UBIQUITOUS COMPUTING, TELECOMMUNICATIONS & SCIENCE OF LEARNING STUDY TEAM REPORT

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Study Team Blog: The activities of the study team and the development of this report are documented on the study team blog.

 http://www.personal.psu.edu/cxz12/blogs/technology_study/

Background & Context

Recent changes in the workplace have renewed criticisms of the nature of schools and schooling (National Center for Education and the Economy, 2006; Wallice & Steptoe, 2006), and have called attention to the need to prepare education professionals to meet the demands of a 21st century global economy. In addition to deep and flexible understanding of core subject areas, today's learners must develop reasoning skills that allow them to think and problem-solve across disciplines, become global citizens with sensitivity to other cultures and issues of global interdependence, access information from a variety of sources and be critical consumers of that information, and work effectively in teams and communicate well. Attention to these "21st century skills" are reflected in the Partnership for 21st Century Skills Framework and the newly revised National Educational Technology Standards for Students (NETS*S), which were released by the International Society for Technology in Education (ISTE) in Summer 2007. Newly revised NETS for teachers are due to be released in Summer 2008 at the National Educational Computing Conference.

Pennsylvania is leading the charge in helping high school students develop 21st century skills and enhance learning in the core subject areas with technology through Classrooms for the Future (CFF). This $200 million, 3-year initiative is attempting to transform every high school mathematics, science, English and social studies classroom into "smart classrooms." In addition to the infusion of state-of-the-art technology, including laptop computers, SMART Boards, and high-speed internet access, CFF is supporting the professional development of teachers to ensure the success of the project. The Regional Educational Laboratory at the Penn State College of Education is conducting an evaluation of CFF; findings from the first year of the project (2006-07) are promising. The College of Education also is sponsoring the 4th Annual One-to-One Computing Conference for public school and higher education faculty in April 2008.

The Penn State's College of Education is well positioned to provide a leadership role in preparing the next generation of highly qualified education professionals for success in 21st century learning environments. Not only are College of Education faculty at the forefront of research on learning and teaching in technology-rich environments, but they are also engaged in cutting-edge education initiatives. It is through this strong commitment to research in the context of leading-edge practice that we stand to play a significant leadership role both nationally and internationally, and raise the profile of the College within the Penn State community.

After a 2-year pilot study in the Professional Development School partnership and more than a year of intensive faculty development, the Elementary & Kindergarten Education and Secondary English Education programs are implementing EDUCATE: Exploring Directions in Ubiquitous Computing

And Teacher Education in Fall 2008 (http://www.ed.psu.edu/educ/educate), which is aimed at integrating powerful technology tools into teacher education experiences. Central to this work is the development of electronic teaching portfolios and video analyses of teaching practices. Mathematics Education and Science Education faculty have been nationally recognized for their efforts to enhance subject matter learning and teaching using cutting-edge applications of technology. Mathematics Education faculty, for example, have written and researched technology-intensive high school mathematics curricula, have international research organization on computer algebra in mathematics education, and have edited international volumes of research on technology and the teaching and learning of mathematics. The Language, Culture, and Society faculty have strong expertise in digital literacy and its implications for schooling. Special Education faculty have been using technology to support outreach and connections to education professionals in the field. Counseling Psychology is increasingly integrating digital video into their practices and programs. Educational Theory and Policy, Educational Leadership, and Children's Literature have innovative programs in distance education. Instructional Systems faculty are examining the educational impact of gaming, blogging, and information markets. A hallmark of these initiatives is the engagement of undergraduate and graduate students in active learning and problem-solving using state of the art technology tools.

Our report, therefore, is aimed at achieving the following outcome: **Be a national leader in research and practice associated with educating effective education professionals[1] (e.g., teachers[2], teacher educators, educational researchers, administrators, counselors) for 21st century technology-intensive learning environments.** The recommended initiatives that follow are aimed at providing coherent support and dedicated resources for achieving this goal.

Initiative 1: Transform classrooms into cutting-edge learning environments to support innovative instructional practices and research on learning and teaching in technology-rich settings.

If we are to achieve the goal of retaining national and international leadership in research and practice on applications of technology for preparing the next generation of highly qualified education professionals, then our classrooms and other learning spaces must be transformed to reflect key features of 21st century learning environments. The classrooms in which we prepare the next generation of educators must be equipped with the best leading-edge technologies available in preK-12 schools. Each methods class should be taught in a 21st century classroom that can serve as an exemplar of the promise of technology for 21st century learning and that can function as a laboratory for research on technology-intensive teaching and learning. This will require upgrading classrooms structurally and with an infusion of technology, including multiple-station projection facilities, equipment for real-time data collection devices, and SMART Boards, as well as upgrades to wireless access and internet connection rates throughout the College of Education. It is no longer

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[1] The study team conceptualizes "education professionals" in broad terms. For example, education professionals should include Humphrey Fellows, who often have a strong interest in learning technologies, and students in Adult Education, Workforce Education, and Corporate Training.
[2] While there is a tendency to focus on preservice teacher education, the study team also acknowledges the importance of sustained professional development of practicing teachers and other education professionals as part of this work.

viable to teach 21st century education professionals in mid-20th century classrooms. It is insufficient to rely solely on 236 Chambers as a demonstration classroom.

Similarly, because College of Education faculty function at the forefront of research on learning and teaching in technology-rich settings, at the most basic level we need to be equipped with appropriate hardware and software for achieving this goal. Local learning spaces must be configured specifically to attend to research needs. For example, classrooms should be equipped with video and audio recording devices to capture individual and group interactions and technology that permit remote collection of data. For some lines of research, a 3-year life cycle for computer upgrades may be unreasonable.

In keeping with the focus of this initiative, it is important to note that there is a growing need to be able to engage colleagues from around the state, the country, and the world in face-to-face, real time communication about research and instructional experiences. External grant applications are often enhanced by inter-institutional research and teaching collaborations. Convenient and dedicated cutting-edge videoconferencing facilities are a necessity in coordinating collaborations with international researchers. The emergence of communication tools, such as Adobe Connect, iChat AV, and Polycom, has provided ways to connect colleagues across great distances and diverse settings to engage in meaningful conversations and inquiries. There is great potential in the ability to connect preservice teachers working in urban settings with those in suburban and rural contexts. Also, more robust interactions with teachers and university faculty from countries, such as England and Sweden, where some of our teacher education students complete their student teaching experiences are desirable. A centerpiece of this initiative is to develop expertise within the College about how best to use these tools to facilitate communication among geographically dispersed groups. In order to accomplish this, faculty will need high-speed wireless access in their offices and classrooms, as well as the audio-visual equipment necessary for face-to-face desktop conferencing and chat to support instruction, research conversations with colleagues and graduate students, and/or data collection at remote sites.

Initiative 2: Create an Innovation Studio to support the building of capacity among faculty to use technology in support of research, teaching and learning, and outreach.

Educational technology changes rapidly. In order to be a leader in this area there is an urgent need to support the ongoing professional development of faculty. In particular, we propose an Innovation Studio where faculty can go to receive support for pedagogical innovations that involve technology, be introduced to and/or become skilled at using emerging technologies, and explore technology tools for advancing their research.

The Studio director and support staff would have to be able to interact effectively with faculty around their teaching and research needs, as well as understand enough about technology solutions to collaborate well with ETC staff and central IT personnel. We anticipate that the director would have a PhD in an appropriate education field, and that at least one staff member would be an instructional designer. Graduate students should be dedicated to the Studio and involved in supporting research-based projects.

The Studio would expand current efforts associated with the EDUCATE initiative to all Departments of the College. Examples of projects that could be supported through the Studio include:

- Supporting solutions for storing, streaming, and coding video associated with research in classrooms as well as in non-classroom settings.
- Assisting faculty in using desktop conferencing to enhance resident instruction courses or research group communications.
- Identifying powerful tools and systems for communicating with students who graduate from our programs.
- Interacting with school partners in urban settings to create opportunities for our students to participate in real-time observations of diverse classroom communities.

The Studio would need to have a strong web presence. Faculty research and teaching innovations supported by the Studio would be highlighted on the web site.

Several Penn State colleges already have in-house technology support for faculty that extends beyond technical support like that provided by our Education Technology Center (ETC). For example, The College of Earth & Mineral Sciences has the Dutton e-Education Institute, the goal of which is to increase access to programs through the development of online courses. The College of Information Sciences and Technology has the Solutions Institute, which offers innovative e-learning products and services for faculty and students. While we also could support the development of blended and online courses through the Studio, the feature that would set us apart would be a clear focus on faculty development/support around research and problems of practice in teaching.

The study team recommends that the Innovation Studio be housed in 201 Chambers. We envision a comfortable, lounge-like atmosphere in which faculty would be welcome to stop in and sample hardware and software or speak with a project consultant.

The director of Penn State's Education Technology Services (ETS) attended our open session with the faculty and suggested making the College of Education a local Digital Commons site. This will bring some technology and human resources into the College and allow us to showcase our work across the university. More specifically, if we dedicate the space ETS will provide a high-end multimedia development station and green screen, and they will dedicate a trainer to support faculty development 1-2 days per month.

Considerations & Recommendations

The study team acknowledges that both of the aforementioned initiatives will require substantial research and planning. We recommend that a group immediately begin work on assessing the current state of our classrooms, visiting Colleges of Education that have technology-rich classroom spaces (e.g., Indiana University and University of Texas), and crafting a plan, budget and implementation timeline for updating classrooms and creating the Innovation Studio. If a director for the Studio can be hired in the near future, s/he could ideally oversee the process.

In talking with the Teacher Education Study Team, it became apparent that we need a formal and stable mechanism for developing trusting relationships with preK-12 school partners. In particular, we need to assist them in understanding the benefits of technology in teacher education and engage

them as active partners in research on learning and teaching with technology. We recommend constituting a committee to address these issues. In addition, the committee could explore solutions to barriers, such as wireless access for our preservice teachers in schools and restrictions for capturing video of teaching practices, which are typically viewed by school district personnel as security threats.

The Shepperd School project is exploring innovative uses of iChat AV to make remote classroom observations of student teachers and to engage in remote meetings and discussions among students and instructors between site visits to Philadelphia. The study team suggests using this work as a case for considering how to provide students in our programs with access to diverse urban classroom contexts. In addition, we recommend the continued cultivation of student teaching supervisors and their use of technology to enhance field experiences.

Technology solutions should be considered when exploring ways to recruit talented students to our programs, staying in contact with alumni (i.e., extend the work of EdLion), communicating with donors, and cultivating development opportunities.

Staff from the Office of Advising and Certification Services have participated actively in meetings associated with EDUCATE and the Ubiquitous Computing Study Team. They are interested in pursuing a leadership role in the Penn State community related to making the most of technology solutions for enhancing advising interactions. This work is important to the success or our overarching goal and should be supported.

In the wake of the Spellings report, assessment and evaluation of program outcomes and student learning have become a top priority among university faculty and administrators. Penn State is no exception. Technology tools have great potential to support efforts to document and monitor student learning. These tools coupled with expertise within the College of Education place us in a unique position to serve a leadership role within the Penn State community and nationally. All of our undergraduate programs are accredited by national professional agencies, and we are making productive advances in the use of electronic portfolios. The study team believes that it would be beneficial for the College to cultivate particular expertise in assessment systems that capitalize on electronic archiving capability. This work could be supported through the Innovation Studio.

As we more forward with this part of the College's plan, it will be necessary to strategically strengthen our relationship with Penn State's Teaching & Learning with Technology group and Education Technology Services. These groups have a mission of enhancing learning and teaching using technology. In the past, they have been supportive of College initiatives, most recently securing a university-wide site license for Studiocode video analysis software.

Financial Implications

The work we are proposing will not be possible without permanent budget lines dedicated first to the transformation of teaching and research environments and the development of the Studio. Innovation in technology for teaching and research also requires ongoing support for maintaining cutting-edge technology-rich learning environments and research tools, as well as the ongoing professional development of faculty and staff.

The study team recommends the following actions to supplement financial support for the initiatives associated with the goal of being a leader in research and practice on educating effective education professionals for 21st century learning environments.

- Collaborate with the College of Education Development Office to create a coherent plan for approaching donors who have interest in supporting technology initiatives. For example, there is an opportunity to name the Studio and classrooms.
- Systematically pursue research grants that support examining learning and teaching in technology-rich contexts.
- Explore the possibility of capturing a larger percentage of student technology fees to support this work.

National Center for Education and the Economy (December, 2006). Tough choices or tough times: The report of the new commission on the skills of the American workforce. San Francisco: Jossey-Bass.

Wallice, C. & Steptoe, S. (December 10, 2006). How to bring our schools out of the 20th century. TIME magazine.