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# Transforming the Topography of Teaching With Technology: A PT3 Holmes Partnership Project

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## Abstract

*The University of Alabama at Birmingham, School of Education, as lead institution, initiated a collaborative PT3 project to infuse technology into the teaching/learning experience for prospective teachers in the Greater Birmingham Holmes Partnership. It featured the following projects: (a) assistive technology, (b) mentoring between K–12 and higher education faculty modeling technology infusion during prospective teachers' field experience, and (c) preparation and mentoring for higher education faculty to infuse cutting-edge technology into content/pedagogical courses. The project reached prospective teachers in five teacher education institutions and enabled participants to realize effective uses of technology and assistive technology for teaching, instructional management, reflection, and lifelong learning. This practical piece serves to disseminate the ideas from successful on- and off-line technology interaction.*

Comparable to transforming the topography of a geographic area, infusing technology into teacher education and K–12 settings can be an ambitious endeavor. The University of Alabama at Birmingham, as lead institution of a PT3 grant, with the Greater Birmingham Holmes Partnership, transformed the topography of the educational terrain in the area through technology implementation.

Prior to writing for PT3 funding, the National Center for Education Statistics (National Center for Education Statistics [NCES], 1998) reported that the nation's schools owned one computer for every six students. Internet access in schools more than doubled in the past five years, from 35% of schools in 1994 to 89% in 1998. Consequently, technology was evident in U.S. schools and the Internet enabled students

to pursue educative information at school, home, and community settings. Survey results indicated that 25% of the teachers responding to the survey reported using technology in a substantial way. Just 20% of the respondents stated that they were prepared to integrate technology into teaching (NCES, 1998).

Considering that the teaching force has to change dramatically over the next decade and that systems will hire 2.5 million teachers (Hussar, 1999) created a unique scenario. The situation consequently presented an unequaled opportunity to transform the topography of the teaching force. To prepare successful prospective teachers, it is essential that higher education and K–12 faculties model and reinforce effective use of technology through teacher preparation and fieldwork, in content knowledge, pedagogical practice, and positive dispositions toward technology integration.

In the spring of 1999, the International Society of Technology in Education (ISTE) released findings from a U.S. survey about technology in teacher education. ISTE established that although technology was available in most K–12 classrooms, prospective teachers did not routinely use it during field experiences and did not have master teachers who advised them on its use. The society acknowledged that the integration factor—items that addressed interns' use of technology during teacher preparation—was the best predictor (ISTE, 1999). These findings were foundational for the PT3 project.

## Collaboration of the Holmes Partnership

The University of Alabama at Birmingham (UAB), School of Education, four additional teacher education institutions in the Greater Birmingham Holmes Partnership (GBHP), and 11 Birmingham school systems unified to renew teacher education programs and meet the challenge of preparing technologically competent urban and suburban teachers. The four additional teacher education institutions were Birmingham-Southern College, Miles College, Samford University, and the University of Montevallo. This contingency included a representative cross section of our topography, both large and small institutions, public, private, a historically Black college, research and liberal arts institutions. K–12 school systems included were Birmingham City Schools, Bessemer City Schools, Fairfield City Schools, Homewood City Schools, Hoover City Schools, Jefferson County Schools, Midfield City Schools, Mountain Brook City Schools, Vestavia Hills City Schools, and Tarrant City Schools. The K–12 school systems comprised large and small, suburban and urban systems, some with 98% free and reduced lunch student populations, to systems where no children were eligible for free or reduced lunch. Uniquely, the partnership was an opportunity to bridge the digital divide and balance technological expertise. The purpose of the PT3 project, funded by the U.S. Department of Education, was to infuse technology, including assistive technology, into the entire teaching/learning experience for prospective teachers within the GBHP.

Initially, faculties from higher education institutions were surveyed to determine strengths and weaknesses of technology implementation within their programs. Some expressed needs that included support for curriculum integration, professional development in subject areas, individualized assistance, time commitment, and content-specific technology resources. Preparation in assistive technologies was not a part of regular teacher preparation course work at any of the partner institutions.

As GBHP representatives met to identify assets and needs, it was determined that reciprocal relationships would be beneficial. Features that were determined to be essential

within the PT3 initiative included the following: (a) faculty groups planning and infusing cutting-edge technology into courses through mentoring, professional development, and incentives for participation; (b) cross-mentoring between K–12 and higher education faculty to provide prospective teachers field experiences where technology was modeled and theory and practice were cohesive; and (c) an assistive technology program for prospective teachers' to practice the social and curricular benefits for special needs populations.

## Powerful Transformation in the Technological Topography

Our collaborative vision was for prospective teachers to become proficient in myriad uses of technology and assistive technology for teaching, instructional management, and lifelong learning. Educated for the 21st century, they were to be prepared to assume leadership roles in effective use of technology. Specific project objectives that addressed gaps identified by the partnership were to

1. Infuse technology and assistive technology into the entire teacher preparation curriculum (knowledge, skills, dispositions, and internships) according to National Education Technology Standards (NETS) and the Alabama Course of Study guidelines.
2. Improve prospective teacher preparation through engaging students in powerful learning experiences (multimedia portfolio, visual learning, modeling and simulation), using Web-based learning, teleconferencing techniques (synchronized and asynchronized communication), and methodologies (learner-centered and project-based learning).
3. Provide incentives, professional development, and support for faculty to renew practices in teaching content and methods courses to reflect the technology-rich foci, and model it through teaching, reflecting, and life-long learning.
4. Ensure that prospective teachers receive adequate preparation and assistance in incorporating new teaching approaches to meet the academic needs of special student populations in inclusive settings through effective use of assistive technology.
5. Narrow the digital divide through collaboration among technology-rich and in-need schools by sharing technology resources and expertise.
6. Develop employment guidelines to assess technology proficiency for teacher candidates.
7. Organize institutions' student services to technologically advise and provide information.
8. Nurture partnerships among GBHP members to sustain the effort to infuse technology and assistive technology into teacher preparation beyond the funding.

## Three Key Programs

This PT3 project involved nine different programs. Three were key to the implementation of the goals and objectives outlined and descriptions follow.

### *The Assistive Technology Initiative (ATI)*

The field of assistive technology is burgeoning in its development as the potential for students with special needs and students at risk for school failure is explored, expanded, and disseminated throughout the ranks of educators. The Individuals with Disabilities Education Act Amendments (IDEA, 1997) that defined an "assistive technology device" as "any item, piece of equipment, or product system, whether acquired commercially off the shelf, modified, or customized, that is used to increase, maintain, or improve functional capabilities of a child with a disability."

Assistive technology is a relatively new notion for the majority of in-service teachers in regular and special education, as well as faculty in university settings preparing prospective teachers. As a result, many K–12 students have had little to no opportunity to benefit from the promise of assistive technology. The number of students with disabilities in inclusive classroom continues to grow with the implementation of inclusion to meet the previous least restrictive environment placement requirements under IDEA (1997) as well as the inclusion expectations of No Child Left Behind. ATI had as its mission to provide the opportunity for prospective teachers, higher education instructors, and K–12 in-service teachers participating in field-based experiences for prospective teachers to develop the knowledge and ability to infuse the education of students with special needs with assistive technologies where appropriate. It was envisioned as a collaborative effort and responsibility of regular and special educators, higher education instructors/professors, and K–12 in-service, and prospective teachers.

For higher education and K–12 partners, the activities designed for the ATI focused on

- Developing an awareness of assistive technology.
- Establishing each higher education institution as a reserve of assistive technology materials available for loan to prospective teachers to use in field-based placements, and to demonstrate uses through direct assistance and training.
- Providing K–12 partners with materials and training to create well-informed field-based placement sites for prospective teachers.
- Demonstrating "cutting edge" assistive technology and educational applications of its use.

During the first year of grant activities ATI focused on conducting a needs assessment and planning project activities. The existing assistive technology within each partner's physical plant was surveyed and discussions followed regarding the availability, use, and management of existing and future resources. Higher education and K–12 partners discussed strengths and weaknesses of existing prospective teacher preparation in the area of assistive technology. Only one higher education institution in the partnership offered a course in assistive technology and it was solely required for special education majors. Materials and resources needed to expand existing programs were identified. Items were prioritized for purchase and for training as the next "best step" in the growth process, priorities for assistance and training were developed, and additional online sources of information and training were identified. The initial intent was to work with three schools from within the GBHP: one elementary school, one middle school, and

one high school. As the director worked with representatives from the 11 school districts and 5 partner universities, it was apparent that all of the K–12 partners wanted an active role in the project. It was decided that during year 2, each K–12 school district would have one participating school with a building-based project coordinator. Working together, participating schools were identified with distribution across all grade levels. Likewise, each participating higher education institution had a project coordinator and training was made available to any interested faculty members. Training requests during this phase tended to be for individual institution meetings at their home institution. This allowed the project director to better understand individual institution strengths and challenges with regard to implementation of the project, materials needed, and support required. Higher education partners were responsible to redesign coursework that demonstrated assistive technology to prospective educators for the following year.

In year 2, the direct project implementation began. Prospective teachers and each higher education partner received assistive technology devices and software for preparation and use. Materials included the following:

- Hardware and software applications to support alternative and augmentative communication. Some higher education institutions had labs refitted with updated equipment to align with project needs. Site licenses were provided for Dynavox software. Additional voice output communication aids (VOCA's) were provided to all institutions to give prospective teachers experience with programming devices for student use.
- Adaptive switches (buttons, adaptive mouse options, joysticks, eye gaze switch, touch screens).
- Adaptive feeding equipment, crayons, scissors, and rulers.
- Concept mapping software (site licenses for Inspiration and Kidspiration as well as trial CD's for students).
- Picture symbol software (site licenses for Boardmaker with Speaking Dynamically Pro and Writing with Symbols).
- Screen reading software (Kurzweil).
- Talking word processors, some including word prediction software (Clicker 4, Co-Writer, Writing with Symbols, Read and Write, Type and Talk).
- Math manipulatives, software (Tom Snyder products), and hardware including talking calculators with additional assistive technology features.

In-service teachers had similar but not identical resources and were extended short-term checkout privileges from the higher education institution for additional materials needed to enhance opportunities for prospective teachers and K–12 students with disabilities. In addition, UAB became a repository and demonstration site for assistive technology for individuals with visual impairments through the American Printing House for the Blind. This opportunity was made available due to an existing special education master's degree program in visual impairments and the desire of the program's coordinator to strengthen all programs in the area of assistive technology.

Each teacher education institution implemented course revisions including features of assistive technology. At UAB, elementary education majors enrolled in a blocked set of method courses which included math, science, social studies, and

assessment, with a newly expanded overlay of special education. The courses were team taught by five professors and included extensive field practice. This was an excellent opportunity for modeling the application of assistive technology across curricular areas and of instructional technology, such as Web Quests, designed for multiple academic levels and learning styles. Students experienced opportunities to implement Universal Design for Learning and Universal Access applications.

Periodic meetings and professional development sessions were held throughout the academic year to expand information and learn about available resources. Site visits were made to K–12 partner schools and professional development was provided at individual higher education sites. At the end of the academic year, ATI piloted another information dissemination technique where roles were reversed. Prospective teachers became leaders for in-service teachers. During internships, prospective teachers at partner K–12 sites were encouraged to present an assistive technology PowerPoint overview to the faculties. At one school, prospective teachers from three of the higher education partners presented it collaboratively.

During year 3, ATI continued the same plan of implementation as during year 2. More materials and resources were added for participants. There was a focus on acquiring instructional materials for use in prospective teacher training, which included modules, videos, and a software workshop by Tom Snyder Productions. Representatives from all higher education partners attended the Closing the Gap Conference in Minneapolis, Minnesota, where there was a concerted effort made to connect with ongoing resources for information, training, and implementation. In addition, outreach expanded as each K–12 partner schools "adopted" another school in each of the 11 districts, in an "each one, teach one" model. Prospective teachers presented PowerPoint overviews to willing schools instead of at participating partner sites. Prospective teachers' feedback with higher education and K–12 participants was mostly positive. Through the implementation of assistive technology, successes were made possible for K–12 students with disabilities. This was the hallmark of what was accomplished by the ATI. Challenges were present. During each of the two years of implementation, one K–12 district was not able to complete all of the activities due to teacher attrition or work overload. The sheer number of participants was overwhelming at times for the project director in meeting individual needs. However, the large number of participants led to the development of a peer group across district lines, which has the potential to sustain future growth and sharing of resources and information regarding assistive technology. The Assistive Technology Initiative made an impact on many prospective and in-service teachers. Changing the model from three K–12 schools participating to 11 (one from each partner district) and expanding to 22 K–12 schools in the third year made it difficult to implement a depth of awareness and the change desired. However, the scope of awareness was the impetus for teacher growth that reached into more schools, and impacted more K–12 students with special needs. Like other technology applications, assistive technologies needed a substantial effort to change habituated patterns of instruction to achieve a seamless, embedded implementation in the teaching/learning process.

ATI was designed to ensure that prospective teachers received an awareness of assistive technology and its potential for use with K–12 students. Adequate preparation to recognize the potential for use of assistive technology in K–12 classrooms, and assistance in incorporating new approaches of teaching during their field-based experiences to meet

the academic needs of special student populations through the effective use of assistive technology was accomplished.

***Teaching + Technology Program (TTP)***

Mentorship, a label that connotes a "philetic" association, is based on a relationship of sibling affection and dialogue (Broudy, 1972). The notion of mentoring is rooted in the Greek epic, *The Odyssey*. As it unfolded, Odysseus journeyed through life's trials. While away, Odysseus provided a mentor, literally, Mentor, for his heir and son, Telemachas. Mentor advised and taught Telemachus in reflective ways to learn about imminent leadership. He encouraged Telemachus in novel approaches of making decisions and solving problems to meet the needs of his constituency. This metaphor is an exemplar for professional affiliation between teachers and university faculty who modeled the use of technology as an effective instructional strategy for prospective teachers (Christensen, 1992).

Often, the gap between theory and practice in teacher education is problematic at best. Since 1987, the effort to integrate technology into instruction has been ongoing (Newsom, 1996). For obvious reasons, most teacher education and K–12 faculty were prepared without adequate experience in technology, primarily because it was in its infancy. Yet, some veteran K–12 teachers introduced technology into teaching and learning because of their drive for student-centered effectiveness.

The Teaching + Technology Program (TTP) paired higher education and K–12 faculty willing to model technology during prospective teachers' field experiences. The TTP mentor was a K–12 teacher who actively used technology and was working toward integrated delivery of curriculum and instruction. The TTP mentee was a higher education faculty member involved in teacher education and who prepared prospective teachers while committed to infusing technology into the K–12 curriculum. Although the mentees may not have had sophisticated technology skills, the willingness to learn was evident. Mentors provided mentoring, coaching, pedagogical and technical support, and modeled technology use in the K–12 classroom. The TTP mentee learned from and worked with the TTP mentor to practice technology infusion in K–12 classrooms and also in teacher education classroom. Together they explored solutions to solve instructional problems and identified effective technological tools to implement their projects into prospective teacher education.

In the first year of funding, 15 K–12 teachers volunteered as mentors for teacher education faculty. Most already had rapport with at least one of the five higher education institutions in the GBHP, and housed prospective teachers for field experiences. Beginning the initiative, the mentors paired with mentees, and the higher education faculty collaboratively designed a model to fulfill the mission of infusing technology into both the university and K–12 classrooms. They asserted that mentor teachers were

- role models for prospective teacher and university faculty mentee
- advocates for prospective teachers
- coaches for prospective teachers and university faculty mentee
- liaisons with the PT3 director of TTP

As pairs met, they designed particular projects to suit unique needs in both the K–12 and higher education classrooms. This alliance assisted prospective teachers to experience collaboration related to the development of technological curriculum and instruction.

Projects in the first year included third graders in a mentor's classroom designing Web Quests and sending them via e-mail to the higher education classroom. Prospective teachers accomplished the quests and then designed their own in response. Another project that was developed between K–12 and a higher education mentee was planning, implementing, and showcasing PowerPoint presentations on a thematic teaching unit about *Talking Walls*, a piece of children's literature. Four prospective teachers were involved in this project across two university terms. Digital photos, information on various countries, and associated diverse customs were part of the instruction. Another class of second graders developed mathematical word problems and e-mailed them to the mentee who taught a math methods course to prospective teachers. These collaborative projects not only offered authentic interaction among participants, but gave prospective teachers experience in technology integration across the curriculum and valuable understanding of developmentally appropriate practice.

In year 2, some teacher mentors were lost to normal attrition and others were added. Many mentor and mentee pairs became more ambitious in their technological pursuits for their respective students, especially as they met to discuss the past projects and what they learned from year 1. Virtual field trips, in the form of videoconferences, were notable. Third-grade urban students, who are not normally afforded opportunities to travel to museums and aquariums across the United States, were taken there virtually. For example, one videoconference was a trip to the Tennessee Aquarium, where the topic of study was the Chilean rose-colored tarantula. Two prospective teachers planned the corresponding curriculum prior to the conference. Fiction and nonfiction literature, a study of issues surrounding the tarantula, and questions to ask the conference docent were developed. Four other prospective teachers attended the actual conference on the school site, and more than 30 prospective teachers viewed it from an on-campus location at one of the higher education institutions. In another project, two schools were linked, an elementary and middle, with two mentors working with a higher education mentee. Gardens were planted and tended at both school sites with prospective teachers assisting in the science curriculum and instruction as well as actually preparing and planting the garden. K–12 students recorded plant growth, rainfall, and other important aspects and exchanged data electronically. Comparisons and similarities were drawn. Other science activities took place too, including another on the systems of the human body. Prospective teachers participated in the curriculum and instruction assisting fourth graders develop PowerPoint presentations about the topic. The most poignant project involved sixth graders. Under the direction of the teacher-mentor and the higher education mentee, students designed Web sites for local elders at an assisted care facility down the hill from a middle school. Elders were bused to the school for the Web sites' unveiling. With the help of the mentee's prospective teachers, Web sites were developed that featured popular music from the elders' lives, digital photos the elders shared, and historical links appropriate to their lives. Tears were shed as this cross-generational technological project culminated.

In year 3, the mentor/mentee program had 20, mostly newly paired, mentors and mentees. The capacity for exchange was phenomenal, and the ultimate recipients were

prospective teachers. As the first-year interns became newly inducted into the profession, they entered with a profound set of technological skills and a vision of effective and creative possibilities for its implementation. Furthermore, they were privy to collaboration among K–12 and higher education faculty building the profession together through technology.

Participants were amazed at the synergy and enthusiasm shaped by mentor and mentee relationships. A workshop by APTE, Inc. Coach provided prospective teachers with creative means to use digital cameras in field experience and across curricular areas. This professional development opportunity brought educators at every level and numbers of school systems together for learning. The cross pollination of ideas among participants was a powerful experience, not just for the prospective teachers, but for all involved. Many prospective teachers e-mail higher education faculty from their student teaching placements, or first-year positions, sharing pride in technological accomplishments. The improvement our partnership achieved in the technological topography was extensive.

But, questions remained. What about K–12 teachers, higher education faculty, and prospective teachers who did not have the benefit of exceptional and exponential growth from the implementation of technology into K–12 curriculum and instruction? Where will they be in providing technology as an instructional strategy to plan, implement, assess, and reflect upon pedagogy?

### *Technology Infusion Program (TIP)*

Professional development designed to improve technological use is effective when it is flexible and does not follow the traditional "one size fits all" (Brand, 1997). TIP was developed as a higher education faculty-to-faculty mentoring model, assisting faculty based on self-selected goals and objectives to prepare future teachers to integrate technology by

- Infusing technology into the teacher preparation curriculum (discipline knowledge, pedagogical skills, and field experiences) including ISTE and NETS, state standards, and the state course of study guidelines.
- Improving teacher preparation by technology engagement in learning experiences and instructional delivery.
- Providing incentives, focused training, and individualized support reflecting a technology-rich curriculum.
- Modeling technology for teaching, reflecting, and life-long learning.

Triads within institutions met to design and complete their technology quests. Projects varied from electronic portfolios, extensive Web page development to inform secondary English students, to basic presentations to integrate into classroom instruction. TIP provided support to keep teacher educators abreast while they infused technology into content-area courses. Members met as a whole group to share information about the progress of their projects, and served as mentors and mentees working collaboratively to design, build, and implement projects into courses. The activity director met with groups for professional development, support, and mentoring. At the end of the year, a showcase of all projects highlighted the successes of each technology venture.

In year 1, 10 TIP fellows and 5 mentors from five area institutions, and 1 Teacher-in-Residence (TIR) were participants. The TIR had been recognized as a leader in technology integration and was one of four finalists for the National Teacher of the Year award . She worked closely with faculty to coordinate professional development opportunities and share new information. Collaboration among institutions proved beneficial as conversations about integrating technology transformed how new projects were implemented. Opportunities to discuss and use technology in courses offered inspiration and sometimes informal, friendly competition. During its first year, the activity was successful and participants formed relationships among the institutions. Although successful, there were challenges. The mentor/mentee relationships needed redefining. Triad participants worked collaboratively, and offered knowledge to the group. In most cases no one was the obvious expert, so the "mentor" title disappeared and relationships became reciprocal. Another challenge was finding time to meet for professional development sessions. In the beginning, limited access to technology presented a challenge. Smaller institutions had fewer opportunities to purchase technology, and fewer human resources to participate in this and other phases of the PT3 Project. In response to year 1 challenges, TIP was redesigned. Transition was complex but participants worked more closely with grant leaders to complete projects. Technology integration projects included instructors from schools of education and arts and sciences departments. More individualized training was offered. Challenges remained but on a smaller scale. Meeting time was still problematic, but by having more individualized training, professional development opportunities were scheduled around the availability of smaller groups.

Excitement for learning and using technology continued. Projects such as conducting videoconferencing, building electronic portfolios, using digital cameras and scanners, making art, developing pamphlets, and using handheld computers with students with disabilities made TIP successful. A yearlong calendar was ready in September of the third year. Guests from public schools who use technology and state technology initiative representatives spoke to higher education faculty about practice in the classroom and at the state level. Participants from various institutions tutored faculty in other higher education institutions. Members shared projects as a technology family. Challenges for year 3 decreased as the participants became more involved and were active team members. Finding common time to meet as a group remained a constant challenge, but measures were taken to increase participants' availability.

The transformation of the technology topography for higher education occurred. Comments from higher education faculty and prospective teachers who benefited were positive, such as the following:

> We just had an amazing experience today. One of my three sections [of prospective teachers] is using the handhelds for three weeks, and I distributed them to the class on Tuesday. Today we went to the middle school and the students in the Academic Enhancement class taught the university students how to use the handhelds. It was great!!!! We have come full circle with the students and the prospective teachers. (R. Fowler, personal communication, March 7, 2003)

## What Does the Future Hold?

From the literature and our GBHP experiences, teacher educators who rethought traditional means of teaching and learning to include instructional and assistive technology reshaped the topography. Specifically, technology became an educative tool to achieve instructional goals, instead of a peripheral skill that was understood by some, but little understood and sometimes resented by others (Lan, He, Ouyang, Qiu, & Bao 2000). Concisely, teacher educators created a culture that encouraged, fostered, nurtured, and rewarded effective instructional technological innovation and initiated renewal in our area.

## Implications for Further Research

Questions remained. How can the "digital divide" best be described? Did two crucial facets exist: those who had adequate technology resources, as opposed to those who did not and those who implemented technology with adequate resources as opposed to those who did not? What more could have been done to create a critical mass of educators who infused technology into the teaching/learning process in our schools and teacher education programs? Educative cultures, traditions, and institutional characteristics heavily influenced educational practice. If we seek to understand why certain instructional practices are more effective and what fundamentally distinguishes them, perhaps we can identify what specific contexts learn from the exemplars. This PT3 prototype was valuable to educators who transformed the topography through teaching with technology. Can it help you?

Table 1 summarizes the influence of project activities on GBHP. For more information on *Preparing Tomorrow's Urban Teachers: Leveraging the Power of Information Technology*, visit www.ed.uab.edu/pt3.

**Table 1**

***Influence of Project Activities on GBHP, June 2000–March 2003***

| | |
|---|---|
| Number of prospective students reached | 1,600 |
| Number of higher education faculty participated | 63 of 122 |
| Number of K–12 teachers participated | 66 |
| Number of partnerships formed across institutional lines | 88 |


## Disclosure Statement

This project received $966,665 from the U.S. Department of Education, which is 50% of the total cost of the project. The remaining of the total cost of the project ($1,080,750) was financed by nongovernmental sources, including participant colleges, departments, and local school districts within the Birmingham area.

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