Technology Integration and Teacher Training: Preparing Pre-service and In-service Teachers to Meet the 21st Century Needs of P-12 Students

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Abstract: Professional and personal lives are being transformed by technology. Educators can utilize technology tools as a means to blend real-world relevance with content-specific subject matter. Training that combines pedagogical and technological tools provides the pre-service and in-service teacher practice in preparing the 21st century citizen. Teacher education programs need to assess how technology can aid the P-16 edification process and then based on the assessment analysis develop initiatives to meet the needs of the P-12 population. The assessment and development needs to be ongoing as technology changes. This reports an example of the continuing growth of one teacher education program to meet those needs.

Introduction

Globally, technology is developing exponentially and access to information is virtually available almost anywhere at anytime. Technology has been and continues to transform education just as it does businesses and our personal lives. If current educational systems adapt appropriate technological functions too slowly, then they will be preparing students for a world that no longer exists. Educators need to model how best to incorporate technological changes and become process instructors and purveyors of guided learning – to use technology to “teach students how to research, what to do with the information gathered, and how to use it to solve problems” (McCain & Jukes, 2001, p. 114).

Many states have developed P-16 education plans as a means to meet the needs of the 21st century learner. Many of these initiatives address issues of literacy, English language learners, enhanced home-school communications, graduates prepared for a global community, inclusion, and technology integration. Given the increased demands on teachers and learners to meet state and national standards, technologies can be utilized to enhance student grasp of curricular content to meet these standards. Bringing the world of the digital native into the classroom provides a relevance link between subject matter and the learner’s life. Blending curricular content, pedagogy, and relevance is part of these P-16 plans and can be realized in part through the integration of technology in the classroom. Teacher education programs that offer pre-service and in-service teachers opportunities to experience technology integration – modeled in education courses as well as through practice in lesson planning and instruction – will serve to meet the needs of the P-12 student.

From Study to Course/Program Development

This journey began with a research study and continues to evolve as the needs of the education community and technology changes. Data from the study combined with collaboration from educators in the field led to the development of higher education course offerings to aid pre-service and in-service teachers with integrating technology to enhance the grasp of subject-matter content.

Research Study

Technological literacy is quickly becoming an educational standard in the classroom. Increasingly, educators are expected to model technological literacy and integrate technology into the curriculum. Teachers who exude confidence in their technological abilities are more likely to integrate technology into the classroom curriculum (Jao, 2001). Initially, many teacher education programs require pre-service teachers to enroll in an
introductory computer science course to obtain training in fundamental computer skills. Maeers (2000) asserts that a single technology course is insufficient training to generate technologically literate teachers with the confidence to integrate technology into the curriculum. For this reason many teacher education schools have been slowly altering their approaches to technology’s role within the curriculum. Teacher technology requirements that began as a detached introductory computer course have become either a separate educational technology course incorporating skills training with curriculum integration or have included adding technological aspects to educational methods courses and student teaching experiences (Brown, Appelman, Green, & Hansen, 2000). Pre-service and in-service teachers who experience modeling of relevant usage of technology will be more likely to implement this approach within their own classrooms. Teacher education programs are expected to facilitate the development of teachers who are computer literate and able to integrate technology into the classroom (Beyerbach, Walsh, & Vannatta, 2001). Therefore, learning to incorporate technology into classroom learning is becoming a focal point in teacher education programs. But a focus on computer applications alone fails to prepare pre-service and in-service teachers to use technology as an effective teaching tool (Gibson, 2002).

This research sought to identify specific skills and define methods for inclusion of technology into the pre-methods education curriculum that would prepare pre-service teachers to effectively infuse computing technology into their lesson plans. Assignments for three required core education courses were redesigned with embedded technology applications. Data was collected from students who were enrolled in sections of these education courses as well as from education majors taking an introductory computer science course and at least one of the core education courses without the embedded applications and from education majors who experienced both the embedded education courses and the introductory computer science course.

Findings

The quantitative and qualitative data collectively reflected positive self-efficacy and confidence levels for all the approaches tested. Participants experiencing the embedded approach, the standard introductory computer course, or those with both indicated that technology integration is possible within their future classrooms once these pre-service teachers become teachers.

The literature review indicated that technology integration should begin earlier within the college education program. It was suggested technology integration should appear prior to methods coursework. The results of this study appear to align with this premise since the most significant changes occurred within the initial education course. If the initial education course embeds technology that affords pre-service teachers successful opportunities to develop perceived self-efficacy and confidence levels of at least four on a five-point Likert scale then successive courses can focus on developing the applications of technology in the classroom so that pre-service teachers entering their methods coursework are able to elaborate on integration possibilities beyond their knowledge of and experience with the basic levels exhibited in the interviews.

Conclusions and Action

The students who experienced the education courses with embedded technology tasks and also completed the introductory computer course reflected the greatest positive self-efficacy and confidence levels. Based on this and the results indicating a positive impact on students who are in the early stages of their program, the researcher decided to propose a new course for undergraduates that would focus on educational technology. This would allow pre-service teachers an opportunity to learn software application skills while at the same time develop technology integrated lesson plans within their respective content and grade levels. Area administrators and educators provided additional insight into technology skills they felt were needed by first-year teachers which aided in the development of course topics.

Pre-service Initiative

The initial undergraduate educational technology course was created for students majoring in adolescence education. These students can opt to take the new course in place of the introductory computer science requirement. The course is set up as a hands-on laboratory experience exploring the potential of computer technology and a multimedia approach to facilitate curriculum integration, problem solving, and the teaching and learning of
knowledge in various adolescence education content areas. Thus course enrollees learn and/or further develop skills and knowledge of a variety of hardware and software applications while creating products to be used in 7-12 classrooms. These students continue to experience technology embedded into their core education courses as well. The course is open to adolescence education majors who have completed the initial core education course. This allows for a mix of students at various levels of program completion – some are first year students while others are one semester away from taking methods or student teaching. This combination of skill and experience levels allows the undergraduates to work with and learn from their peers.

This course is now in its second semester of implementation. The qualitative feedback from faculty and students has been positive and enthusiastic. Students are sharing technology integration ideas when applicable with peers and instructors in their education courses as well as making connections between topics embedded in core education courses and the educational technology course. Some representative examples: “We were discussing how to use electronic portfolios in Family and Consumer Science classes and student A said, ‘Oh, we just covered that in our Ed Tech class,’ and initiated sharing ideas with her peers”; “We just discussed ed tech in our education class. It was about the Digital Divide.” Area educators were asking that pre-service teachers learn how to use interactive whiteboards because many school districts had invested in the technology and wanted to see the boards utilized to their potential. Interactive whiteboards were purchased, instructors trained, and pre-service teachers now utilize them in core education courses as well as this educational technology class. Some of the pre-service teachers have introduced cooperating teachers to more interactive ways to use the electronic whiteboard during their field experiences.

Course topics include: what is educational technology, distance learning, course management systems, using the web to teach and learn, web page design, eFolios, hardware, peripherals, interactive whiteboard, learning environment design, legal and ethical issues, trends in educational technology, issues in technology integration, word processing, desktop publishing, spreadsheets, databases, and multimedia. Course tasks include: creating student-centered lessons within respective 7-12 content utilizing word processing, desktop publishing, spreadsheet, database, and multimedia; creating a class web page or WebQuest; compiling an eFolio; creating how-to handouts and teaching the class an aspect of a software application; evaluating web pages for educational use; designing a software evaluation and utilizing it to rate software being considered for purchase; creating a content-specific technology integration project for 7-12 students.

The topics require instructors to stay abreast of current and emerging technologies and the institution to meet the growing technology needs. Some of the topics the pre-service teachers are introduced to include using and creating student-centered activities for interactive whiteboards, slates, student response systems, podcasts, v-casts, Geographic Information Systems, and use of online discussion formats. Instructors need to collaborate with the technology information staff regarding acquisition, training, updates, and maintenance of these items. The course has expanded to include use of digital voice recorders and/or MP3 devices to record information during field trips as well as use for online instruction pieces such as quiz or test review preparation. The growing use of Web 2.0 applications has generated an endless array of uses by our education majors as they create lessons/activities to enhance student learning in the various content areas.

Products generated by these pre-service teachers – interactive whiteboard templates, recorded whiteboard lessons for use by students who missed class, informal quizzes using student response devices, video instruction projects – indicate the early success of this course. Student enthusiasm surrounding the creation of products to be used in their program and careers also generates increased requests for critical thinking challenges in the application of the technology. Looming on the horizon is the addition of more Web 2.0 and 3.0 items as topics and conducting a study of the impact of this approach on teacher implementation in 7-12 classrooms.

In-service Initiative

In-service teachers also require means to stay abreast of innovations that can be utilized to enhance student learning of subject-matter content. Following the results of the study mentioned previously, graduate courses were designed that would offer practicing P-12 educators the opportunity to immerse themselves in a focused educational technology topic for 15 weeks. In-service teachers have commented that the one or two day workshops do not provide the time needed to practice the skill or application required to develop comfort for classroom implementation. The undergraduate course discussed above serves as an overview to a variety of uses in one semester whereas these graduate-level courses allow enrollees to focus on specific technology applications for 15 weeks. The products developed in these graduate courses are student-centered approaches to develop higher-order thinking skills. The design of the courses included consideration of educational technology specialist state standards
and insights provided by P-16 administrators and educators. In-service teachers can opt to enroll in individual courses as a means to update knowledge and skills or as part of a graduate program.

Several of the courses were initially offered as electives in order to assess need and applicability of topics. Skill levels and interests enrollees brought to the courses also served in topic development. The results were five different course offerings (in addition to the one technology integration course already offered at the graduate level). The student-centered product focus of the individual courses is to: generate multimedia products; delve into advanced uses of word processing/desktop publishing/spreadsheet/database applications and design curriculum webs; explore applications of telecommunications within online learning; assess and manage selection (classroom and district-wide) of appropriate education technologies, and the impact of technologies to develop and deliver instruction as well as for professional development; and consider learning approaches and the learning environment when integrating technology into content.

Due to institutional budget constraints teachers need to learn how to use existing hardware/software and/or add freeware to supplement resources. Additional topics include using basic hardware to supplement the expense of buying specific pieces. For example, when trying to record items into recorded whiteboard lessons or creating own sound effects the teachers learn to use their earbuds/headphones as microphones instead. These makeshift devices are used with a variety of sound applications. We also cover freeware and Web 2.0 applications. One example is using Google Lit Trips to integrate English Language Arts, Social Studies and Earth Science. This type of collaborative effort allows students to understand that each course goes beyond the specific classroom door.

Some in-service teachers participated in these new courses as electives while others are opting to use the courses as part of a graduate program. The following is one example of a product developed from the multimedia focused course. The in-service teacher collaborated with a colleague who teaches 8th grade health class. The 8th grade students designed and created a video commercial about the physical and psychological impacts of smoking as a class project. The students utilized personal video cameras and basic software applications to generate a high-quality video. The completed student production closely resembled commercials seen on TV today.

As part of the needs analysis, the idea of offering these courses via video conferencing or other distance learning media individually or at satellite sites is in the development stage. Collaboration with P-12 institutions throughout this process serves to ease roadblocks that might otherwise prevent in-service teachers from participating in this opportunity for professional development.

Summation

As the technology evolves so too will the educational uses of it. Educators at all levels need to stay abreast of these changes and collaborate on methods for training pre-service and in-service teachers. These methods might be to model how technology can be integrated into the classroom to enhance the grasp of subject-matter content or how-to training on the use of the technology prior to generating integration ideas. A concerted and continuing effort is needed to communicate the P-12 community needs and collaborate with higher education so current and future educators can meet those needs.

References


