tools and technologies for the next millennium.* Paper presented at the 1999 annual meeting of the Association for Educational Communications and Technology, Houston, TX.

Hannafin, M.J., Hall, C., Land, S., & Hill, J. (1994). Learning in open-ended environments: Assumptions, methods, and implications. *Educational Technology, 34*(10), 48-55.

Hill, J.R. (1999). Teaching technology: Implementing a problem-centered, activity-based approach. *Journal of Research on Computing in Education, 31*(3), 261-279.

International Society for Technology in Education National Educational Technology Standards Project. . (2000). *National standards for technology in teacher preparation.* [Online]. Available:.http://www.iste.org/Standards/NCATE.found.html. Accessed May 12, 1999.

Kent, T.W., & McNergney, R.F. (1999). *Will technology really change education: From blackboard to web.* Thousand Oaks, CA: Corwin Press.

Kovalchick, A. (1997). Technology portfolios as an instructional strategy: Designing a reflexive approach to preservice technology training. *TechTrends, 42*(4), 31-36.

Leggett, W., & Persichitte, K.A. (1998). Blood, sweat, and TEARS: 50 years of technology implementation obstacles. *TechTrends, 43*(3), 33-36.

Lewallen, G. (1998). *Report on the ASU West College of Education technology survey.* [Online]. Available: http://coe.west.asu.edu/survey/

Milken Exchange on Educational Technology (1999). *Will new teachers be prepared to teach in a digital age? A national survey on information technology in teacher education.* Santa Monica, CA: Author.

Moursund, D. & Bielefeldt, T. (1999). *Will new teachers be prepared to teach in a digital age? A national survey on information technology in teacher education.* Santa Monica, CA: Milken Exchange on Education Technology. [Online]. Available: http://www.mff.org/publications/publications.taf?page=154 .

National Council for Accreditation of Teacher Education. (1997). *Technology and the new professional teacher: preparing the 21st Century classroom.* Washington, D.C.: NCATE.

Persichitte, K.A., Tharp, D.D., & Cafarella, E.P. (1997). *The use of technology by schools, colleges, and departments of education.* Washington, DC: American Association of Colleges for Teacher Education.

Shoffner, M.B., Dias, L.B., & Thomas, C.D. (2001). A model of collaborative relationships between instructional technology and teacher education programs. *Contemporary Issues in Technology and Teacher Education* [Online serial], *1*(3). Available: http://www.citejournal.org/vol1/iss3/currentissues/general/article1.htm .

Shoffner, M.B., Thomas, C., & Dias, L.B. (February, 2001). *Keeping the "I" in "IT": Establishing partnerships between instructional technology and teacher education departments.* Paper presented at t he European Teacher Educators Network Annual Meeting, Bruges, Belgium.

Shoffner, M.B. (1999, February). *Development of an on-line preservice education technology course.* Paper presented at the 1999 Annual Meeting of the Association for Educational Communications and Technology, Houston, TX.

Shoffner, M.B. (1996, February). *Teachers and technology: What makes a technology adopter?* Paper presented at the 1996 Annual Meeting of the Association for Educational Communications and Technology, Indianapolis, IN.

Smaldino, S., & Muffoletto, R. (1997). The educational media experience in teacher education. *TechTrends, 42*(4), 37-40.

Technology counts [Special issue] (1997, November 10.). *Education Week, 17*(11). [Online]. Available: http://www.edweek.org/sreports/tc/tchome97.htm. Accessed May 12, 1999.

Trotter, A. (1999). Preparing teachers for the digital age. *Education Week.* [Online]. Available: http://www.edweek.org/sreports/tc99/articles/teach.htm .

U.S. Congress, Office of Technology Assessment. (1995). *Teachers and technology: Making the connection* (OTA-HER-616). Washington, D.C.: U.S. Government Printing Office.

U.S. Department of Education, National Center for Education Statistics. (2000). *Teachers' tools for the 21st century: A report on teachers' use of technology* (NCES 2000-102). Washington, DC: U.S. Department of Education. [Online]. Available: http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2000102 .

U.S. Department of Education (1999). Preparing tomorrow's teachers to use technology. [Online] Available: http://www.ed.gov/teachtech/. Accessed May 12, 1999.

USG News: Principles on Teacher Preparation Approved (April 8, 1998). [Online]. Available: http://www.usg.edu/news/1998/prep2.html

Vygotsky, L. (1978). *Mind in society.* Cambridge, MA: Harvard University

Wetzel, K. (1993). Teacher educator's uses of computer in teaching. *Journal of Technology and Teacher Education, 1*(4), 335-352.

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