RUNNING HEAD: TEACHER USE OF TECHNOLOGY

Teacher Use of Technology: From the Teacher Education Program to the Classroom

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Abstract

This research study examined teachers' perceptions of technology integration and actual technology use over time, from preservice teacher education program experiences to inservice teaching practice five years later. Qualitative data were analyzed to determine the context of technology integration and when, how, and why it was used. The researchers sought to determine what led teachers, prepared in a teacher education program which encouraged technology use to (a) continue and/or build upon using technology in their content field, (b) continue using only pedagogical plans they were comfortable with using, or (c) use limited technology, if any.

Teacher Use of Technology: From the Teacher Education Program to the Classroom

Technology integration is generally promoted as a method to enhance teaching and learning. State departments of education have set forth standards requiring use of technology in the classroom and assessment of such use. National accrediting agencies include statements of technology use (e.g. NCATE) and federal dollars through initiatives such as Preparing Tomorrow's Teachers to Use Technology (PT3) grant programs have supported teacher training and capacity building efforts to encourage technology integration (Koehler & Mishra, 2005)). Such efforts promote and encourage student-centered uses of technology in addition to instructor-led uses (Fletcher, 2006), but, the reality is that often, in their own classrooms, teachers experience multiple barriers and roadblocks when trying to use technology. These barriers include a lack of training (Fletcher, 2006), time to learn technology (Butler & Sellbom, 2002) and to plan for its use (Bauer & Kenton, 2005), and hardware/software issues such as reliability (Butler & Sellbom, 2002), access, and lack of technology support (Fletcher, 2006).

Challenges in Teacher Preparation

While barriers continue to exist, there are teachers who may have technology access and training, but cannot integrate the technology in the teaching of content (Koehler & Mishra, 2005). Bauer and Kenton (2005) in their qualitative study of 30 "tech savvy" teachers noted, that technology integration is difficult due to common obstacles such as problems with equipment, scheduling difficulties (e.g. computer labs), and software availability. Due to such obstacles, teachers may believe that technology integration is not worthwhile (Swain, 2006), worth the time and effort, and can be

exhausting to use (Hofer & Swan, 2006). In Cuban's 1986 work, he noted that teachers do not always *embrace* technology and again in 2001, he purported that teachers were still using traditional methods in their teaching (such as lecturing and homework reviews) and not using technology to transform teaching and learning. Hofer and Swan noted technology can conflict with the "standards-driven, text-based, chronologically-sequenced curriculum" (¶40) of which teachers are accustomed to using. Other researchers have had similar findings, concluding that teachers primarily use technology for basics such as gathering information for lesson planning (Fletcher, 2006) and not instructional use or for active student learning (Bebell, Russell, & O'Dwyer (2004). Dawson (2006), in a four year study of "technology enhanced" experiences for teacher candidates found that "technology use did not bring about fundamental changes in instruction but instead either replaced, improved, or extended traditional instruction" p. 285. However, Dawson did find that the teacher candidates in her study applied technology content in "authentic classroom environments" (p. 285) they had learned during their university experience.

Ertmer, Ross, and Gopalakrishnan (2000) in their research examining exemplary technology-using teachers, described three themes that emerged*: guiding vision* (teachers reflected on how technology became a tool to encourage and motivate students in their learning*), teaching pedagogy* (teachers described opportunities for students to participate in the learning and the teaching and evaluation techniques were varied), and *intrinsic incentives* (teachers noted multiple ways for all students to benefit). Wenglinsky (2005) stated that technology's value "depends upon how it is used" (p. 9). He further noted

> The effectiveness of educational technology is enmeshed in the kind of pedagogy employed. Constructivist uses of technology help students learn better than they would otherwise, whereas didactic uses of technology make the technology useless or even damaging. (p. 11)

Researchers have noted that frequent use of educational technologies (Swain, 2006) may be using a power point presentation as an elaborate overhead. While using PowerPoint as an overhead projector is being recognized in the literature as a traditional, teacher-centered use of technology (Hofer & Swan, 2006), and is usually not considered as *true* technology integration, the primary premise of using technology should be to use technology as added value for the presentation of content (Crocco & Cramer, 2005). Researchers have also (e.g. Russell, Bebell, O'Dwyer, & O'Connor, 2003) pointed to the need for teacher education and professional development programs to provide opportunities for teachers to learn, not just the *how to* but also provide time to implement the technology to allow for more ownership and understanding of how to teach with the technology. Teaching or modeling how technology integration looks can and probably is complex (Koehler & Mishra, 2007). Noting the level of that complexity, Bebell, Russell, and O'Dwyer (p. 59, 2004) stated that,

> In good faith, a principal can no longer evaluate a teacher based on whether the teacher is using technology or not, but rather the question should evolve to include *how* a teacher is making use of various technologies and for what purposes.

To address this, preservice teachers should have opportunities to observe, receive support (Wilson, 2003), and participate in appropriate technology practices in their field

experiences, later applying what they have learned in their own classroom. Koehler and Mishra (2005) advocate their *Learning by Design* model in which teachers "focus on a problem of practices, and seek ways to use technology (and thereby learn about technology) to address the problem" (p. 95). In doing so, Koehler and Mishra say teachers become *designers* versus users or simply *consumers* of technology. Teacher educators must continue to encourage teachers and students to "think outside the box" (Wright & Wilson, 2005) and to understand that technology has constraints, has breakdowns, and is context sensitive (Koehler & Mishra, 2005).

This Study

Few studies in educational technology and teacher education have followed teacher use of technology over time. Researchers have indicated a true need for consistent connections to relevant mentoring and professional development opportunities. Ertmer et al. (2000) challenged educators to continue to reflect and to "grow new and even more powerful visions" (p. 1524) of exemplary technology use. Wenglinsky maintains that training teachers does not solve the problem of not using technology wisely. Hooper and Rieber (1999) described five phases of teachers' use of technology: familiarization, utilization, integration, reorientation, and evolution. It was asserted that teachers often do not progress past a utilization stage to an evolution stage in which teachers are willing to adapt technology and extend its application in the classroom for higher quality instruction. While some educators have been slow to make technology integration part of their teaching (Ledford & Hattler, 1997), teacher educator programs can initiate change by addressing the potential barriers to technology integration that

teachers may face in their classrooms and by encouraging "guiding vision" (Ertmer et al., 2000, p. 1522).

Purpose

Examining what occurs during the time of a student's initial teacher education preparation and a few years into teacher induction can potentially advance how we, as teacher educators, further shape technology as a "partner" both in context and in fostering development and opportunities for the students. In this study, the researchers sought to determine what led teachers prepared in a teacher education program which encouraged technology use to (a) continue and/or build upon using technology in their content field, (b) continue using only pedagogical plans they were comfortable with using, or (c) use limited technology, if any.

Methods

Participants and Setting

The participants in the study were purposively identified as they were teachers who researchers followed from their teacher preparation program, student teaching experience, and who, for the majority, were in their fifth year of teaching when the researchers collected the most recent data. All of the participants were enrolled in the secondary social studies methods course in the fall, 2001. Initially, the researchers sought to interview and observe the population of the social studies methods group of 21 members, however, of this group, five had chosen not to pursue teaching as a career, three could not be located, two were unavailable to participate for personal reasons, and 1 had entered teaching as an art teacher, but at a later date. After concluding this, we interviewed and observed eight male and two female teachers who had been in the fall

2001 methods group and were currently teaching five years later. The participants were part of a technology-rich teacher education program and were exposed to multiple classroom, interactive, and emerging technologies available at the time (e.g. online discussions, interactive white boards, development of online electronic portfolios). The university teacher education program (TEP) integrated technology across the curriculum in lieu of requiring a computer applications class. The TEP had participated in a state consortium PT3 grant, was active in helping to develop the state's technology standards, and was considered a leader on campus in using technologies to enhance teaching and learning. Many of the technology skills required of the candidates were demonstrated through their individual electronic portfolios showcasing products (such as presentations, resource databases, multimedia projects, and electronic field trips and webquests) they had developed. The candidates were also required to develop and implement technology in their student teaching experience. In situations where the students did not have access to technologies in order to do presentations and online assignments, they had access to the TEP's Technology on Wheels (TOW) bundles. Each bundle consisted of a laptop, productivity software, projector, and network cable.

Data sources and analysis

The two main qualitative data sources which contributed to our study were audio-taped interviews and classroom observations of each teacher by one or both researchers. The interviews occurred during their class preparation time or before/after school hours; typically the interview lasted 1 hour. Observations occurred and field notes were taken during an entire class period of the teacher's choice. The teachers were instructed to select a class that indicated a typical, teaching day.

To further inform our data, we examined technology use surveys the participants completed in their teaching methods class and their student teaching experience. Data were triangulated across the data sources and analyzed for emerging patterns and trends using constant comparative analysis (Miles & Huberman, 1984). The two researchers read and reread recorded interview transcriptions and notes written by the researchers from the observations. Coding involved looking for patterns and emerging categories (Patton, 1990). To further frame and inform our specific research of *why* and *how* the teachers use technology, as promoted by Hicks, Doolittle, and Lee (2002), the researchers adapted Hooper and Rieber's (1999) five stages of technology use by teachers defined as: 1) *Familiarization*, learning the "how-tos", 2) *Utilization*, trying the technology, but won't miss it if taken away, 2) *Integration,* using for certain tasks; designated uses, 4) *Reorientation*, using for more than delivery of content; focus is more on student learning and, 5) *Evolution*, continuing to evolve and can adapt.

Data Presentation

The data are presented for each teacher using pseudonyms. Each of the 10 participants was teaching in a middle or high school in the southeastern portion of the United States. The majority of teachers were teaching in low socio-economic schools (SES).

Results

Summary of Methods and Internship

In examining the surveys from both the methods and internship experiences, the researchers noted that the entire group could, *and should,* be considered at the utilization stage based on their experiences and use of technology while in TEP. As teacher

candidates, they had a social studies mentor who actively used technology; they learned multiple technology applications and skills in developing their electronic portfolio and the products within; and they were placed in field experiences and expected to integrate technology and be evaluated on their use. Therefore, they each learned the "how to" (familiarization stage) and experienced "trying it" (utilization) in the classroom. Some participants did indicate that during their internship they didn't always have easy access to technology; therefore, in some cases, they only applied what they could in one lesson after checking out the TOW bundle. For example, Cindy wrote, "If it were readily available with little or no effort, I would use it." Interestingly, all participants indicated on their methods survey their comfort and excitement about using technology in their classroom, plus its worth in the classroom, as indicated in the following statements:

> "Technology is a useful tool." (Cindy)
>
> "I believe technology should be used whenever possible in the classroom." (Ross)
>
> ". . . technology is a vital part of educating today's students." (Ted)
>
> "I enjoy using technology and think it improves the overall learning environment." (Antonio)
>
> "Technology will be incorporated in my classroom." (Chris)
>
> "Students will also need to see technology because they will need to use it in the future." (Jim)

Five Years Later

Individual profiles of each participant (pseudonyms are used) are presented next to show technology uses, any trends the researchers noted, and barriers/successes the researchers observed. Suppositions based on these trends, interviews, and observations

are reflected in how each participant is characterized by the researchers in one of Hooper and Rieber's five stages.

Utilization. Only one of the participants remained at the level of utilization after graduation. Doug hoped to pursue the "whole new world" of technology that he learned about at the university, however, he employed it when he could find access and had not moved beyond what he learned at the university. Doug tried to think outside of the box, but was unaware of the possibilities due to lack of inservice training in his district and the fact he had not pursued a graduate degree. His school, located in a rural area, presented other problems such as accessibility. After Doug obtained a projector from the school, he built a mount for a projector but was not provided with a computer until his father purchased one for him. He explained his problems: "I had that projector but didn't have a laptop and this school was built in the 60s and you only have two outlets and that's it." Doug rarely took his students to the one computer lab in the school due to lab availability. He mentioned the desire to employ webquests and other strategies learned at the university and noted: "I would like to do a lot of stuff like that but it's just that (I do) not have the technology available…" For Doug, his technology use seemed to be more difficult for him to employ into his instruction than in 2002 due to his school climate and resources. While both the methods and student teaching experiences gave him opportunities to employ different forms of technology, he was unaware of the possibilities today as he spent his time trying to gain access to technologies he employed during his teacher preparation program.

Integration. Of the group, five of the participants could be categorized at the integration stage. For all five participants, technology was integral to the instructional

process; without it, the teacher would have difficulty teaching. However, there were differences among this group; two teachers could be considered teacher-centered while three participants were student-centered in their instruction.

Jim and Steve were similar in their use of technology in that they were the disseminators of knowledge and were authoritarian in their integration of technology into their social studies instruction (teacher-centered). Both teachers used technology to present the knowledge they found to be important. Jim and Steve learned PowerPoint at the university and built their class delivery process around it; if the computer or projector were not available, they would have great difficulty in teaching since the task of delivery had been designated to PowerPoint presentations. Jim had every lecture placed in binders with the PowerPoint presentations and felt that this mode of delivery allowed him to "talk to them (the students) more." It is important to note that while he was at the integration stage he did not seem to be growing in his knowledge of new technologies in his small rural school district; he did not have Internet at home and indicated that it was "hard to keep up" with the changes in technology over the years.

Steve explained that he was limited in his social studies class "by the test"; he felt pressured to meet the requirements of end of year course tests required in his state. Steve decided that presenting the key test objectives in daily PowerPoint allowed for some interaction because he tried not to "…lecture all period everyday" and tried "to make it fun." He noted: "I try to make it as active as possible. I'm the leader." He felt that this mode of delivery made the material easier for the students. As the center of the instructional process, he decided what was taught and how it was taught ("I am the best

resource they have"). Both teachers had a rigid structure to their teaching in which the technology was the guiding vehicle for their dissemination of the content.

Like Jim and Steve, Ross, Ted, and Bob demonstrated that they were in the integration stage as they had designated technology for certain tasks, yet they also differed from Jim and Steve as they integrated technology to meet the needs of the students. Their reasons and intentions were different. Ross, who had also completed his MA degree in history education and was beginning his Educational Specialist degree during the last phase of this study, incorporated technology into many aspects of his teaching,. During his teacher preparation program, he used the technology learned in his internship and was concerned he would not have access to it in his teaching. He was teaching middle school social studies at the conclusion of the study. It appeared that his school/community (57% free and reduced lunch) expected technology to be used throughout the school. USB removable drives were available for purchase in the school store and professional development for technology was provided regularly by the district. As an advisor for the technology team, he had become involved with technical and instructional aspects of technology. He felt confident in using technology because of his university preparation: "It's just not as hard; I am more familiar with it." I am not stressed out about using it." Ross's middle school students used technology for their presentations, word processing, and researching (Internet); he hoped to add video conferencing when the capability became available. Ross felt that the students "enjoy technology" and expected its use in the social studies classroom because they use different forms of technology (Xbox, cell phones) in everyday activities. He explained that: "They started out not interested in history, but now they make straight A's with

anything that had to do with computer stuff. After a while, they started doing better in everything else."

Ted taught at a low SES school with the majority of students on free or reduced lunch. He explained that "we are in a unique situation because we have a lot of opportunities." Teachers at his school have greater access to programs and professional development activities through his district and the university than most of the other participants. When he was presented with an idea, he tried it. He explained that " when someone tells me it works really well, I'll use it…" Ted's lessons were likely to start off with a PhotoStory, then a multimedia PowerPoint with music, accessing digital primary documents to be shown on the projector for whole class discussion, and then conclude with a DVD clip. Ted was student centered in his teaching and said he was "willing to stretch and take on different things" …because "kids are different; everybody's needs are different and I try to build lessons that go along with the students' needs more consistently and integrate technology more in the classroom so they can get a better grasp of the material." Ted's goal was to find ways to motivate his students to learn; he hoped that using technology that the students did not have access to outside of school would stimulate their desire to learn.

Bob taught at one of the highest rated schools in the state (e.g., test scores, local funding, 90% of the students attend college). Bob did not quickly implement the technology presented in the teacher education program during the methods or student teaching experiences. However, in his own classroom, he recognized that his students used technology heavily outside of class. Subsequently, Bob used technology for communication outside of class (e.g., email assignments and assessments, the writing

process/draft attachments). He explained that "dialoguing through email is so much more time efficient to me." While Bob used technology as a foundation of his communication with the students outside of class, he was very selective in his integration of technology during his lesson delivery noting that he had "increased systematically (his technology integration) every year." He believed that his teaching should be centered on "…the kids (taking) an active role in their learning process. So I not talking at them, they are seeing as we go along." If technology facilitated and supported that effort, he would use it. He explained that "technology opens up an entire new world of teaching." "It is time consuming, but it is worth it."

Reorientation. Teachers in the reorientation stage seemed to scaffold the content for their students by using technology as the bridge; the teacher and the technology facilitated the students' construction of their own knowledge. Of the three participants in this category, Antonio seemed to have the strongest grasp of mediating content and technology for his students. Antonio felt technology was a tool to lead his students to learn their social studies content. Throughout the five years of the study, Antonio communicated frequently with his university mentor. During the methods course, the mentor facilitated his use of technology by helping him outside of class when he prepared his lessons. He purchased software to use during student teaching and continued to refine his teaching during the inservice phase. Open to new ideas, he would not use technology for "technology sake"; instead, he only used the technology if he felt it was the best way to facilitate his students' learning. His views of technology today can be summed up: "It (technology) better allows the students to understand the content of the material. It makes

it more sensitive to what they are used to and it makes them more comfortable. The more comfortable they are in the learning atmosphere, the more it (the content) will stick…"

Tamika received her MA degree in secondary social studies education after graduating from the same undergraduate program. During her undergraduate program she was placed with one teacher who was a Master Technology Teacher and another who did not discourage technology use, but disliked the use of PowerPoint. As a MA student, she was involved in a grant project which established a website to study the Civil Rights Movement. She had only been teaching two years during the last portion of the study. She was struggling with many issues related to novice teachers (e.g., management, testing). For her teaching she noted that she was "finding it very difficult to make social studies a kind of discourse between the kids and getting them to think critically about it…I have got to figure out how to put it into proper perspective." To do this, Tamika used a variety of technologies in her classroom. For example, students created Civil War newspapers by using Internet research and Publisher software, PhotoStory presentations for the American Revolution in U.S. history and Multiple Intelligences in psychology. Technology to her was valuable "because it opens up areas that you would never have access to without it."

Michael was an Alternative Masters students at the start of the study. He returned to the university after another career. During his teacher education preparation program, he became excited about incorporating technology into his instruction, but learned he was confronted with barriers. He noted that:

> Many students just do not know how to use hypertext to their advantage. The age group with which I work lacks the background knowledge crucial to using most

> computer software efficiently. Most programs operate in an intuitive manner. This scenario assumes that the user has a certain prior relevant knowledge. My students often do not possess this knowledge (Wilson, 2003, p.34)

During his inservice teaching Michael's work took new directions stimulated by his assistantship assignment which focused on technology for the department. His positions that followed were either teacher training or computer teaching at a middle school. At the conclusion of the study he was a computer lab teacher at a middle school and worked with various content fields. He explained his use of technology which can be categorized as reorientation: "Compared to the first semester, I use technology a ton more to accomplish some of the more simple tasks that I would have done in the beginning in a more manual way." He noted that since beginning his teaching career, he had started using UnitedStreaming and blogging tools, both having become available since he graduated from the teacher education program. He recognized that he must be "selective" in what technologies he used in his classroom. While the class observed was a technology applications class, Michael used social studies (his content major) to underpin his technology teaching. For Michael, his teaching centered on providing the students at his low SES school "support" for the students through his teaching with technology.

Evolution. Of the 10 participants in this study, the researchers believed that only one teacher had truly reached the evolution stage of evolving and adapting. Cindy, who during her teacher education program categorized her technology level as expert, had also indicated during the internship that she wanted technology to be accessible, stating, "if it were readily available with little or no effort, I would use it." After graduation, Cindy started teaching social studies at an affluent high school where she had multiple resources

and where she was able to use technology routinely. Cindy continued teaching, but switched schools in order to take a position where she was the instructional technology liaison for an elementary school. In this position, she was the primary teacher and facilitator for multiple classes when the teacher chose to utilize technology. During this time, she completed a technology Masters program and enrolled in a doctoral program, with an emphasis in instructional technology.

When we observed Cindy at this school, she worked with all content areas and utilized many different technologies from multimedia programs and digital video editing to PDAs and interactive white boards. Her philosophy of teaching was student centered and she noted:

> I think that one of the things about technology that I think is so great is that a lot of traditional teaching methods do not offer is the fact that the kids can pose their own questions and answer their own questions independent of a teacher or with minimal teacher guidance.

Although her current school was affluent and one which had accessibility to many technologies, Cindy noted that the teachers at the school had previously experienced multiple problems with technology "not working" and that there "was a very big deterrent for the use of technology." In her job, she helped teachers integrate technology and also worked with students on their projects using technologies (e.g. digital videos, online searches, WebQuests). Cindy indicated the teachers were getting more comfortable, adding that two classes she helped recently had teachers who were "active and modeling" the technology. At this point in her career, Cindy seemed very comfortable about being able to adapt and evolve in her use. She was also eager to allow

the students to take control. She talked about handheld use in one classroom and said, "The first day we showed them how to use it and the second day they were pros."

Conclusions

Results indicated that while basic technology skills and processes learned in their teacher education program (TEP) were transferred through time and the participants remained comfortable with those technologies; as a whole, participants in the study did not apply individual creative technology integration plans or new and innovative technologies. For those teachers who moved beyond using technology for specific tasks and teacher-centered objectives, it was clear that relationships and ongoing professional development (e.g. continued contact with mentor, education in instructional technology) had played a role.

Barriers were experienced, at some level, by each of the participants. The most common barriers appeared to be scheduling conflicts and lack of equipment (Bauer & Kenton, 2005). For Doug, these barriers were constraining and kept him from using even the technologies he felt comfortable with, such as webquests. For Ross, Ted, and Bob at the *integration* stage, technology was used for specific tasks, and for the most part, it was replacing (Dawson, 2006) traditional teaching for those tasks. While it would appear that Ted and Bob were at the reorientation stage, a deeper analysis and rereading of the notes showed that in reality they were allowing the students to use the technology for certain tasks relating to management and direction. Ted used technology to motivate the students to learn by using technology but not in the context of the students' directing their own learning while Bob used technology to manage his students' questions and the writing process. However, in the cases of Steve and Jim, technology was used only as a

teacher-centered instructional tool (e.g., PowerPoint to present the content) (Hofer & Swan, 2006). Steve indicated that his use of technology was primarily limited due to pressures to meet the requirements for testing.

In observing and interviewing these teachers, the teachers we categorized at the reorientation and evolution stages appeared to have the guiding vision needed to encourage their students to use technology as a vehicle for their knowledge construction (Ertmer et al., 2000). In doing so, these teachers were also the ones who had remained active in professional development efforts (dialog with faculty mentor, Master Technology Teacher, additional graduate studies). For those at reorientation, Antonio was willing to experiment with new technologies on his own in an effort to facilitate his students' learning. Tamika saw technology as a means to improve her students' critical thinking through various technologies previously learned as a student and during her professional development. Michael recognized the need to be selective in his use of technology to motivate and support student learning. At evolution stage, Cindy used technology to motivate and support learning, as well as evolving and adapting technology, allowing her students to take control of their own learning.

Implications for teacher educators

As teacher educators, this research was illuminating and pointed to areas we should improve upon. While we may have a "technology rich" program, this research, conducted over time, showed that an additional emphasis should be placed on preparing teachers to think outside the box. We should recognize that technology integration is complex (Koehler & Mishra, 2007), but we must look for ways to prepare teacher candidates to critically and creatively adapt and evolve when using technology. Perhaps

we have engaged in too much *tech parenting* (e.g., providing the students with Technology on Wheels) and not enough *tough love*. By requiring certain technologies for certain tasks (e.g., presentations for the e-portfolio) in the teacher education program, we may be limiting the creative use of other technologies. A solution might be to provide teacher candidates with a list of outcomes and the technologies/skills we want to see, model some examples, and practice *tough love* (cut them loose) to develop and implement their own versions of these assignments. Teacher educators must become better *tech parents* by giving teacher candidates the tools to solve problems, seek answers, and find new ways to incorporate existing and future technologies into their classrooms.

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