REFORM IN TEACHER EDUCATION AS A SCAFFOLD FOR TECHNOLOGY INTEGRATION

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Faculty and staff at the University of Wisconsin-Milwaukee (UWM), an institution which prepares teachers to work in urban settings, utilized PT3 grant funds to support the integration and institutionalization of technology into UWM's largest teacher education program. Collaboration, curricular reform, coursework revision, and community relationships exemplify the success of the project.

Faculty members in the School of Education at the University of Wisconsin-Milwaukee (UWM) were awarded a Preparing Tomorrow's Teachers to Use Technology (PT3) grant in the first round of the PT3 grant competition. The grant had as its goal supporting the full integration of technology into UWM's largest preservice teacher education program, not as a goal in itself, but as part of comprehensive teacher education reform. At the start of the project, instructional technology was not addressed in any significant way in teacher preparation. Two one-credit technology courses devoted mostly to technology for professional use existed, had not been revisited for many years, and were completely disconnected from the programs themselves. As the project ended, technology was highly visible, was institutionalized in the program, and was assessed as part of the portfolio assessment process. The success we experienced was possible, we believe, because technology integration was built on the programmatic reform that was already underway. The reform context itself served as the scaffold from which technology integration was launched.

UWM is committed to preparing highly qualified teachers to work in urban settings and recognizes that highly qualified teachers must be technologically proficient if they are to help

narrow the achievement gap between students in urban schools and their more advantaged peers. This commitment is evidenced by a highly collaborative faculty who regularly examine program content and requirements to ensure they match the mission of preparing teachers to work in urban schools. Both program reform and this urban education commitment created the environment that laid the foundation for the PT3 grant work and enabled the sustainable transformation of technology use and instruction.

In this chapter we provide a description of the major aspects of our PT3 work which contributed in a unique way to the project's success. In particular, we address the importance of creating a vision for technology integration which is grounded in curriculum, implementing the project by becoming visible and creating an approach to technology integration which considered students, faculty, and the community, considering the unique opportunities for increased technology integration through the collaboration between general and special education, and the work involved in creating sustainable change in both personnel and policy.

Creating a Vision for Technology Integration

During the planning phase, we thought systemically and considered different branches of the project that would be critical to effect long term, systemic change. The three branches included faculty development, student development, and community development. It was important to us to improve the knowledge and practice of the students we were preparing to become teachers. We believed accomplishing student growth in technology would require the faculty on campus and in our partner schools to extend their knowledge and use of technology as well. Accomplishing this task depended on developing a system of communication and support

among faculty and students, and among our field placements in the public schools and on campus.

Within each branch of the project, parallel objectives were established that addressed growth in technology knowledge and use, particularly as it contributed to developing a more sophisticated understanding of diverse students in urban schools and increased awareness of how technology might support diverse populations. Part of that objective included learning about assistive technologies to support students with disabilities.

We set a number of specific goals to address our objectives. First, technology needed to be more available, more visible, and more embedded into the teacher preparation program. For this to happen, the structure and content of the existing stand-alone, required technology courses needed to be changed significantly so that the technology information learned was aligned with the content presented in the methods courses and a system of assistance needed to be created so School of Education and Letters and Sciences faculty could better (or, in some cases, begin to) incorporate relevant technology enhanced projects into their courses.

Second, because UWM's teacher preparation program includes a heavy field component, strengthening the frequency and range of technology use in partner schools in the Milwaukee Public Schools (MPS) would be essential to help our students authentically translate knowledge to practice. Faculty at our three partner schools would need to develop priorities for more indepth uses of technology in the classroom. Accomplishing that goal would require readily available "experts" to work with school faculty to conceptualize and carry out logical technology supported projects.

Finally, while we had a goal of effecting sustained change at the outset of the grant, during the course of the grant, it became clear that for this to happen, permanent lines for technology

staff at UWM would need to be created. To continue a positive evolution of technology integration, our school had to recognize technology as a formal field of study and valued area of expertise and commit to securing staff who could be entrusted with the task of supporting curriculum development in this area.

The success of this grant was due in part to creating a vision for technology integration that spanned learners, learning environments and content. However, creating the vision was made easier in large part due to the pre-existing conditions of teacher education at UWM. Significant collaborative work within and across departmental units, chiefly between the Department of Curriculum and Instruction and the Department of Exceptional Education in years prior to the grant served to lay a foundation on which technology could more easily be integrated. Because faculty had carefully considered content, experiential, and dispositional outcomes for their students, the technology work served to enhance what was already there, and in some cases, transform it. We were dedicated to making sure that every interaction with technology was connected to schools and to the curriculum, and made this a consistent feature of all of our work. This commitment framed the implementation of our project.

Implementation

We focused our implementation on four areas. These included becoming visible, students, faculty and the community.

Becoming Visible

All the plans and preparation would be for naught if the resources offered by the grant were not utilized well. To guard against this possibility, one of the initial and certainly ongoing goals was to become visible and widely known in a unit that had not addressed instructional

technology in teacher preparation before. Identifying and hiring an individual with both technology expertise and classroom/curriculum expertise who could focus on making technology visible, sensible, and desirable was the first step to implementation. Finding this person was easier said than done, but once accomplished was critical to our success.

Establishing visibility involved offering multiple access points so faculty and students could extend their knowledge in ways they felt comfortable. An open house was held so faculty and students would know where to come whether they needed specific help or wanted to begin thinking about ways technology could contribute to teaching and learning. Weekly emails were sent to faculty and students to remind them of staff development sessions. A webpage was created on which resources as well as information about the grant and its services were housed. Grant staff attended curriculum planning meetings, initiated hallway conversations, and made themselves available to suggest ways technology might enhance work. We also did not restrict our support solely to the targeted program. Our belief was that helping anyone would contribute to helping everyone. Soon enough, this effort paid off as a wide range of faculty began seeking our help on a regular basis.

In addition, we launched an instructional technology lab, which became a focal point for instructional technology activity. Although the actual equipment in the lab was rather modest, it quickly gained a reputation for a place where you could "get technology done" and get immediate assistance. In addition, the staff put great value on connecting technology to the curriculum, and this message was reinforced for every student who accessed the lab.

Students

Prior to the grant, UWM required Middle Childhood-Early Adolescence education majors to complete two one-credit courses in technology. The courses were offered in large lecture

format with some accompanying labwork. The content consisted primarily of teacher productivity tools such as word processing, spreadsheet and presentation software as well as developing web pages. No link to the methods curriculum and little suggestion as to how to use technology with children were provided. This situation was made more difficult by the lack of educational software available in the School of Education's single computer lab.

We carefully thought through what our end goal was in terms of range and depth of knowledge and then worked backwards to ensure students acquired skills but also learned to apply them both in their courses and fieldwork. During this process, we developed a framework for acquisition and use of technology skills and knowledge that was in line with the ISTE standards and INTASC standards. We parsed knowledge into four categories – technology as a teacher's assistant, technology roles for teachers, technology as a teacher's tool, and technology to communicate/share. These categories were broken down further to include topics of ethics, copyright, computer-assisted instruction, particular software programs, assistive devices, web page development, and digital technology. This information was to be taught in the two one-credit dedicated technology courses. Though the courses were distinct, they were lab-based and the content made sense given the other courses students were taking in any given semester. There was careful consideration of which topics should be addressed given the content of the methods courses. For a listing of technology topics and sample assignments by semester, see Appendix A.

Assignments in the technology courses supported content learned in methods courses. For example, during the first semester of coursework, students took an integrated course in primary literacy. As part of their corresponding technology course, each student created a storybook based on the interests of the child they tutored, using Kidpix software. So Kidpix software, an elementary paint program, was taught but also taught in a way immediately useful for teaching.

In addition to technology faculty focusing on using the dedicated technology coursework to support content learned in methods courses, methods faculty also developed or modified existing assignments so they included technology. As part of the literacy coursework, for example, students were required to develop and maintain a database of children's books. Each semester they added at least 60 books to their database. Students were taught to develop databases in their technology class but were expected to utilize that skill in their literacy methods classes, as well as drawing on the database for science, social studies and mathematics methods classes by creating a utility to support their organization of their growing familiarity with children's texts. Other classes required students to create webquests, find websites relevant to particular topics, or evaluate software.

This alignment was accomplished through the collaborative infrastructure that had been developed as an integral part of the overall teacher education reform effort. Interdisciplinary faculty teams taught in each semester, or "block" of the program and met on a regular basis to discuss the curriculum for that block. With the arrival of the PT3 grant coordinator, this individual attended all block meetings and was therefore able to begin introducing suggestions for how to connect technology from coursework into the methods sequence. The strategy used was to listen carefully, figure out one or two "do-able" projects, and then work individually with faculty in each block to implement the project. As faculty comfort levels increased, the technology coordinator supported them to higher levels of sophistication.

During the course of the grant, a third one-credit class was developed and approved. This course focused on web page development as a vehicle for students to create an electronic portfolio. Students had been maintaining a portfolio of their work in paper form. The addition of the third course enabled them to create an electronic version that could house their resume,

teaching philosophy, work experience, and examples of how their teaching reflected the core values of the teacher education program, accompanied by student work samples. For example, a student might demonstrate his or her value of advocating for and education children with disabilities by summarizing a lesson, explaining how particular students were included, discussing student learning, and showcasing aspects of the lesson using pictures or video clips.

The student teaching semester also included expectations for technology use. This semester allowed us to see how much our students had shifted in their expertise and understanding of technology integration. Initially, students seemed to view both the classes and the newly required technology project in student teaching as necessary but useless hoops to jump through to attain their certification. As students completed their student teaching and began interviewing for jobs, however, they discovered the currency technology knowledge buys. One student, who had been less than engaged during her technology coursework, shared with an incoming group of student teachers how in her interviews principals asked her what she knew about technology. She was surprised because she had thought since she hadn't seen much technology in her field placements, that technology would not be part of her interview agenda. What she discovered was that even principals who did not yet have much technology still sought teachers who would be prepared to utilize technology once it was acquired. Principals asked her what programs she knew and if she could provide examples of how she had used them. The student shared how grateful she was that her technology project was part of her showcase portfolio, as well as what she had retained from her technology classes.

So, while initially students incorporated technology in minor ways, such as word processing a report, or creating fairly static Hyperstudio stacks, more recent examples of technology infused projects developed and implemented by students in the student teaching

block demonstrate heightened sophistication in both knowledge and understanding of effective uses of technology. For example, one student checked out four digital cameras from the grant office for her second grade students to use on a field trip. Though the university student was apprehensive about putting cameras in the hands of children so young, she found that the children became very planful and intentional about the pictures they took and how they used them to support information they had gathered about particular animals. The students owned the content, which was clearly seen in the quality of the written work enhanced by digital photographs. Another student used digital cameras with her first graders to take pictures of shapes in their neighborhood (e.g., stop signs, houses, tires). Then they returned to school and drew and identified the shapes they had seen using Kidpix software. In these cases, technology was more than a vehicle for presenting a product, it was a tool to help understand curriculum content. This was our goal.

Since the onset of the grant, students who have completed their teacher preparation work at UWM have left much more skilled in technology and in their ability to consider how technology can best support the learning of their students. Each cohort of students demonstrates greater sophistication on their required performances and portfolio entries than the previous one as technology becomes a stronger, more embedded element of their preparation program. This is due to the continuous improvement of their technology courses and the increasing demands to integrate technology into a much wider range of their methods courses. The work we had done with the students on campus to extend their knowledge of technology and its appropriate uses within curricular areas was paying off in the field. They used their creativity and knowledge to create their own relevant technology-enhanced projects. This type of application was repeated again and again by other students. As the expectations for technology use increased, and the skill

level of our students increased through integration and dedicated coursework, their sophistication increased as well.

Faculty

Coinciding with the development of the framework, we began the task of working with School of Education and College of Letters and Sciences faculty to help them identify technology goals for their learning. While adopting a philosophy of "just in time, just enough" staff development, we offered a range of delivery models for providing support. We determined that this flexible approach to staff development was hugely important because faculty had differing schedules, differing investments, and differing learning approaches. So, while some faculty enjoyed formal workshops, others preferred the drop-in sessions where they could come and get help as they worked. Still others already had a vision of where they wanted to go and used our support in a one-on-one format to develop skills and complete projects that they could be independent in sustaining.

For example, during a curriculum planning meeting, a children's literature professor shared his dissatisfaction with the cumbersome nature of using videotapes in class to teach students about aspects of storytelling. He hoped for a way to make the videos available to students to use out of class so that more class time could be utilized to discuss the content and sequence of the videos rather than viewing them. The project coordinator for the grant worked with this faculty member to create a special Hyperstudio stack containing several storytelling clips that not only showed the video but labeled it as well. Students checked out the CDs, viewed them, then discussed them in class. From this one project stimulated several others. One faculty member in the exceptional education department taught a distance education course and needed a way for her students to analyze language samples of students. By putting video in a Hyperstudio stack

and creating a tutorial of how to obtain a language sample, the students could better understand, even at a distance, this aspect of their education.

Community

The school component was integral in that it enabled us to provide important staff support and development at our partner schools, schools where our students were placed for fieldwork and student teaching, as well as to keep us abreast of issues associated with integrating technology at the school level. This helped us better understand and prioritize projects for our students at the university. Each partner school received grant funds to hire a half-time technology coordinator at their school. While dedicating staff at each school to spearhead technology growth in their school was a temporary luxury afforded by the grant resources, some of the schools made technology coordinators a permanent position once grant funding ceased. The principals felt as we did, that technology was important and in order to continue the momentum begun with the grant, hiring someone permanently was essential. The coordinator of the grant worked individually and collectively with these individuals on a weekly basis to identify within and across school goals related to technology use.

Each school had different issues to explore and identified different areas of technology for their own development. In one school, the technology specialist helped each teacher identify a way they could integrate technology into a schoolwide civil rights project. One classroom was preparing a play to perform and the teacher wanted to use technology to capture the event. The grant coordinator suggested digital video and iMovie, not only because he thought it would be an easy tool to use but also because he saw this request as an opportunity to extend knowledge and support the creativity of the students. Why? How is this important to learning? Did they use the video after? By hosting training sessions before school for teachers and students, the grant

coordinator helped prepare a group of students who were able to record and edit video to best capture and portray the play about Rosa Parks. The use of digital video and video editing software deepened the students' understanding not only of technology but of audience. They had multiple discussions about angles and how best to film the play to achieve the greatest impact. Because not everyone could attend the play, by creating a digital recording, families and other students could still benefit from the content of the play. This knowledge was not used in a one-time fashion. The following fall, shortly after the terrorist attacks on 9/11, the students learned of a private religious school whose students had lost family members to the attacks. Entirely on their own, they prepared an iMovie to lend their support and well wishes to the students. These fifth grade students at an inner city school in the Midwest connected with a very different student body. Other children in the school created friendship bracelets and artwork to send. The students in New Jersey were touched by the offering and sent back their own video reply. So, technology was used not only to learn, but to heal.

The project coordinator and the three technology specialists formed a collective, which met monthly. Each technology specialist seemed to have a different expertise and so they balanced one another nicely, helping each other through such issues as networking, developing thematic technology infused projects, and hammering out effective staff development agendas. Each of the collective members found value in the meetings. It provided each person with ongoing professional support in terms of identifying technology initiatives, resolving issues, and feeling less alone. Technology specialists have expansive responsibilities but oftentimes little professional or collegial support, in part because they are the only knowledgeable person in their field at their location. Monthly meetings among the technology specialists reduced the feelings of isolation and enabled them to support one another and share resources. Many districts provide

this support at a district-wide level. MPS certainly did. However, this more intimate working group was effective in handling both short and long term issues related to technology, perhaps more effective than the support a large district collective could offer.

The children benefited tremendously from this collaborative as well. Towards the end of the grant, one specialist voiced her desire for the students at her school to have a venue for showcasing their hard work with technology. The other specialists agreed and considered how each school should be involved. Ultimately it was decided that a "Technology Expo," where the students from each school would come and share their knowledge and accomplishments, would be hosted by the university, during the annual School of Education Urban Forum. This event was powerful for all who participated or visited. The students shared knowledge with one another – one school focused on digital video, one on digital images and compositions, and the third on technology to support inclusion. Community and university members who attended the Urban Forum visited the Expo and were impressed with the students, who could easily explain and show what they could do. School of Education faculty and students also attended the event. It was a wonderful demonstration of the impact technology can have on engagement and learning.

Connecting Technology Use in General and Special Education

Teacher education faculty in the Middle Childhood-Early Adolescence program regularly collaborate with exceptional education faculty. Students are required to take a course in collaboration between general and special education, learn about students with special needs throughout their preparation program, and are often placed in classrooms for field experience where various levels of inclusion are practiced. It was natural then to extend staff development opportunities to faculty in the exceptional education department. This goal was made easier

because one of the project directors for the grant was a faculty member of this department. This faculty person incorporated technology into her courses, both as an instructional tool and as a focus of instruction.

In addition to utilizing presentation software to share her ideas in text, graphics, and video, she taught her students about augmentative communication, alternate keyboards, text-to-speech word processors and other assistive technologies to support the learning and inclusion of children with special needs. She similarly required students to learn about readily available educational technologies that could just as easily support student learning as more "special" technologies. Because of the resources provided by the PT3 grant, she was able to incorporate a lab component into her courses so that her students could learn the software and evaluate its usefulness relative to more traditional tools. This work around technology culminated in a large assignment in which students considered and prepared their own adaptations to thematic units and individual lessons. For example, the students, in small groups, had to design a weeklong thematic unit of instruction that spanned content areas such as literacy and math, prepare individual lesson plans, and create low and/or high tech adaptations that would maximize student involvement in the lessons. This experience helped them understand how they could creatively support students but also made them aware of the time commitment involved in doing so. Understanding the time commitment involved in effectively planning for and utilizing technology to support students with disabilities helped the students understand what sorts of personnel support would need to be allocated to best serve their students.

Other faculty members stopped by on a regular basis to learn about particular programs and began teaching about assistive technology in their own classes. Several faculty members in the department asked the principal investigator to guest lecture on assistive technology in their

courses but others, who shared her interest in literacy, had ongoing conversations about tools such as talking word processors, word prediction software, and graphic organizers. As a result of seeing the tools she was using regularly and discussing ways in which these tools could be helpful, they then began incorporating these technologies into their literacy and deaf education courses. Because the principal investigator was just a few doors away, they could stop for help or discussion. They didn't feel "on their own." They could continue to refine their knowledge of the technologies in an ongoing way, becoming more comfortable with technology as each semester passed. That their training in technology extended to this area as well reinforced the notion that all students can benefit from technology.

Sustainability

Grants often provide the impetus for wonderful projects or programs. The challenge is always how to sustain momentum once external funding ceases. For our part, a significant effort was made to instantiate resources and personnel so that instructional technology would not die away but instead become more and more embedded in the fabric of the teacher preparation experience. Relevant educational software was purchased or obtained through partnerships with software companies. Technology was made available for checkout to the students and faculty. In fact, technology kits which included digital cameras and video cameras, as well as a computer loaded with educational software was made available to student teachers who sometimes found themselves in school placements with limited technology resources. A small instructional technology lab was developed. These technology resources were permanent acquisitions.

In terms of personnel resources, several initiatives were accomplished. First, the grant coordinator was vital to the technology courses and faculty support. Early on in the grant, we

worked to create a hard line position for an instructional technology specialist whose role would be to continue support to students and faculty. By the grant's end, not only was a search conducted and completed for this position, but two tenure track faculty positions had been created as well. One focused on distance technology and the other on instructional technology. The addition of the instructional technology specialist, a tenure track faculty member, and a cadre of three adhoc instructors from the local school system now provide ongoing support in the area of technology.

Dedicated coursework was not developed to stand alone, but rather was integrally linked to the regular sequence of methods courses. In this way, methods faculty sustained the skills students learned within their technology courses and broadened their use directly in classrooms. Dedicated courses are taught and undergo continuous improvement, as do all courses in the program. Faculty and instructors in the methods sequence continue to develop their own technology skills to enhance the use of technology in their courses and to link projects across technology and methods courses. The technology faculty and staff continue to work with other faculty to support the evolution of technology as it relates to program goals and revision. The energy surrounding technology remains such that, even in times of slim budgets, the work continues.

Conclusion

The success of our experience hinged on people and vision, and a commitment to using the resources provide by the PT3 grant in a manner that would have a sustainable impact. Further, this grant was embedded within a unit where the redesign of teacher education had already been accomplished, where a commitment to continuous improvement existed, and where

faculty across departments collaborated in the work of teacher preparation. Ensuring that by the end of the grant itself, permanent expectations for the role of instructional technology, and required performances, were essential to making instructional technology a deliberate, visible part of teacher preparation.

What took longer than we anticipated, and what required patience and scaffolding, was reaching success with faculty who were not "technology savvy" to embed technology within their classes. Once we broke through this barrier of uncertainty and unease on the part of faculty, most of whom had not used instructional technology before, the connections the PT3 grant staff had envisioned all along, the reciprocal nature of the entire program and the required technology coursework started to work together in a coordinated and effective way. Once faculty members began to understand how technology could support their goals and that they would have person support to integrate this technology effectively, they were more eager to consider technology for their courses. These breakthroughs have occurred more with some faculty than others, so future goals relate to expanding technology integration even further.

Our achievements with our partner schools mirror those at the university. Technology became more visible and more integrated. Just as with our faculty and courses at the university, this happened to differing degrees at our partner schools and some schools have been more successful than others at sustaining the gains in times of fiscal difficulty. However, our students continue to benefit from the increased uses of technology in these schools.

To be successful in enhancing K-12 student learning, technology cannot stand alone. It must be connected to the curriculum (Chang, Henriquez, Honey, Light, Moeller, & Ross, 1998; White, Ringstad, & Kelly, 2002). Similarly, in higher education, efforts to integrate technology also cannot stand alone. If technology redesign is not directly connected to the teacher education

curriculum, and if it is not assessed as an integral part of the curriculum, it will not be sustainable. Our major recommendation for other institutions that wish to focus on technology integration is to address the larger picture of reform and embed technology as part of the effort. This means building a collaborative environment among faculty so that the teacher education curriculum is discussed and improved regularly, with technology as a major consideration within the curriculum's conceptual framework.

We view the PT3 grant as a highly successful enterprise in our institution. Its gains are tangible for our students and for our faculty. The three years of our PT3 grant represented a period of high energy, high visibility, and new breakthroughs. Now, in times of fiscal constraints, the goal is more difficult. We are challenged to sustain the gains we have made, to ensure that new faculty and instructors are supported in embedding technology, and to continue to be a voice for building the infrastructure that is required not only to sustain, but to fully support, technology preparation for teachers.

References

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Table 1. Coordination of Technology with Coursework

	Professional Courses	Technology Course Focus	Project Examples
Semester 1	• Linking Seminar • Reading And Children's Literature In The Primary Grades • Learning And Development • Language And Urban Schooling • Instructional Computing I	• Kid Pix • Kidspiration • Appleworks • Ethics For Software And Fair Use • Software Review (in class and at field placement) • Assistive Technology • Troubleshooting	•Kidpix Storybook •Kidspiration Web Of Things/Facts About Students With Supporting Details •Children's Literature Database
Semester 2	• Linking Seminar • Teaching Mathematics, Elementary • Teaching Science, Elementary • Classroom Assessment • Instructional Computing II	• Eportfolio • Imovie • Digital Video And Scanners • Photoshop • Ethics For Permission Slips And Copyright • Dreamweaver	• Construct Webpage • Portfolio Template • Resume, Philosophy, Examples From Classroom • Add Science Books To Database
Semester	• Linking Seminar	• Hyperstudio	•Webquests

3	• Teaching Of Social Studies • Teaching Reading, Language Art And Adolescent Literature • Teaching Mathematics, Middle School • Instructional Computing III	• Inspiration • Websources • Appleworks • Software Review	• Add Social Studies and Children's Books to Database • Science or Social Studies Hyperstudio Tutorial • Inspiration To Organize Web Resources For Hyperstudio Stack
Semester 4 (Student Teaching)	• Seminar In Curriculum And Classroom Management • Student Teaching		• Instructional Technology Project Integrated Into Classroom Unit • Log of technology use throughout semester