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ABSTRACT

This paper addresses issues related to the development and preservation of tacit knowledge (i.e., institutional knowledge rooted in actions and experiences) for technology integration. Results of a 1999 survey of teacher preparation programs in Texas are presented. The survey asked administrators in colleges of education to identify skills that might be important to teacher education majors and to assess the adequacy of general skills training currently received by preservice teachers. The majority of the respondents felt that preservice teacher skills were adequate to operate a computer system and to use software and tools directly related to individual professional use, such as productivity tools and databases, word processing programs, and spreadsheets. Respondents reported, however, that preservice teachers were just beginning to produce and use multimedia in projects. Key features and outcomes of the Technology Mentor Fellowship Program at Texas A&M University are described. Objectives of the project included developing proficiency of the College of Education faculty in the use of various instructional and communications technologies; developing capacity within the College of Education in digital media that supports national standards; and supporting faculty transitioning to the new teaching program by providing technical assistance. A model for institutional development for technology integration is presented. (MES)

A Dilemma for Technology Professional Development in Colleges of Education: Building Capacity vs. Providing Tech Support

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Abstract

With limited resources in terms of time, money, and human power, how should we support faculty so that they can provide the kinds of instruction pre-service teachers need to become effective users of technology? The answer that we suggest is that while building capacity and providing tech support provide both benefits and have countering drawbacks, neither is sufficient alone. Our experience supports the proposition that both are needed for a successful professional development program for faculty.

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A Dilemma for Technology Professional Development in Colleges of Education: Building Capacity vs. Providing Tech Support

The press for advanced skills in using electronic technology devices for instructional purposes is nearly overwhelming, because of the ubiquitous presence of tech tools in schools, homes, and offices. In order to maintain job security, educators are being encouraged to adopt and use the Internet, PowerPoint, and online management tools like Blackboard and WebCT. These mainstream technology tools, combined with student demands for new technology-based instructional delivery, are changing K-20 educational institutions. Faculty are increasingly providing distance learning programs to their students in synchronous and/or asynchronous modes (Hirschbuhl & Bishop, 2002).

Means (2000/2001) observes that despite great strides in integrating technology in schools across the nation, our schools in general are not succeeding in providing a seamless, convenient, robust, and reliable technology support structure for all students and their teachers. Many educators lament the lack of current computers and viable school networks. Yet, far too often teachers and their students are not using the available technology or under-utilizing available resources. However, Means does offer an encouraging view for future technology professional development given insights that have been gained from recent experiences with technology integration, combined with advances in cognitive science regarding how people learn and the technological improvements that will likely occur in the coming decade.

To increase the level of technology integration in schools, the integration of technology into teacher education programs must also accelerate. Implementation of technology into teacher education programs was given a tremendous boast when the U.S. Department of Education launched its Preparing Tomorrow's Teachers to use Technology (PT^3) program. In developing a successful application to this program, Wedman (2001) wrote that while many teacher education programs have similar problems in terms of integrating technology into the curriculum, the lack of collaboration across programs impedes collective efforts to address these problems. Although some teacher education programs have successful experiences in integrating technology, their

successes often occur in isolation and are not disseminated to other programs in a systematic, enterprise-wide manner. Further, effective technology integration knowledge is often rooted in actions and experiences, or tacit program knowledge that is hidden in individual minds. Without an explanation of this tacit knowledge, the community misses the opportunities to leverage existing knowledge. Finally, Wedman posits that in most teacher education programs, a small number of people know a great deal about effective use of technology in teaching and learning. Such institutional knowledge needs to be saved in a convenient format to avoid missing important details and generating unnecessary effort to track down the technology integration expert. By not preserving this tacit knowledge, the teacher education community puts its knowledge asset at stake if knowledge owners leave. The remainder of this paper addresses issues related to the development and preservation of this tacit knowledge for technology integration.

The Dilemma

The need for institutions of higher learning to prepare students for a technological world is self-evident. It is also apparent that faculty in colleges of education, who should be leaders and models of technology-enhanced education, are not. The question is: With limited resources, in terms of time, money, and human power, how should we support faculty so that they can provide the kinds of instruction pre-service teachers need to become effective users of technology? The answer that we suggest is that although building capacity and providing tech support provide both benefits and countering drawbacks, neither is sufficient alone. Our experience supports the proposition that both are needed for a successful professional development program for faculty.

The Challenge

Projections show that two million new teachers will be needed in the United States in the next ten years. Projections also show that the current rate of technological change is phenomenal, with computing improving, expanding, and doubling in processing power every 18 months; a literal explosion of computing capacity is occurring (Cairncross, 1997). Recently, the National Council for Accreditation of Teacher Education (NCATE, 1997) called for an increased focus on technology in teacher

education, citing the need for technology to move from the periphery to the center of teacher preparation. Recognizing that indeed "some colleges of education are in the vanguard of introducing technology into teacher preparation," NCATE reported that "...most schools of education have not yet fully integrated technology into their teacher preparation programs" (1997, p.v). NCATE has now called for "vigorous action" to integrate technology into teacher education programs to provide the knowledge base in technology and technology integration for future teachers.

With this in mind, project staff conducted a survey in 1999 of teacher preparation programs in Texas. All teacher preparation programs were invited to participate; about 60% actually completed in the survey. The survey asked administrators in colleges of education to identify skills that might be important to teacher education majors and to assess the adequacy of general skills training currently received by pre-service teachers. A majority of the respondents felt that pre-service teacher skills were adequate to operate a computer system and to use software and tools that were directly related to their own professional use, such as productivity tools and databases, word processing programs, and spreadsheets. Respondents reported, however, that pre-service teachers were just beginning to produce and use multimedia in projects. Pre-service teachers were not often required to use computer-based technology in their teacher preparation programs, although many actually had the skills to use advanced technologies and software and did so without being asked or assigned such tasks.

The profile of faculty included low use of computer hardware and software, general use of the VCR in instruction, and widespread use of word processing programs, spreadsheets, and presentation software. Respondents felt that these technologies had been around long enough for faculty to have developed a comfort level with them, but that faculty had not been given sufficient support in the instructional use of computer-based technologies in teaching.

Recognition of Digital Divides

Pre-service teachers in our Colleges of Education are predominately of the Net Generation (sometimes called Generation Y). The Net Generation, having grown up with

the new technologies, enters our institutions of higher education with a much better comfort level for technology than the existing university faculty who grew up with television and radio. Consequently, an "Intergenerational Digital Divide" exists. To compound the problem, a second Digital Divide exists; the technology infrastructure gap between public schools and teacher education programs. Texas schools have experienced substantial technology infrastructure changes over the past few years (Author, Davis & Strader, 2001). However, colleges of education are limited in their ability to provide substantial pre-service training in Internet-based technologies. Rather than presenting exemplary models of technology-enhanced instruction to pre-service teachers, most Texas institutions of higher education are struggling with integrating technology into courses and content areas and in offering on-line courses.

Our PT^3 Project

We designed our PT^3 Project, funded in 1999, to address the need for increased faculty proficiency in technology while recognizing the challenge—and the potential—of the disparity between faculty and students in technology skills. The goals of the project were to facilitate faculty development through both approaches: building capacity and providing tech support. Our stated objectives included:

(1) Developing proficiency of the faculty in the College of Education in the use of various instructional and communications technologies **[Building Capacity]**;

(2) Developing capacity within the College of Education in digital media that supports the NCATE standards and the International Society for Technology in Education (ISTE) **[Building Capacity]**; and

(3) Supporting faculty transitioning to the new teaching program by providing technical assistance **[Providing Tech Support]**.

Program Description

The **Technology Mentor Fellowship Program (TMFP)** draws upon successful strategies evolving from programs funded by the Technology Literacy Challenge—specifically the Generation www y program (Challenge Grant –Olympia, Washington)

and the Profiler and Trackstar tools developed by the Advanced Learning Technologies (ALTec), a division if the Center for Research and Learning at the University of Kansas, and extensive experience of our project staff in working with schools for the past four years on technology integration.

The key features of the TMFP follow.

1. Provide teacher education faculty (campus-based faculty, cooperating teachers, early experience supervisors) a system for technology training that:
   - provides mentoring and support to faculty and cooperating teachers in the field from pre-service teachers experienced in the process of integrating technology into instruction at the K-12 level; **[Providing Support]**
   - identifies the growing knowledge base within college and school organizations, among students and faculty, and supports the sharing of both skills and knowledge through collaboration and the development of specific, skill related instructional objects; **[Developing Capacity]**
   - provides continuous assessment of competence for college and school teacher education faculty in the area of integrating technology into instruction. **[Providing Support]**
   - provides professional development activities tailored to the particular needs identified by teacher education faculty regarding technology skills/processes for technology integration. **[Developing Capacity]**

2. Provide teacher education faculty and pre-service teachers access to a repository of instructional objects designed to:
   - develop and use basic technology skills and provide instructional applications of technology, **[Building capacity]**
   - use technology-congruent pedagogy, such as project-based learning and continuous skills assessment; **[Building capacity]**
   - be searchable by their application to specific issues related to the integration of technology into instruction across grade levels, content areas, and national standards. **[Providing Support]**

3. Provide opportunities to organize instructional objects into web-based courses. **[Building capacity].**

Outcomes after Two Years

The redesigned elementary and secondary teacher education programs became fully operational as field based programs during this TMFP grant. The elementary program has 12 Professional Development Schools (PDS) and 10 Integrated Methods Schools (IMS) that support the preparation of approximately 430 teaching candidates each semester. Integrated Methods Schools are pairs of schools that support the field-based teacher education programs. All methods classes are conducted on site at the schools. The department head of teacher education has worked closely with the TMFP project staff to provide the equipment infrastructure to support technology integration throughout the teacher education curricula. To illustrate, four "smart carts" have been placed at PDS/IMS schools to enable greater technology integration into the field experiences for our teaching candidates. The smart cart consists of a large heavy-duty movable cart equipped with a laptop computer with Internet card, a digital projector, a VCR, a digital camera, and a PolyComm (2-way audio-video communication system). In turn, TMFP project staff assigned a team of Technology Fellows (2 to 4) to assist faculty in developing instructional objects for the methods classes and classroom activities in the school. This collaboration will be a very significant factor in sustaining the goals of TMFP once project funding has been completed.

Across the second year of the grant, the project placed 218 Technology Fellows (Fall Semester=137, Spring Semester=156, with 75 fellows participating both semesters) with teacher education faculty. As information spread about this program, faculty from six different academic departments elected to participate in the program during year two. The logistical challenges were daunting for tracking so many Technology Fellows at a time. Anticipating these challenges, project staff developed an **Electronic Management System** to track the Technology Fellow assignments, to provide work schedule targets and payroll information, and to serve as an online communication system for the Technology Fellows, the Project Coordinator, and the Faculty partners. The management

system uses the Internet to address challenges associated with multiple levels of communications, project management and monitoring of electronic instructional object development.

We had hoped to make extensive use of the Profiler system (an on-line technology skill self-assessment system) to identify the strengths and weaknesses of our faculty and our mentors so that effective sharing could occur. Since the program began, 302 technology skill self-assessments have occurred on the Profiler system; and a total of 122 TMFP participants have completed a Profile at least two times. It is disappointing that just forty-nine (49) percent of TMFP participants have completed the self-assessment at least twice. Getting faculty to complete a self-assessment has been a major challenge. Reluctance to being assessed on technology skills has proved more difficult than anticipated. And while the Profiler has been a useful tool for getting individuals oriented to basic technology knowledge and skills, actual demonstrations of technology skills are thought to be necessary for measuring whether our program is actually succeeding in attaining its goals. The development and implementation of a skills performance system, with faculty involvement in affirming particular technology skills have been exhibited by teaching candidates, is one of our "must do" tasks for the final year of TMFP.

To address this need, TMFP staff members are developing *i-Folio,* an interactive portfolio documentation tool that allows pre-service teachers to display work products from pre-professional experiences and correlate those artifacts to state and national standards. The *i-Folio* interface will enable efficient verification of student work by College of Education faculty to insure that certification and national standards are being met. The system serves as an electronic clearinghouse for student portfolios developed as competency demonstrations associated with certification and course requirements. Students will maintain their own portfolio web site on a College of Education server that contains assignments and projects from courses, student organizations, community service projects, and personal interests. The student places their work products (responses to assignments) on their own COE website and then request that their professor evaluate the work product.

The joint-creation of learning objects by faculty and their student mentor provides for support and builds capacity. Of the 736 electronic learning objects created during this

project, TrackStar tracks have been developed far more often than any other resource. However, assistance has occurred quite often with Technology Fellows helping their faculty member create PowerPoint presentations, personal WebPages and on-line course syllabi. A large number of electronic objects have been created across a wide range of content areas for learners from kindergarten through graduate school. One online asynchronous course is operational and several other courses have on-line components. In addition, an on-line professional development portal has been developed for continuing professional development opportunities for teacher preparation faculty. These resources are being considered as a vehicle for providing certification preparation for secondary mathematics and science teachers. Other faculty members are preparing online courses and have requested support from their Technology Fellows in putting their courses online. We are confident that faculty participating in TMFP will have at least ten (10) asynchronous courses operational by the end of year three.

Model for Institutional Development for Technology Integration

The operational protocol for technology integration by teacher education faculty that has evolved for the TMFP is a four-step process modeled from *Professional Development: Learning from the Best* (Hassel, 1999). It provides a framework for providing technical assistance, capacity building, and systemic change for technology integration into teacher preparation curricula. The following steps delineate important processes in developing and conducting professional development for institutional change.

> Step 1. Designing Professional Development – sound professional development design includes both strong *content* and an effective *process* for making initial and ongoing decisions.
>
> Step 2. Implementing Professional Development – reoccurring processes that have been gleaned from successful professional development efforts include: keeping current with literature, incorporating best practices in leadership, and instructing that leads to technology integration, and ensuring the organization's policies and practices support actual implementation for faculty.

Step 3. Evaluating and Improving Professional Development –formative evaluation of the process is needed to insure ongoing success. Establishing program benchmarks and then monitoring progress in attaining those benchmarks are critical in determining whether the program is being implemented as planned.

Step 4. Sharing Professional Development Learning – sharing professional development challenges and successes can be helpful to others in similar organizations across the country. This step directly addresses the formalizing of tacit technology integration knowledge held by teacher education faculty.

Each of these steps generates documents that can be directly linked to dissemination products. Assuming a professional development program is successfully implemented and documented, many tactics and organizational guidelines (usually internal documents and guidelines) that enabled the program to maintain momentum and succeed may be quite useful to share with other organizations to build capacity while providing technical support

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