Training Teachers for Success: Pre-Service Teachers and Technology Integration

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Abstract: Today's teachers are challenged with integrating technology into their classrooms. National and state initiatives have provided guidelines for colleges of education regarding teacher training and the use of technologies. One model for preparing pre-service teachers for these challenges involves a technology component sequence in which students develop basic technology skills, observe technology in the classroom, implement lessons, and reflect upon their experiences. This model involves a combination of college-classroom experiences and field experiences to ensure that tomorrow's teachers possess the skills they need to successfully integrate technology into their classrooms.

Resume: Les enseignants d'aujourd'hui sont confrontes a 1'integration des nouvelles technologies dans leurs classes. Les initiatives des divers paliers gouvernementaux ont fourni des lignes directrices aux colleges d'education au sujet de la formation a I'enseignement et 1'exploitation des nouvelles technologies. Un des modeles de preparation des etudiants-maitres pour ces defis implique une sequence de composantes technologiques qui leurs permet de developper des habiletes technologiques de bases, d'observer ces technologies en classe, d'implanter des lessons et finalement de reflechir sur leurs experiences. Ce modele implique un combinaison d'experiences en classe au college ainsi que des experiences en milieu scolaire afin d'assurer que les enseignants de demain auront les competences necessaires a la reussite de 1'integration des nouvelles technologies en classe.

Training Teachers for Success: Pre-Service Teachers and Technology Integration

A critical element of the pre-service teacher experience involves the use of technology. Within an integrated technology Teacher Education program, future teachers can develop the technology skills they need to integrate technology into the curriculum. Historically, teachers have been ill-prepared to use and integrate technology into their classrooms (U.S. Congress, 1995), even though teachers who effectively use technology can improve students learning experiences (Braun, Moursund, & Zinn, 1992). Strategies for training teachers in the use of technology must be incorporated into pre-service education to prepare them for future challenges offered by reform and accountability initiatives. Pre-service teacher programs with integrated technology components can ensure that future teachers are adequately

prepared for the classrooms of the 21st century' (Northrup & Little, 1996).At the University of West Florida (UWF), the basis for technology integration strategies is founded upon benchmarks for technology and integrated curricula. National U.S.A. entities that provide guidance to Teacher Education programs include the National Council for the Accreditation of Teacher Education (NCATE), the International Society for Technology in Education (ISTE), and the U.S. government, in its SCANS (Secretary's Commission on Achieving Necessary Skills, 1991) Report and in Goals 2000 (Northrup & Little, 1996; Peck, 1998). Other North American governments have also developed standards such as the Employability Skills for British Columbia (AETT, 1995).

The technology component of the pre-service education program at UWF emphasizes ISTE standards, focusing on three areas: foundations, personal and professional use of technology and application of technology in instruction (ISTE, 1998). Specific tasks support each area and technology outcomes are aligned to these tasks. The purpose of this paper is to describe the technology component of this innovative pre-service teaching program.

In Florida, standards for student and teacher performance are also based on the goals of Blueprint 2000, Florida Sunshine State Standards (SSS) and the Teacher Accomplished Practices (Florida Education Standards Commission, 1996). Florida's Blueprint 2000 addresses goals for Florida's schools. Goal 3 refers to student (i.e., children's) performance and outcomes which are categorized in areas of: Information Managers, Effective Communicators, Numeric Problem Solvers, Creative and Critical Thinkers, Responsible Workers, Resource Managers, Systems Managers, Cooperative Workers, Effective Leaders, and Culturally Sensitive Citizens. Throughout the SSS, outcomes for technology skills are infused into eight subject areas (Language Arts, Mathematics, Social Studies, Science, Foreign Languages, the Arts, Applied Technology, and Health and Physical Education) (Florida Department of Education, 1996).

There are twelve Accomplished Practices listed for Florida teachers. Accomplished practices describe the skills that teachers should display at the pre-professional, professional, and accomplished levels of performance. The Accomplished Practice for technology indicates that teachers will use appropriate technology in the teaching and learning process. At the pre-professional level (i.e., graduates of pre-service Teacher Education programs), pre-service teachers are expected to use available technology that is appropriate for the learner, provide students with opportunities to use technology, facilitate access to electronic resources, and use technology to manage, evaluate, and improve instruction (Education Standards Commission, 1996). Table 1 outlines state-suggested indicators, pre-professional requirements, and activities that meet those indicators. Also included are the technology classes where those skills are primarily taught.

The skills learned in UWF technology-focused courses are practiced and reinforced throughout the pre-service teachers' course of study. Technology is widely integrated across the entire curriculum, in knowledge-based courses and

methods courses. Throughout the college, faculty model the use of technology and require students to use technology for course assignments, projects, and communication. To assist in this modeling, extensive summer faculty development initiatives have been implemented to ensure that faculty have the skills that they need to integrate technology into their own classrooms.

Underlying the skill base of the technology-related coursework is the notion of systematic application of technology in the teaching and learning process (Reiser & Radford, 1990). Pre-service teachers follow a systematic process as they analyze, design, develop, implement, and evaluate instructional products. An electronic planning tool, the Lesson Architect, is employed as a guide to assist pre-service teachers in creating technology-rich, integrated lessons and units that are aligned to student performance standards (Northrup, Rasmussen, & Pilcher, 1998; STEPS, 1998).

The Lesson Architect is a tool in the electronic performance support system, STEPS (Support for Teachers Enhancing Performance in Schools), that teachers can use for instructional planning. It follows Gagne's events of instruction (Gagne, Briggs, & Wager, 1992) and includes elements of a variety of curriculum models (e.g., project-based learning, problem-based learning, and thematic learning) (Northrup, Rasmussen, & Pilcher, in press). Pre-service teachers use the Lesson Architect as a tool to help them design and develop lessons. Within STEPS, model lessons, web sites, best practice databases, and tutorials are also available to pre-service teachers as needed.

Pre-service teachers complete a 120-credit hours of coursework, a typical Florida baccalaureate program. UWF is a regional institution in the panhandle of Florida; students range from the traditional 18-24 year old to non-traditional students who are returning to school or changing careers. The foundational philosophy of the College of Education (COE) program is one of the Empowered Person and Professional who has the skills of critical thinker, problem solver, lifelong learner, counselor/therapist, decision-maker, and ethical/moral being (UWF, 1998).

Support and Laboratory Facilities

Pre-service teachers have access to two computer laboratories, a Macintosh-based teaching lab and an open-access personal computer-based lab. All machines have Internet access. The Macintosh Lab has 32 multimedia stations, networked printer support, and a laser-disc player. The open access PC Lab has 15 multimedia, Pentium II machines and a networked laser printer. Both laboratories have various software packages including ClarisWorks, Office 98, and HyperStudio, in addition to a large number of CD-ROMs, provided by a Microsoft Teacher Training Grant. Labs are staffed by lab assistants who are available to assist students with their projects. Two full-time undergraduate faculty support the pre-service teacher technology classes with assistance from expert adjuncts, who, themselves, are classroom teachers with extensive experience in integrating technology into the classroom.

Technology Sequence

Before the current modifications to the technology sequence, pre-service teachers completed one, three-credit hour course on Instructional Technology (each credit hour equates to 12-16 hours of in-class instruction). In that course, they developed skills in productivity tools, multimedia use, and telecommunications; examined how technology was used in educational environments; and created sample technology-rich lessons. The technology component of the pre-service education program was modified to six credit hours of coursework:

1. EME 2040: Introduction to Educational Technology (3 semester hours)
2. Practicum II: Multimedia (1 semester hour)
3. Practicum III: Telecommunications (1 semester hour)
4. EME 3410: Integrating Technology Across the Curriculum (1 semester hour)

Throughout the technology sequence, pre-service teachers are provided with positive technology-use models (e.g., professors, supervising teachers, and field placement), given extensive opportunities to use technology, and, finally, they implement lessons using skills that they have learned. An integral part of the technology experience is the pre-service teachers' active reflection upon what they have learned and observed. The sequence begins in the sophomore year, continuing into the junior year. Courses are completed in the sequence listed.

Introduction to Educational Technology

In the introductory class, pre-service teachers (approximately 125 each term) develop and demonstrate basic skills in productivity tools (e.g., word processing, spreadsheets, databases, e-mail, and desktop publishing). They are introduced to uses of traditional media and multimedia and telecommunications concepts. As skills are developed, pre-service teachers also explore how technology can be used in various educational environments. Projects for this course include extensive portfolios that demonstrate proficiency in each of the targeted areas; performance-based and knowledge-based tests are also completed. Individual classes are comprised of both lecture (in a traditional classroom, with projection system) and laboratory experiences, with the primary focus being on development of skills in the laboratory. Pre-service teachers have access to both Macintosh and Personal Computer-based systems in two different labs and are expected to spend at least two additional hours per classweek working on assignments outside of class. With this foundation, students are prepared to develop additional skills in multimedia telecommunications in their practicum experiences.

Practicum Courses

To introduce pre-service teachers to how technology is used in the classroom, strong technology components are required in two of four required practica. Each

practicum consists of students observing and working in a PK-12 classroom. For each technology field experience, practicum students are matched to teachers and schools who have access to appropriate technologies. In Practicum I, pre-service teachers observe classroom management techniques, student-teacher interaction, and the day-to-day operations of a classroom. In Practicum II, multimedia is the primary focus; Practicum III has an added telecommunications component. In Practicum IV, pre-service teachers are closely supervised as they approach their student teaching experience. At the successful completion of Practicum IV. they enter the student teaching experience. For each technology-based practicum, students spend 80 hours in the field, in an assigned classroom, and 20 hours developing multimedia or telecommunication rich lessons, which they then present to their PK-12 students. After the in-field experience, practicum students return to the college classroom to reflect on the outcomes and present their experiences to faculty and their peers.

Multimedia Practicum. This technology experience is comprised of five sessions in addition to development and implementation activities. The sessions are four hours each and are held over the entire semester. In the multimedia practicum, the students explore various types of multimedia such as CD-ROMS, laserdiscs, digital photography, and authoring systems. In the first sessions, students are introduced to systematically designing instruction using a generic instructional design model, the ADDIE model (Gagne & Medsker, 1996) where they focus on how the analysis, design, c/evelopment, implementation, and evaluation of the instruction matches the lesson that they will create (see Table 2). They also complete simple storyboarding/screen design tasks. Students collaborate to design a simple HyperStudio stack, assisting each other in the development process. This sample stack includes animation, scanned graphics, QuickTime movies, text boxes, test questions and buttons so that basic multimedia skills are acquired. To facilitate design and development, the instructor provides an instructional goal; practicum students develop the content that meets the goal and associated storyboards that match the learner and content analysis. At the end of the session, practicum students are instructed to contact their supervising teacher and instructional technology personnel to determine what multimedia resources are available at the school site. They also begin to plan their technology -integrated lesson, associated content, and storyboards. Students are encouraged to use the Lesson Architect to assist them in their design activities.

At the second session, the students create their lesson, including a HyperStudio stack. Appropriate multimedia elements are included in their project (e.g., graphics, digital pictures, etc.). Students consult with technology faculty and other students at this time to ensure high quality materials. At the end of this session, the lesson is ready to be implemented back in the classroom. An evaluation rubric is provided so that the lesson can be evaluated upon completion in the classroom (see Table 3). During the third session, the students work with the digital camera, CD-ROMs, and laserdiscs to explore how multimedia elements can be used in classrooms.

Table 1. Pre-Professional Accomplished Practices and Student Activities.

Sample Indicators (Florida Technology Accomplished Practices)	Pre-Professional Requirements	Sample Activities	Technology Class(es)
Utilizes appropriate learning media, computer applications, and other technology to address students' needs and learning objectives	Uses, on a personal basis, learning media, computer applications, and other technology	Use productivity tools for class projects (word processing, spreadsheets, database, desktop publishing, presentations)	EME 2040 EME 3410 Practicum II Practicum III
Utilizes instructional and other electronic networks to provide students with opportunities to gather and share information with others	Utilizes instructional and other electronic networks to gather information	Join class listservs, research the WWW for lesson plans, and educationally-related information	EME 2040 Practicum III
Utilizes a wide range of instructional interactive video, audiotaping, and electronic libraries to enhance the subject matter and assure that it is comprehensible to all students.	Can identify and use standard	F,valuate CD-ROMs, inclusion into classroom activities	Practicum II
Continually reviews and evaluates educational software to determine its appropriateness for instruction and management and compare findings with others	Selects and utilizes educational software for instruction and management purposes based on reviews and recommendation of other professionals	Review instructional software for alignment with stated objectives	EME 34 10
Teaches students to use available computers and other forms of technology at the skill level appropriate to enable success and maintain interest	'leaches students to use available computers and other forms ol technology	Develop technology-rich lessons and implement in field experiences	Practicum II Practicum III
Uses appropriate technology to construct teaching materials, e.g., construct assessment exercises, prepares programmed instruction, uses word processing, produces graphic materials, etc.	Uses technology in lesson and material preparation	Create handouts, lessons, and tests using appropriate technologies	EME 2040 EME 3410 Practicum II Practicum 111
Uses appropriate technologies to create and maintain databases for monitoring student attendance, behavior, and progress toward specified performance standards	Uses technology to assist with instructional and classroom management	Develop database to assist in classroom management activities (e.g., grade rolls, class rosters, inventories)	EME 2040
Provides instruction at the appropriate level in identifying and using standard references, other learning resources, gathering data and anecdotal information and accessing computer data banks	Can identify and use standard references in electronic form	Research using CD-ROM, WWW. and library resources	EME 3410
Works with technical and instructional specialists available to the school, teachers, and students to collaborate on instructional design and delivery	Works with on-site technical and instructional technology specialist^) to obtain assistance for instructional delivery	Works with field experience supervisors to implement technology lessons	Practicum II PracticumI I I
Develop short and long-term persona] and professional goals relation to technology integration	Develops short-term personal and professional goals relating to technology integration	Discusses and develops professional development plan, especially related to enhancing technology skills	EME 3410

Table 2: Multimedia Practicum Session 1.

Instructional Design	HyperStudio Activities	After the Session
ADDIE Model, including: Learner Analysis Task Analysis Environmental Analysis Storyhoarding Screen Design Implementation Constraints Evaluation Requirements	Stack Creation, including: Buttons Text Boxes Graphics Animation QuickTime Movies Sound	At Practicum School: Locate HyperStudio Determine Platform OnOwn: Plan Lesson Create Stor\boards Gather Graphics

To prepare for their final assignment, practicum students create presentations using PowerPoint in the fourth session. Screen design, transitions, builds, and inclusion of multimedia elements are explored to design a presentation that describes learning environment and the lesson implementation. At the final session, students present their work, using projection devices, to faculty and other pre-service teachers, reflecting on their practicum experiences.

Telecommunications Practicum. In Practicum III, educational telecommunications applications are explored. To model telecommunications delivery and use, the practicum is presented via the World Wide Web (WWW). Instructional activities include: surfing the WWW for lesson plans, contacting an experienced teacher via e-mail to find out how they use telecommunications, communicating 'and collaborating with other students using a listserv, and exploring instructional websites on the WWW. Following the structure of the multimedia practicum, students create a lesson incorporating telecommunications and implement it as part of their field experience. Again, they use the Lesson Architect template for lesson design. In conjunction with their telecommunications lesson, an instructional web page is designed, developed, implemented, and evaluated. At the end of the practicum, pre-service teachers present their work and reflect on their experiences.

A class web site is created that includes the instructional material, activities, and assignments created by the pre-service teachers. A sample web page is available so that practicum students can model, then create, their own web site. An example of a student's telecommunications lesson using the Lesson Architect is found in Table 4.

Integrating Technology Across the Curriculum

As a capstone experience, Integrating Technology Across the Curriculum is completed. In this course, pre-service teachers re-explore technologies and reflect upon how those technologies can be used to facilitate the teaching and learning process at a unit, rather than a lesson, level. In addition, topics such as resources that might be used in the classroom, ethical concerns of using technology, and how to teach with technology are explored. Personal experiences gained in the practicum enable the pre-service teacher to reflect upon practicalities and realities of how technology can be used in the classroom. The Accomplished Practices related to

technology are reviewed, discussed, and personal skills are evaluated. Professional development plans are designed that focus on skill-deficient areas. Using skills acquired in the technology sequence, pre-service teachers develop portfolios and unit plans that showcase how technology can be integrated into the PK-12 classroom. These materials are designed to be used as reference materials when the pre-service teacher graduates to his/her own classroom.

Table 3. HyperStudio Lesson Evaluation.

Technical Aspects		
Do all the buttons work?		
Back	Exit	Next
Test Answer	Help	Menu
Do the QuickTime movies work[7]	Yes	No
Does the animation work?	Yes	No
Is the text accurate?	Yes	No
Is the spelling correct?	Yes	No
Aesthetic Aspects		
Are the colors appropriate?	Yes	No
Is the font/size appropriate?	Yes	No
Are multimedia elements relevant?	Yes	No
Is screen design consistent?	Yes	No
Instructional Aspects		
Were the students able to read the text?	Yes	No
Did they understand what they read?	Yes	No
Were students able to navigate the lesson on their own?	Yes	No
Were students successful in completing test items?	Yes	No
Did students speak positively about the program after completing it?	Yes	No

Conclusion

This program has been in place for approximately three academic terms. Results of this integration of technology are just beginning to be realized. Transfer of the knowledge and skill base in the Introduction to Educational Technology needs to be enhanced. Many students take the course very early in their academic career and may not receive the opportunity to practice all of the skills learned until they reach Practicum II. Consequently, there is a period of retraining that must take place in Practicum II. Faculty teaching other College of Education courses are continuing to increase activities using technology including requiring electronic presentations, developing class web pages, and using multimedia and telecommunications for class assignments. We anticipate that with increased uses of technology in other classes, this period of retraining will decrease. Other results observed include:

- entering practicum students are overwhelmed by the amount of available technology; however, once they begin to work with the technology, they become comfortable with it,
- practicum students report that PK-12 students enjoy the multimedia or telecommunications lessons and are motivated by them,
- practicum students need a framework and structure at the beginning of the sequence which can lead to increased freedom later, and
- practicum students are helping to bridge the gap between in-service training and technology integration in the classroom by assisting supervising in-service teachers in learning more about technology and integrating technology in the curriculum.

This model of training pre-service teachers prepares the student for success by offering them the opportunities to see technology integrated into the College of Education classroom, develop lessons and implement them, and finally, to reflect upon the uses of technology in the PK-12 environment. The benefits of this program have yet to be fully realized and evaluated. Determining the impact of this program is an important investigation that needs to be undertaken as a next step.

As we increase the technology-literate pre-service teacher population, they will be able to integrate technology in their field experiences, assist supervising teachers, and gain valuable real-world experience that they can use upon graduation. Using this model of integrating technology, students no longer are taught technology skills and integration in isolation. Rather, they develop basic, broad skills, then apply those skills in real world situations where they can try new ideas. When these future teachers walk into their new classroom, they will be ready to integrate technology effectively.

Table 4: Example of Pre-Service Teacher Lesson Using the Lesson Architect.

Q3K *Written by:* Jackie Adams

School: *C.A. Weis Elementary* District: *Escambia* Subject/Theme: *Reading and/or Study Strategy'*

Planning The Lesson

GOALS:

As a result of this lesson, the students should know/understand: a) that learning a pre-reading strategy will help to improve their grades; b) that authors use bold headings, charts, and graphics to help the reader better understand the meaning of the text: c) that listening carefully to a speaker shows respect, d) how to construct meaning from text; e) speaking strategies effectively.

Sunshine State Standards:

Language Arts-Reading-Standards 1 & 2 (LA.A.1.2& LA.A.2.2); Language-Standards I&2 (LA.D.1.2& LA.D.2.2); Listening, Viewing, & Speaking Standards 1 & 3 (LA.C.1.2 & LA.C.3.2): Goal 3 Standards-1,2,4,5,8.

OBJECTIVES: As a result of this lesson, the students should be able to:

a) explain many reasons why a pre-reading strategy can improve grades;

b) describe how bold headings, charts, and graphics are used to help the reader better understand the text;

c) demonstrate respect by listening to others when they are speaking:

d) explain the main idea from reading material:

e) speak clearly and use appropriate volume when working in a small group environment.

RESOURCES: To complete this lesson 1 will need: chart paper, marker, a couple different textbooks that has bold headings, charts and graphics (social studies and science), copy of a blank web for each student.

INTRODUCTION: To motivate the students into wanting to listen to the lesson. 1 will start out with the question, "How \vould you like to learn a way to read your textbooks and storybooks that would help you make better grades and make reading and understanding those books easier?" 1 will explain that if they learn the strategy I am about to teach them their grades will go up. textbooks will be easier to understand, and comprehension of material read will improve.

LESSON ACTIVITIES: I will start out by reminding the students to raise their hand before answering any questions. No one can learn anything if everyone is talking at one lime, and that it shows respect for others when one waits to speak. I will give a brief overview of the pre-reading strategy SQ3R. Next, with the help of the students we will create a web-graphic organizer outlining the different states of the strategy. For example, S stands for survey and in this stage students look at all the title and headings and quickly read the overview of the chapter and the summary. This gives the student an overall picture of what the chapter will be about. Q stands for question. In this stage, the student turns each heading into a question to create a purpose to read. The first R stands for read. In this section, the reader reads to answer the question created in the above stage. This provides the reader with a focus. The second R stands for recite. In this stage, the student test oneself by answering the question that has been created. The last R stands for review. In this stage, the student reviews the reading assignment which helps put the information all together and helps comprehension. After going over this information, the students will e-mail college students who have started using this strategy since learning it and ask them questions about the strategy. Students will also visit the web page I have designed as a review of the strategy. The web page will be available for any student wanting to review the strategy. During all of the stages I will model it by using the students' science and social studies book. I will bring to a close the lesson by stressing how after learning this strategy my grades greatly improved.

ASSESSMENT: First, as I present the information, I will observe the students for understanding or misunderstanding of the information being taught. 1 will question any student who may look confused to be sure and straighten out any questions as they arise. 1 will question the students at random to assess the group as a whole.

LEARNING ENV IRONMENT

Instructional Strategies

Cooperative learning strategies, Reflective thinking strategies. Graphic organizer, strategies. Decision making strategies, Problem solving strategies

Innovative Methods

Mathematics, Language Arts. Science. Social Studies

Instructional Technology Approaches

Web-Based Instruction, Software Applications. Presentations. F.-Mail

Sl'.MMARY: To summarize the lesson. 1 will question the students informally. For example. I will call on a student to tell me what the S means in the strategy and what should be done during that stage. I will continue in this manner.

ASSESSING STl'DENT OITCOMES: To assess the students. I will informally question the students. This lesson is an ongoing type of lesson to be practiced over a long period of lime. I will question students every time we start a new story in our reading book as to the proper strategy to use when starting new reading material. I will also observe the students when they start a new lesson on their own to see if they start with the S in the SQ3R strategy before reminding them of the proper strategy.

Assessment Strategies

Teacher-assessment, Peer-assessment

Assessment Tools

Informal assessments

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