EMERGING TECHNOLOGIES AND TEACHER INCENTIVES FOR RETOOLING

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Abstract

The purpose of this study is to explore the wealth of experienced teachers, willing to retool, as a resource for addressing teacher shortages. Studies have been conducted on emerging technologies and their applications in educational settings. Technologies such as smart boards, learning content management systems and pod casting were developed within the past fifteen years. All of them are applications of technology integration which can serve as multimedia tools for teachers preparing students for commencement. The literature included extensive discussions of new technologies with applications for use in the classroom environment. Organizations have documented standards for the integration of technologies into instructional design. Extensive reviews of distance learning have been included in the standards. There is a breadth of literature on professional development for teachers in a new environment. There is very little research on teachers, with five or more years of classroom experience, adjusting their implementation of instruction to the changing needs of student populations. There is also limited study of the recertification and skill upgrades for experienced teachers. This proposed study is designed to address these issues.

Introduction

Teacher shortages have been identified in special education, English as a Second Language, mathematics, biology or life sciences, bilingual education and music. Brownell, Bishop and Sindelar (2005) documented the shortage of special education teachers in rural school districts. Jacob (2007) discussed staffing challenges of urban school districts where, “the share of students classified as Limited English Proficient is twice as high in central cities as it is in the suburbs (17.3 versus 8.2 percent)” (p.132). Jacob (2007) stated the challenges of attracting qualified math, special education, biology or life sciences and English as a Second Language teachers to urban school districts. Thus, there are documented shortages of teachers in mathematics, special education, biology or life science and English as a Second Language. An empirical study of National Assessment of Educational Progress results was conducted by Linda Darling-Hammond (2000). According to the study students achieved better when they had certified teachers as instructors.

The certified instructors demonstrated knowledge of pedagogy or andragogy and were accountable for student learning. According to Hammond, under-certified teachers apparently did harm. Hammond stated that under-certified teachers were not cognizant of student learning styles, did not assess student needs nor used data to inform instruction. They did not communicate concepts well because they did not use instructional strategies or practice. Hammond's study reinforced the need for qualified teachers. According to Hammond qualified teachers are certified teachers.

Teacher shortage areas occur for a number of reasons. Brownell et al. (2005) cited forecasts for the next decade. Teacher retirements, special education enrollment increases and high attrition rates of teachers continue to increase the number of uncertified teachers. Brownell et al. (2005) projected a 6.8% increase in the population with a 20.8% increase of students with disabilities. Johnson and Kardos (2005) explained the reasons for the shortage of experienced teachers which was "in 1971, 57% of the teaching force had fewer than 10 years of teaching experience. Fifteen years later, in 1986, this cohort of teachers still represented the largest portion of the teaching force (45 percent); relatively few new teachers were being hired. By 2001 this cohort was approaching retirement" (p. 9). As a result a wave of experienced teachers started to retire.

Teacher Shortage and Experienced Teachers

Technological advancements also continue to impact preparation of students to meet commencement standards. Pearson (2004) emphasized the guidelines for assessment of technological literacy when he stated, "the standards were a clear statement that the old ways no longer were sufficient to maintain, let alone grow the profession" (p. 28). Phyllis Bo-Yuen Ngai (2004) advocated for multicultural training to prepare students for diversity within a global community.

A survey was designed to address the following research question: What do experienced teachers report to be incentives and disincentives for acquiring additional credentials in teacher shortage areas? How does the need to integrate technology impact their decisions? Items of the original survey instrument addressed such factors as demographics, household status, career status and demographics. Experienced K–12 teachers have had time to develop skills in classroom organization and management. As evidenced by the New York City Public Education System's conversion program, teachers licensed in early childhood, common branches, generalist in a middle school or social studies education to certification in math, the sciences, teaching students with disabilities, Spanish or English As a Second Language were offered the opportunity to retool and for one of the shortage areas. The conversion program was one attempt to

address the teacher shortage. For example "Nationally, the number of ELL students in public schools increased from approximately 2 million students in 1993–94 to 3 million students in 1999–2000. ELL students represented approximately 7 percent of the national public school population in 1999–2000, up from 5 percent in 1993–94" (Meyer, Madden & McGrath, 2005, p. 1). This statistic represents a need for public school systems to prepare teachers to facilitate the instructional needs of all students, including English Language Learners.

Technology, Teachers and a Global Society

Fishman (2007) expressed the concerns of educators around the issue of student achievement. According to Fishman schools face discipline problems with students who react to being "forced to attend schools and experience a curriculum developed for a mechanical era they do not comprehend." He proposed the implementation of curricula based upon video game technology, to engage students. Fishman's idea to implement curricula based upon video game technology was supported by an opinion expressed by e-school news staff which stated that the image of technology integration must be updated to address the true core teaching skills needed to prepare students for the world they will face. The author expressed the vision that in addition to teaching core skills such as reading, math, science and world languages, themes such as global awareness, financial, economic, business, and entrepreneurial literacy and civic literacy are necessary components of the curriculum with a focus on creativity, critical thinking, problem-solving, communication, information and media literacy, self-direction, leadership and responsibility (p. 2).

Alexander (2006) described some of the technological innovations in teaching and learning. He presented the combination of an "open XLM standard and java functions" (p. 34) which cause a search engine such as "Google" to become a more effective and powerful network. In an article on global competitiveness, the publishers of e School News (2007) discussed the use of laptops to motivate students in a South Dakota school. Outcomes of an increase in laptop use resulted in a dramatic increase in student access to information and motivation to spend more time on their academic studies.

Kavanaugh and Carrington (2004) envisioned the virtual classroom with synchronous delivery of instruction. This venue has many implications for addressing teacher shortages, particularly in small, rural districts. A number of global communities can and have emerged from this practice. Finkelstein, Adams, Keller, Perkins and Wieman (2006) introduced a set of computer simulations for conducting physics experiments. The simulations facilitated learning through visual representations of experiments which, in reality, can be too dangerous to conduct. One example is the ability to see the interaction among molecules in experiments involving the changes from one form of matter to another. Klopfer,

Squire and Jenkins (2002) discussed the use of Personal Digital Assistants (PDA's) in the instructional setting. They emphasized the mobility, allowing adaptation to different contexts; social and web-based connectivity; and individuality of these tools. They depicted an application used for future environmental engineers to conduct research. Previously, Escalada, Grabhorn and Zollman (1996) demonstrated the use of interactive video simulations in the physics laboratory environment. Ip, Linser and Naidu (2001) described four crucial roles in web-based role play, "goal-based learning, role-play, online web-based communication and collaboration and the traditional lectures and tutorials" (p. 3). The implications for preparing experienced teachers to guide the simulations are clear. The online web-based communication may be an area which is unique to some teachers, however, goal-based learning, role-play and traditional lectures and tutorials are all part of an experienced teacher's repertoire.

Pearson (2004) proposed the assessment of technological literacy as a valuable tool for teachers. The National Educational Technology Standards (NETS) provided the structure for the modernization of technology education. Even though elements of industrial arts still exist, the integration of technology into school curricula and subject specialty areas have developed new meaning. Technology education is another area challenged with a shortage of qualified teachers.

Several suggestions have been made about addressing the teacher shortage. Johnson and Kardos (2005) presented a comprehensive approach to mentoring which would partner experienced teachers with new teachers. The new teachers would offer fresh ideas such as technology integration and current research. The experienced teachers would offer structure and stability with the knowledge of schools, communities, students and parents. A similar suggestion was made by Poftak (2003) who advocated sustained, on-going training be implemented to strengthen teacher content knowledge and teaching skills. She supported online access for in-service teachers to continue professional development.

Ringstaff and Kelley (2002) conducted a study to discover the impact of technology use on student achievement. They found that student achievement was impacted by the amount of formal training in the use of technology by teachers. They cited an earlier study which also concluded that pre-service and in-service technology integration training consisted of basic computer operation training instead of providing teachers with the tools to integrate technology across the curriculum (Sandholtz, 2001). The researcher of this study currently teaches a course which provides teacher candidates with the tools to integrate technology across the curriculum and design materials appropriate for the elementary and middle school classroom. The course begins with an assessment of teacher-candidate proficiency in technology and the establishment of an understanding about the purpose of the course, which is to prepare teacher-candidates to use

technology to teach content. The basic computer course would be designed to teach technology as content.

Iding, Crosby and Speitel (2002) conducted a study to determine optimum strategies for facilitating teacher use of technology in the instructional setting. The study began with a review of the proposed technology and the usefulness of the technology in the classroom. Seventy-eight pre-service and in-service teachers were surveyed for in-home access to technology and the Internet. They were surveyed for in-school access to technology and the internet, as well. When asked to describe the ideal teaching situation 63% of the respondents wanted total technology integration into teaching and learning, including a computer for each student; 57% wanted technology to facilitate their presentations; and 47% wanted "unlimited access to a multimedia resource room equipped with a lab technician in their school," (p.159). The respondents to the study were asked about their learning needs. Their responses included software, Internet and related applications, assistive technology and research on these topics (p.160). Parallel to the findings of Iding et al., Daggett (2003) discussed the necessary instructional technology skills of students in their preparation for future employment.

Daggett (2003) discussed school reform and the preparation of students for the skills they will need in the world of work. He took the perspective of the school counselors who guide students in their pursuit of a competitive role in the 21st century marketplace: "In many cases, what individuals can do and the skills they can apply have become much more important than where they went to school, what their grades were, or how many credits they accumulated in a field" (p. 239). Daggett made reference to the National Adult Literacy Survey which presented three forms of literacy, prose literacy, the knowledge and skills needed to identify, understand, and use information from continuous text sources; document literacy, the knowledge and skills required to locate and use information contained in functional materials such as job applications and payroll forms; and quantitative literacy, the knowledge and skills required to apply arithmetic operations, either singly or sequentially, using numerals and quantitative data embedded in printed materials (p. 240). Daggett went further to discuss the implications for K– 2 literacy instruction. According to Daggett in order to compete internationally, education systems within the United States must strengthen literacy skills by teaching reading beyond sixth grade, information literacy, nanotechnology, and the Semantic web (p. 242).

Technology Integration at the Teacher Preparation Level

Technology integration by K–12 educators requires new skills on the part of the K–12 teachers. As a result new skills are required on the part of teacher preparation educators.

Transforming Teacher Education

Some of the limitations of initial teacher education programs in preparing new teachers to use technology may in part be due to the general relatively low levels of computer sophistication amongst teacher educators. (This pattern of teacher educators to be older and less computer literate is repeated in the US, Denmark, and France [Simpson, Payne, Munro, & Hughes, 1999].) For example, an assistant principal at a New York City school admitted that although he does not have too much trouble from students abusing technology in the classroom that he was "really not up to speed on the stuff" and that he may not be knowledgeable enough to identify problems (Urbina, 2003). As long as there are teachers who are unsure about technology, especially those in leadership positions, technology will be unevenly implemented in K–12 schools and higher education.

The implications of this is that while teacher educators pay lip service to the importance of ICT, they feel personally unable to keep up with developments and tend not to "model" ICT as a teaching tool for their students (Hall & Higgins, 2002). University faculty members have an enormous responsibility for preparing classroom teachers who are held accountable for preparing and socializing children for adulthood. University faculty and teacher education candidates encounter technology at various stages of their education, which will affect their approach to learning and integrating technology into their educational practices. We do not want teachers to shout, "What am I supposed to do, give up everything I do just to please the damn computer?" (Miller et al. in Hall & Higgins, 2002) regardless of whom they are teaching. University faculty and K–12 classroom teachers are partly responsible for the technological education of their students, which requires an active commitment to life-long learning.

To have an impact on students later in life, school experiences with computers should take place in an environment where technology is important and enjoyable, the activities should be personally meaningful, and students should have these powerful experiences as early as possible (Ching, Basham, & Jang, 2005). Then again, to be fair, teacher educators and classroom teachers are working in environments that constrict some of their academic freedom. No Child Left Behind mandates that schools test their students at several intervals to assess the students' knowledge and the quality of education put forth by a school. The pressure is immense and digital literacy is not the focus of the high stakes exams.

The prevalence of technology brought into the classroom is a challenge for teachers who do not use technology and/or cannot model the appropriate use for technology in a classroom. Teachers are frequently encountering students that use their cell phones or iPods to cheat in the classroom. A teacher at San Gabriel High School in West Covina, California, confiscated a student's iPod during a class and found the answers to a test, crib notes and a definition list hidden among the teen's music selections. Schools in Seattle, Washington, have also banned the devices (Maben, 2007). Many schools have opted to ban the technology, but some have opted to try to use the technology to enhance learning. For instance, "the music players proved to be invaluable for some courses, including music, engineering and sociology classes," said Tim Dodd, executive director of The Center for Academic Integrity at Duke. At Duke, incidents of cheating have declined over the past 10 years, largely because the community expects its students to have academic integrity, he said (Maben, 2007).

I pose a question to current and future educators, recently asked of me, "How digital literate are you and how well do you know how to use popular technology?" I ask this, because the level of technological knowledge will dictate the probability of using technology to engage and foster learning. More technological knowledge should also aid teachers in recognizing the signs of cheating. Bringing some popular technology into the classroom may also prevent cheating and alter the sometimes negative perspectives of technology such as iPods and cellular phones. Educators cannot ignore their students' views and desires for using technology in and out of the classroom, particularly when students frequently find technology useful and effective in their learning (Li, 2007).

Another positive example was reported in MacWorld (2006) about the use of iPods in a Des Moines elementary classroom where the devices are being used to aid special educators. US elementary school teacher, Scott Grimes, refers to the use of the iPod as "the future of special education." The school is using iPods to boost accessibility — students with learning disabilities are using the devices to help them take tests, tests they may otherwise have been unable to attempt (MacWorld, 2006). It is unknown if iPods are the future of special education, but it is reasonable to expect that there will be more technology not less and that using popular technology may be a practical implementation for getting technology in the classroom. The first iPod was sold five and a half years ago in November 2001, and in April 2007 Apple announced that the 100 millionth iPod has been sold, making the iPod the fastest selling music player in history (Apple, 2007). Educators may use the popularity of a device like the iPod as a teaching tool in their classroom.

Conclusion

Retooling

Moving forward technology across the curriculum with institutional support is the most viable means of transforming teacher education programs and K through 12 teacher education. Collaborations amongst K through 12 school systems, institutions of higher education, cultural institutions and community based organizations and corporations have become a productive use of resources. There are advisory councils and school based management teams which review curricula, propose and share responsibilities for mentoring, internships and career opportunities for K–12 students. On the university level, collaborations exist amongst faculty and departments to strengthen student preparation for the 21st century educational environment. Retooling university level faculty will make the transformation a reality as they model technology integration for the students they are preparing as tomorrow's teachers.

As of the time of publication the survey has been under review and will be administered within the next month. Results of responses will be presented at the conference.

The Future of Teacher Education at Medgar Evers College

Creating digital literate adults is not the sole responsibility of the technology educator. Ideally, students should be immersed into the technology that would make them proficient in the workplace as well as at home. The large majority of schools (and school systems) have a long way to go before they can compare their advances in technology and pedagogies that are shaped by current technology to that of the changes that have transformed business and travel because of the influence and adoption of new technologies (Hernandez-Ramos, 2005). This calls for revised and possibly higher technology standards for teacher education programs and classroom teachers.

To date, there is no consolidated [national] picture on how to introduce technology effectively to pre-service teachers. Most teachers, in fact, perceive technology integration as no more than an extra workload (Li, 2007). A comprehensive description and evaluation of strategies is a necessary step, then, to guide researchers, administrators, and educators (Kay, 2006). I believe that the Webquest Learning Experience for Assessment 504, the primary digital literacy assessment, is an excellent start but not enough — it is a place to begin thinking about other methods to use technology in the teacher preparation program and in the K–6 classroom.

The aim for teacher educators should be to create high levels of technology throughout the program — not just the courses in the Education Department, but

in all of the college courses. Technology in practice at most colleges, I suspect, is an add-on instead of an integral part of the learning process. The willingness and ability to transform educators — pre-service and experienced teachers and college faculty — beliefs and approach to using technology is connected with their comfort level in teaching, in technology, in the students, and in the content (Li, 2007).

The desire and commitment to explore new methods of teaching and learning is the foundation of the Education Department whose motto is "Educate to Liberate." The motto supports and obliges faculty and candidates to identify technological challenges and develop a plan to achieve adequate digital literacy. Technology education in the Education Department is not perfect, but it is not being ignored and the faculty are not anchored in the past. Instead, my colleagues are endeavoring to meet all the needs, technological included, of candidates and the children that they will teach. Though beginning teachers often consider instructional technology use as an additional element to their regular instructional practice (Clausen, 2007), our candidates are committed to meeting the Education Department's standards and to liberating their future students.

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