P3T3: Purdue Program for Preparing Tomorrow's Teachers to Use Technology

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Abstract: This paper describes P3T3: Purdue Program for Preparing Tomorrow's Teachers to use Technology, a PT3 project designed to: (1) prepare pre-service teachers to demonstrate fundamental technology competencies, and (2) prepare teacher education faculty to teach pre-service teachers in technology-rich environments, modeling approaches that future teachers should use themselves. The paper describes the project's three complementary components: (a) a comprehensive faculty development and mentoring program; (b) use of two-way communication technologies, notably IP-based video conferencing, for distant field experiences designed to expose students to diversity and technology use; and (c) development of a dynamic web-based digital portfolio system for pre-service teachers.

Introduction

Deficiencies in the preparation of teachers to use technology in the classroom have been highlighted in a number of national reports (e.g., Moursand & Bielfeldt, 1999; Office of Technology Assessment, 1995; Panel on Educational Technology, 1997). These reports indicate that technology is not central to teacher preparation in most colleges of education. Problems include limited use of distance education and computer-assisted instruction in teacher education courses, an emphasis on teaching about technology rather than teaching with technology, lack of faculty modeling of teaching with technology, insufficient funding and faculty professional development opportunities, and lack of emphasis on technology in students' field experiences.

Given that an estimated 2.2 million teachers are expected to join the work force in the next decade, the time for teacher education to change is now. The recent study by the International Society for Technology in Education (ISTE) commissioned by the Milken Exchange (Moursand & Bielfeldt, 1999) recommended: (1) institutional planning for integration of educational technology into teaching and learning, (2) technology integration across the teacher preparation curriculum rather than limited to stand-alone courses, (3) increased opportunities for student teachers to use technology during field experiences, and (4) faculty development to bring about appropriate modeling of technology uses in their courses.

After five years of reform planning by its faculty and administration, the School of Education at Purdue University has begun the implementation of completely restructured elementary and secondary teacher education programs that make significant strides toward addressing the recommendations of the ISTE/Milken report. The new programs, which were launched with students entering teacher preparation programs in the fall of 1999 and will not be fully implemented until the spring of 2002, feature a cohesive set of block courses and practical experiences that are anchored by four strands – technology, diversity, field experience, and portfolio assessment.

In Purdue's new teacher preparation programs, the technology strand is manifest in: (1) concentrated course work focused specifically on educational technology (e.g., EDCI 270, Introduction to Educational Technology – an introductory course that focuses on helping students build basic technology knowledge and skills within the context of planning, implementing, and evaluating instruction); (2) integrated instruction in the application of technology in specific disciplines and with a variety of learners throughout block courses and in methods courses; and (3) reliance on supporting technologies for communication and to provide examples of exemplary practice. The diversity strand is supported through appropriate course work and by exposing pre-service teachers to various forms of diversity (e.g., socioeconomic, rural/urban, religious, cultural, intellectual, special needs/gifted populations) during field experiences in neighboring schools. However, Purdue is not located near a major urban center and hence cannot easily expose students to certain types of cultural and ethnic diversity. The field experiences strand is supported by a Theory Into Practice (TIP) component that accompanies each block of courses in the new program. The TIPs provide more and more cohesive field experiences for our students than were available in the past. Finally, in the new program, each student will develop a professional portfolio that will: (1) be used for self-reflection on learning, (2) document professional growth, and (3) provide the foundation for performance-based licensure. Helping to guide implementation of the new programs and ensure that technology is integrated as originally intended, Purdue is engaged in a PT3 implementation grant, entitled P3T3: Purdue Program for Preparing Tomorrow's Teachers to use Technology.

The overall goals of the P3T3 project are to (1) prepare pre-service teachers to demonstrate fundamental technology competencies, using technology as a tool for teaching/learning, personal productivity, communication, and reflection on their teaching, and (2) prepare teacher education faculty in Education as well as colleagues in Science and Liberal Arts, to teach pre-service teachers in technology-rich environments, modeling approaches that future teachers should use themselves. The project will meet its goals via three complementary components: (a) pre-service teachers will be taught by technology-proficient faculty who participate in a comprehensive faculty development program in which they learn new teaching/learning technologies and practice using them with mentoring and technical support leading to lasting technology integration into teacher education courses; (b) pre-service teachers will participate in rich and diverse field experiences enabled and enhanced through the use of technology; and (c) a dynamic assessment system will provide pre-service teachers the tools and opportunities to select multiple ways of viewing their evolving teaching practice, reflect on that practice, and use digital representations to meet performance-based assessments as they build digital multimedia portfolios. Ultimately, the pre-service teachers will learn about technology, integrate it as they see it modeled by their instructors, and reflect on their own learning about teaching via digital technologies that they will eventually model and use with their K-12 students.

This paper provides an overview of three implementation components of the P3T3 project: faculty development, technology-enabled field experiences, and a dynamic digital portfolio system. Together, these three components provide a cohesive solution to many of the problems related to technology integration that confront colleges of education, and one that fits well the particular needs of teacher education at Purdue University.

Faculty Development

The faculty development component of the project focuses on helping faculty to develop technology knowledge and skills by modeling learner-centered approaches that they can use with their pre-service teacher (who, in turn, can use them with their K-12 students). In technology-rich classroom environments, teachers tend to shift toward more learner-centered practices (Sandholtz & Ringstaff, 1996). Adopting a problem-based perspective to teaching technology (Hill, 1999) offers an approach that aligns with the learner-centered characteristics of the technology-rich classroom. P3T3 faculty development approaches include problem-based workshop experiences, use of mentoring teams with technical support, and online support.

As originally conceived, the professional development component of the project for a group of faculty was intended to begin with a week-long introductory workshop followed by year-long participation in mentoring teams. Faculty development workshops were planned for the summers when most faculty members have times of availability. Each workshop was to enroll about 20 participants consisting of about 10 Education faculty members, 4 graduate teaching assistants who work with teacher preparation courses, 2 faculty members from Liberal Arts and/or Science, 2 Education undergraduates, and 2 master technology-using teachers from our K-12

partner schools. In this, the first year of the project, we were forced to make a change because a late start left us unable to organize workshops for the summer of 2000. Instead, we scheduled the first faculty workshop as an abbreviated two-day start-up workshop during the fall semester break and then followed this with a variety of mini-workshops for faculty at times scattered through the fall semester. Our first workshop also was not as representative of all of the constituencies as we wanted, because no non-Education faculty or undergraduate students participated. However, a mixed group of participants remains a goal for each of the workshops to come.

Our initial two-day mini-workshop was designed to model problem-based learning processes as described by Torp and Sage (1998). In this process, individuals are confronted with a complex problem, define the parameters of the problem, conduct an investigation, and communicate the results. For our workshop, we had groups of faculty members address the question, "What technologies are available at Purdue University to support teaching and learning, how can they be used, and what do faculty and students need to know about them?" Teams of participants developed their own investigations, gathered information, and prepared a multimedia report about their investigation for the other groups. Technology was used during this process to acquire background information (e.g., Internet), produce artifacts (e.g., digital camera pictures), and prepare a presentation (e.g., Powerpoint). Through this process, faculty members were exposed to constructivist approaches to technology integration in the service of content learning. They were able to observe the processes, reflect on the roles of teachers and learners, and see certain applications of technology in the classroom.Following the problem-based learning activity, a variety of available technologies were demonstrated simply to raise awareness of them. Faculty cannot be expected to integrate technologies unless they have some conception of what they can do and how they might be used. Then, we asked faculty to develop their own concrete plans for integrating technology into one of the courses that they teach. The project provides support, in the form of expert assistance and funding, to help implement these projects during the coming year.

As a final step, we offered a number of "how-to" workshops throughout the semester for participating faculty and others. Topics included: web page design, use of the WebCT environment, graphics, managing one's university computer account, and so forth. To achieve extended support, an academic year-long mentoring program (abbreviated to one semester in the project's first year) is underway. Experienced faculty members who integrate technology in their teaching, along with the project's graduate assistants, work with a team of less-experienced faculty members who completed the workshop. Each team member pursues his/her personal and course technology integration goals established at the end of the workshop. Teams meet regularly to discuss implementation activities and to provide mutual support. In addition, work is underway to establish a web-based electronic community where faculty can exchange ideas and gather resources. Faculty who successfully complete a year of professional development activities, and who effectively integrate technology use into a course, will be eligible to lead professional development activities in subsequent years.

Technology-Enabled Field Experiences

Many colleges of education face difficulties placing students in field situations that provide for needed experiences such as interaction with diverse student populations and implementation of exemplary technology use. This problem is particularly acute for Purdue, which is not located near a major metropolitan center. As one way to address this problem, Purdue's P3T3 initiative is making use of two-way video conferencing to link college students and classrooms with K-12 students and classrooms.

Several video-based conferencing technologies are available for use depending on the nature of the activity and the types of interactions desired. For person-to-person interaction, desktop videoconferencing over the Internet provides a convenient and low-cost option. Each party must have a computer equipped with a microphone, speakers, an inexpensive camera, and appropriate software such as White Pine's CUSeeMe or Microsoft's NetMeeting. The grant provides equipment for equipping partner school classrooms with this technology. We will be exploring this option for one-to-one interaction, such as tutoring, between a Purdue pre-service teacher and a child in a K-12 classroom but as of this writing we have not implemented any activities using it.

For group interaction, a higher quality video conferencing solution is needed. High quality videoconferencing can be obtained by systems that operate over high-speed telephone lines (e.g., fiber, ISDN) or over the Internet. In Indiana, over 200 schools are part of a fiber optic video network called Vision Athena

that is operated by the Corporation for Educational Communications, a partner in the P3T3 project. Although Purdue is not part of the Vision Athena network, we can link our ISDN-based PictureTel videoconferencing unit to the Vision Athena network via a network bridge. While the quality is not as high as the purely fiber network, this system has already been used on multiple occasions to link Purdue classes with classes at K-12 school sites, and it will continue to be used in the P3T3 project. A new option is the use of IP-based videoconferencing systems, such as those made by Polycom (http://www.polycom.com) and other vendors, which support the H.323 standard for video conferencing over the Internet. These units can operate at data rates from 128K to 768K and yield results comparable to ISDN-based compressed video systems such as the PictureTel unit that Purdue already uses. Initial experiments in the use of this technology, which is markedly superior to computer-to-computer desktop video conferencing, suggest that it provides a viable alternative for some types of student observations and interactions in school-based settings that typically occur through traditional field placements. As long as adequate bandwidth is available between the school and university site, this technology can support class-to-class videoconferencing.

In the first P3T3 project experiment in implementing two-way connections with a K-12 site, Professor JoAnn Phillion used a Polycom Viewstation to connect her class to an elementary school classroom in East Chicago, an urban area in the northern part of Indiana. The students in Professor Phillion's class, who were enrolled in the first block course in the teacher education program, were able to make observations of the class, interact with students and the teacher, and even teach some small instructional units via the two-way video connection themselves. The connection at 256K was solid with only occasional dropped packets resulting in a high-quality two-way video linkage. This experience suggests that these two-way video connections can expand opportunities for our students to engage in "field" experiences reaching the kinds of diverse sites, such as urban settings, that would ordinarily be very difficult because of Purdue's geographic location.

Dynamic Digital Portfolio System

Portfolio assessment is becoming an important way to address competency-based standards for teacher preparation programs. There is growing interest in the use of electronic multimedia portfolios for documenting growth and development of pre-service teachers (Barrett, 2000; Read & Cafolla, 1999). As part of its P3T3 project, Purdue is developing a dynamic web-based assessment system that will provide pre-service teachers with the tools and opportunities to select multiple ways of viewing their evolving teaching practice, reflect on that practice, and use various representations to meet performance-based assessments as they build digital multimedia portfolios.

Digital, or e-portfolios, take many forms from simple repositories of disconnected student artifacts stored digitally on CD-ROMs or web servers to highly organized and systematically retrievable work representing the synthesis of professional growth (Campbell, 1997). In our project we have focused on the latter. We are attempting to build an e portfolio component as one part of what we call a dynamic assessment system. The system is dynamic because unlike traditional text-based portfolio systems, it emphasizes interaction and ongoing reflection rather than archiving of artifacts; and, unlike many existing digital portfolio systems, it emphasizes the complexity of teaching practice through a variety of web-based components that provide resources about how ongoing teaching practice and assessment are tied to existing theoretical frames, and provides a "community of learners" component where pre-service teachers can interact with peers about their mutual experiences in their evolving practice.

The dynamic assessment system uses the e-portfolios as one component of a Unit Assessment System (UAS), the plan in the School of Education that indicates how pre-service teachers are meeting new performance-based state licensure guidelines. The e-portfolio is comprised of two primary components: (a) a web-based input template in which all pre-service teachers can enter digital artifacts (pictures, video clips, audio clips, text files) they can categorize according to three broad Principles in Practice that organize how they are thinking about learners, curriculum in context, and ongoing professional growth and participation in the teaching profession, and (b) a query component in which they can systematically acquire a "presentation" version of the portfolio in which all artifacts classified according to performance assessments, theoretical frames, instructional principles, and ongoing reflective themes, can be retrieved for formative assessment purposes (pre-service teachers' ongoing assessment and reflection on evolving practice) and summative purposes (presentations to portfolio evaluators at key checkpoints on the teacher education program). On the input side, we anticipate that

several links will be available: (a) Communities of Learners in Practice, (b) Theory in Practice, (c) Performance in Practice, and (d) A Continuum of Growth. The Communities of Learners in Practice page will include our P3T3 partner schools and their web sites, along with our own P3T3 site and the national PT3 site and a page explaining the various projects at Purdue that are related to these initiatives. Theory into Practice will include resources about theoretical foundations of teaching, learning, and reflection on teaching. Performance in Practice will link to a variety of resources providing examples and models of various teaching practices that students can compare with their own evolving practice. Finally, A Continuum of Growth will provide links to a Purdue University's Professional Development Schools and the school web sites, other courses or collaborative initiatives of the School of Education that a student or visitor might be interested in, and links to various professional organizations

Both faculty and students will have the ability to log in and have tools and features accessible to them when they enter the e-portfolio area from the main page. For example, a student who logs in might go to the site of a P3T3 partner school and locate a video of a teacher using a project-based activity with science students. The teacher education student may watch the video, see the teacher's lesson design and comments about the lesson, and then activate a "reflective writing" tool to comment on what he or she sees. The observations made in the reflection box/pad (dialogue window) will then be automatically recorded in the student's portfolio in a designated place. When artifacts are retrieved via a query, the retrieval will occur in such a way that all artifacts, their interrelations to one another, and the student's ongoing reflections of evolving practice are all displayed along with a map that shows how a given student is meeting performance goals of the UAS as he or she moves through the teacher education program. Ultimately the e-portfolio system will meet the primary goal of the P3T3 project by providing a forum in which pre-service teachers, though their use of technologies needed to build and use the portfolio, learn about and feel competent with the very technologies we want them to use with their future students.

Conclusions

Purdue University's PT3 initiative, P3T3: Purdue Program for Preparing Tomorrow's Teachers to use Technology, seeks to prepare our teacher education students to effectively utilize computers and allied technologies for personal productivity, for documenting and reflecting on teaching practice, and for effective teaching and learning. Three interrelated components form the basis of our approach for achieving these aims: (1) a faculty development program, (2) use of two-way communication technologies for virtual field experiences, and (3) development of a dynamic web-based digital portfolio system for pre-service teachers. The faculty development program focuses on the use of problem-centered approaches to technology use with a year-long mentoring and support program to help faculty integrate educational technologies their own courses so that they effectively model its use. Two-way video communication technologies, notably IP-based videoconferencing, allow students to observe and interact with school sites from a distance. This permits students to experience diverse school sites unavailable in the vicinity of the university and so broaden their horizons and preparation. Finally, the development by all pre-service teachers of digital portfolios is a component of a dynamic assessment system for the School of Education. Through the development of web-based portfolios, students will reflect on their emerging practice, demonstrate competencies needed for licensure, and, at the same time, learn about and use the very technologies that we want them to use with their students. Through these approaches, we seek to ensure that teacher education reforms at Purdue, initiated less than two years ago, are implemented according to a vision that emphasizes diversity, field experience, portfolio assessment, and technology as key to the preparation of all teachers. For more information about the project, visit the project website at: http://research.soe.purdue.edu/p3t3.

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