

Learning to Teach in 2004: Technology and Teaching through the Eyes of Prospective Teachers

Melissa E. Pierson
Curriculum and Instruction
University of Houston
United States
mpierson@uh.edu

Alysa McLachlan
Curriculum and Instruction
University of Houston
United States
amclachlan@uh.edu

Abstract: This paper describes the research design and the early results of a longitudinal study exploring the developing vision preservice teachers have of technology in teaching and learning. Participants include a total of 8 teacher education students enrolled in one of three consecutive “Technology in the Classroom” courses that are taken in the three semesters preceding student teaching. Qualitative methods were used to analyze data, and several themes have emerged related to a developing vision of teaching with technology: expectations for using technology, anticipated challenges, questioning classroom uses of technology, and the importance of technology in the classroom.

In recent years, and especially since the documenting of PT3 projects, there has been a call for a second look at the way technology is introduced to prospective teachers. Alternative teaching methods, assessment strategies, and authentic technology uses have been proposed and explored, all aimed at providing rich environments in which prospective teachers can learn to effectively use technology for teaching and learning. The present study is longitudinal in nature with the intent of clarifying the role technology plays in the development of prospective teachers from initial teacher education experiences through the induction years. In essence, do these novice teachers themselves see technology as integrated with the teaching knowledge and skills they are developing? This paper explores in depth the research design and reports early results of this study, with the initial goal of understanding from the participants’ perspectives their developing visions of technology in teaching and learning.

Literature Focus

Our colleagues in the technology and teacher education community have made headway in beginning to understand the job of becoming a teacher in the age of technology. Specifically, findings in the areas of confidence and awareness levels, perceptions of technology use, and the development of teaching identity inform our work.

Confidence and Awareness

Preservice teachers lack confidence in their ability to integrate technology into the curriculum. Research findings indicate that preservice teachers must see the technology modeled by university faculty, and they must be offered instruction and practice in integrating technology into their instructional methods and practices (Pope, Hare, & Howard, 2002). As preservice teachers see technology modeled, and as they are provided more opportunities to use technology in the classroom setting, high anxiety levels stemming from negative attitudes toward computers will be lessened. Preservice teachers can then become more confident in their capabilities to utilize technology effectively in the classroom. The results of many studies suggest that increases in positive attitudes toward computers may have resulted from technology instruction and the integration of the technology skills and strategies into the existing

methods courses (Abbott & Faris, 2001). Novice teachers should have exposure to technology beyond the traditional technology course in order to increase their confidence level with technology.

Although there might be varying levels of confidence found in preservice teachers, the literature states that preservice teachers recognize the value of participating in self-initiated technology projects. Not only is their awareness of technology as a process raised, but so are their insights into their own learning experiences (McRobbie, Ginns, & Stein, 2000). Many students begin their teaching experience with a narrow view of technology, but with experience a change occurs that expands their vision of activities they might use to support their own students' learning (Beyerbach, Walsh, & Vannatta, 2001).

Perception of Technology

Preservice teachers want to learn strategies for integrating technology tools into their teaching (Mowrer-Popiel, Pollard, & Pollard, 1992), and expect to use computers in their teaching (Marcinkiewicz & Wittman, 1995) but express their feelings of frustration at their lack of technology proficiency (Francis-Pelton & Pelton, 1996) and a lack of understanding of effective technology use in contemporary classrooms (Balli, Wright, & Foster, 1997). In order to recognize the benefits of their growing awareness of technology, preservice teachers must see it as logistically and managerially feasible if they are to use it in their classroom. Issues around classroom management and control, integrating the computer into the daily lessons, and "seeing in action" the use of computer technology are critical in the preparation of teachers (Keiper, Harwood, & Larson, 2000). This experience as preservice teachers influences the adoption of technology. If preservice teachers do not perceive that the use of computers outweigh the obstacles, then they will continue to see it as barrier in the classroom. Barriers that have been commonly cited in the literature include: lack of time for professional development (Keiper, Harwood, & Larson, 2000), lack of hardware and software, technology reliability, lack of institutional support, and uncertainty about its worth (Butler, Sellbom, 2002). It is possible for novice teachers to see beyond these barriers as they begin to value technology.

Developing Teaching Identity

Part of the preservice teaching experience includes preservice teachers understanding their own roles as teachers. As their experiences change over time, preservice teachers develop a deeper understanding of their professional identities (Mullen, 2001). Images of self as teacher, of schooling, and of the content being taught, are created and grow from identities of successful students for many years and influence not only perceptions of computer technologies but of the teacher education program as a whole. Each student's perceived self as a teacher provides a lens through which to interpret, accommodate, and/or reject topics related to teaching and schooling. The preservice teachers' vision of technology will mature as they progress through the education program (Palacio-Cayetano, Schmier, Dexter, & Stevens, 2002). The experience preservice teachers' gain in teacher education will influence their justifications for the decisions they make in their own future classrooms.

Participants

Elementary teacher education students at the University of Houston enroll in three consecutive "Technology in the Classroom" courses that are taken in the three semesters preceding student teaching. The participants in this study were all initially enrolled in the first course of this series in Spring 2003. All students in that first course were introduced to the study and its goals early in the semester, and were asked to volunteer to participate. Seven students volunteered in the first semester and an additional participant volunteered in the second semester of the project, while she was enrolled in the second course of the sequence. A total of eight female teacher education students currently participate. Participants agreed to commit to contribute to the study for a period of 4 years, including the two years of teacher preparation courses followed by the first two induction years of teaching. It is anticipated that a new cohort of participants will be added in future semesters so that as our findings are implemented directly into our courses, our ongoing research will continue to chronicle the impact on instruction.

Although this group of participants is not a random sample, nor was it intended to be such since participants were asked to volunteer, they represent remarkable diversity on a number of fronts. They range in career stages from traditional college-age students seeking their first careers to those coming back to school to be certified following other professional and personal accomplishments. The technology skills of the group are as varied; as a whole, they

are comfortable using basic technology tools, such as Word, PowerPoint, and Excel, as well as email and Internet searches. Even those who proclaimed to have few skills at the outset of this project at least owned a computer and had some daily computer-use habits in place. Some of our first career participants actually grew up with computers as a part of their schooling experience beginning with elementary school. Our second career participants gained assorted sets of skills through years of work demands. A few higher range skills represented by the group include setting up a wireless network at home, advanced web design skills, and some server maintenance. Finally, the group is composed of those with intents to teach grades from early childhood through middle school, with a rich collage of personal motivations for why teaching is important and is their career of choice.

Data Collection and Analysis

During the first two semesters of the project, data were collected in the form of interview fieldnotes, think-aloud recordings, and work sample artifacts.

- *Interviews*: Two one-on-one interviews have been conducted with each participant, one per semester for two semesters thus far. Interviews are planned to continue at this rate for the duration of the students' time at the University and for the first two induction years of teaching. Interviews last approximately one hour, and are semi-structured, loosely guided by an interview protocol, but also allowing for redirection according to the participants' inclination to share information and ask questions. It is anticipated that later interviews may occur over the phone if students move away from the Houston area.
- *Think-Aloud Recordings*: Students have completed a "Think-Aloud" activity in which they record with a tape recorder their thoughts on planning a lesson. The intent is to capture evidence on the role technology plays in the planning thoughts of new teachers.
- *Document Analysis*: Participants have submitted teaching-related work samples each semester. Thus far, the samples have largely been assignments for the Technology in the Classroom courses, however it is anticipated that the range of activities that will be of interest to the project will expand as does the participants experience and teaching responsibilities.

Qualitative methods were used to analyze data, with an eye toward tracing emerging patterns and trends throughout each case and then across cases. Interview write-ups have been shared with participants as member checks to ensure that the transcripts reflect participants' intended meanings. Still other data that is being collected from all students in our educational technology courses, but not yet reflected in this stage of the analysis, include concept maps on the topic of technology in teaching and learning, and surveys on computer attitudes, confidence, and practices.

Action Research in Action

The research design we have employed is more than merely an interpretive telling of others' stories. We have conceived of the project through an action research perspective which allows participants to play a role in the direction of research activities. Participants and researchers alike *Listen* to what their current understanding of their contexts are, *Think* together about what that information means and what goals should be set for the project, and *Act* in ways that use that information for the betterment of their own teaching as well as for the improvement of the instructional technology course offerings in the College of Education (Stringer, 1999). This research design is cyclical in that findings from early rounds of data collection are used to inform later rounds.

The study is designed to be responsive to the needs of the participants and in fact has already been modified in some ways. In the first two semesters, participants were involved to the extent that they reviewed interview transcripts. However, we sensed that participants might have more to say and also desire and benefit from more of a role in the direction of the research. We therefore invited participants to a focus group lunch for which the agenda included not only a briefing on initial research findings but also a brainstorming of other ways participants might want to become involved. Half of our participants were able to attend during the busy finals week of the Fall 2003 semester; others will be informed of the collective decisions of the group and invited to join and share their ideas.

Students were able to meet one another; previously participants were not apprised of others in the project to protect confidentiality. Although discussion soon jumped to end-of-semester commiserating, we refocused the conversation by reintroducing our commitment to an action research agenda. Students were asked to not only reflect on what other ways we might consider collecting data but also to think about how this project could be beneficial for them. Some mentioned that they were not always able to remember important technology-related anecdotes when they were actually sitting down for the interview. One among the group suggested that they could email or post their thoughts on more of a continual basis rather than just once during the semester. Through continued discussion, it was decided by the group that a web-based discussion board, similar to the type used for online discussion in our technology courses, would be useful to not only post project-related ideas and thoughts, but also as a means of soliciting help from one another. Already, the group was beginning to conceptualize ways in which the collective whole might become a support for the individuals. This web-based discussion area will be created and implemented in the Spring 2003 semester.

Discussion also focused on the usefulness of the Think-Aloud activity. Although the original intent of the activity was to capture technology-related planning thoughts as they occurred, participants did not feel the recordings were accurate or complete and were interested instead in thinking about other ways of recording their thoughts. It was decided by all that the Think Aloud recordings would be suspended as a required element until the group deemed they were necessary. The researchers quite purposefully then led the discussion toward data types like those that could be collected using handheld computers and digital cameras. Unbeknownst to the participants, Palm handheld computers and Sony Mavica digital cameras had been purchased for each to use for the duration of the project and were sitting in boxes nearby. As some interest in these types of data collection activities surfaced in the discussion, the new tools were revealed. Although there was certainly a strong excitement factor associated with making these tools available to participants, especially a week before the winter holidays, the possibilities for unique multimedia documenting of teaching thoughts and behaviors otherwise not available to researchers and other group members quickly became the focus of discussion. At the close of the focus group, participants agreed to play with their new “toys” and stay in communication with each other about ideas, skills, and thoughts on the uses of these tools. Our inclusion of digital images and handheld-collected data that develops out of the use of these tools will be explored, but also on the minds of researchers is the possibility for advanced teaching options facilitated by these readily available technology tools in the hands of these developing teachers.

Discussion of Emerging Trends

When our students begin the teacher education program, most have not had meaningful classroom experience beyond their own as a student, and they have even less of an idea of what an effective, technology-rich classroom looks like. It is through a vision formed from their own experience and from explicit actions on our part to model technology-rich strategies that they begin to imagine themselves teaching in such contexts. We have actively sought ways to assist students in creating a vision of rich, technology environments for learning. One way we do this is rather than teaching students to use a piece of software by opening a blank document, we first show them a whole range of educational uses for that software and push them to think beyond the examples. Armed with those visions of what is possible and educationally relevant, we then turn to the software. The work produced following this “visioning” is much superior to work we previously received.

As the initial data has been reviewed, some trends have emerged that help us explain what it means for our students to learn to teach with technology. Of the most interesting are four which can loosely be described in terms of this developing vision of what it means to teach with technology.

Expectations for Teaching with Technology

All of our participants expect to use technology in their future classrooms and can describe ways that they envision using it. Although some are nervous, “Right now when I think about using technology in my own classroom I’m not exactly sure of what kinds of things I will be able to do;” at least two of our participants stated that they were already thinking about ways to integrate technology even before attending our courses.

As we spoke with our participants, it became clear that the ways in which they imagined using technology were often based on their own skill levels and experience; the more technology experience, the more varied the types of uses they could imagine. Students for whom our first technology course was an early technology experience described PowerPoint, used as a major project in that course, as a key component in their vision. Also cited were word processing to create worksheets and email to communicate with parents, both common technology uses that can be imagined as being a part of a learning environment. Other participants who knew about more peripherals, such as scanners and digital cameras, or advanced software features, like databases, talked about using those tools in their teaching. One student whose boyfriend worked in computer animation envisioned creating animations to illustrate educational concepts for her students.

By the second semester, students were becoming more confident in their abilities to propose ways to use technology. One student responded when asked how she now imagined using technology, "I now know what it can do. OK, its endless!" and another: "I could see myself actually using it." Yet another even took the initiative to recommend some technology integration ideas to her mentor teacher, even though the vision was not complete in terms of how it might be implemented:

[My mentor teacher] showed me her lesson plan. I went home and made my own lesson plan that had technology. She was good; she talked me through it, saying, "How did you think you might implement this? I didn't know."

At least five of these teachers were beginning to expand their vision to include some pedagogical considerations for the technology use. Several, like this student, displayed an awareness of age-appropriateness in their pedagogical choices: "I keep having to remind myself that I'm dealing with fourth grade and to use graphics that are interesting to a fourth grader." This student made a conscious effort to address diverse learning styles, unprompted by the assignment requirements: "I've covered visual, covered hearing, and I covered pretty much all the aspects of every learning types of children so that anybody in my kindergarten class could understand it and participate in there."

Whether plausible or not as classroom uses of technology, it is clear that these visions were strongly associated with what each individual knew about technology. Implications for teacher educators are to work with novice teachers to create rich visions of technology integration.

Perceived Challenges to Teaching with Technology

Already in their early development as teachers, our participants are aware that teaching with technology presents some unique challenges. Noted in their lists of worries about teaching with technology are troubleshooting, safety and supervision issues, and equity of resources. Interestingly, when asked about the challenges they expect to face in their future classrooms, those they highlighted the first semester of the project, when in their first semester of teacher education courses are different than those they mentioned the second semester, after having taken one technology course as well as other teacher preparation courses.

For one student, her anticipated concerns during our first interview focused on "getting [the technology] to work.

I'm scared to put in a disk and have it not work. It's not like a piece of paper. You're scared that it will not work. I don't know how to troubleshoot if I have problems . . . I need someone to come in to assist me.

By the next semester, with some basic educational technology instruction under her belt and with the reality of teaching becoming clear, her concerns understandably shifted to those of having enough time: "When am I going to have my weekends, my nights? I can see where it will take a lot of time the first two years."

Similarly, the concerns of another participant shifted from semester to semester. During the first interview, she cited as a barrier to regular use knowing how to not misuse technology and how to ensure equitable use by all students. By the second semester, she first noted that it was "easier than I originally thought," but then provided more details on her thinking:

In getting closer to having my own classroom, [I'm concerned with] being responsible for the TEKS (state standards). I dream about the TEKS! I'm trying to work out a system to manage them. I'm going to have a spreadsheet of the TEKS, to make sure I'm covering them. I'll organize them in Excel, and sort which have been covered, and check them off.

In this case, experience may be working against her creativity and optimism, but rather than being completely overwhelmed by a state-demanded emphasis on standards, she is exploring the ways in which technology can be used to manage the standards responsibility.

It appears that those fears early on reflect personal fears about technology use, along with inexperienced perceptions of what should be concerned about (e.g., safety). As these novice educators become more informed about the teaching profession and its expectations, the challenges they expect to see become more focused on the reality of student needs and teacher limits.

Questioning Classroom Uses of Technology

For teachers just beginning to learn about the profession, our participants have become quite aware not only of the physical presence of technology in the classrooms they are seeing, but also of the ways teachers are using it. They are beginning to take notice of what they see, are starting to make connections, and are openly questioning the uses of technology they see. It should be noted that awareness of technology and the next step of forming evaluative impressions was not evident for those participants in the first interview who had no classroom experience. For the first semester, only those with substitute teaching experience volunteered comments. The second semester, there were more who were doing school observations if not field-based courses.

Of those students who had been in the classroom, whether through subbing experience or initial field-based experiences, most could describe the amount and in general, the types of computers and other technology they saw in the classroom. In offering descriptions of the classrooms, they listed computer counts and noted any times when they saw the class going to the computer lab. This student hunted out technology even when visiting other classrooms: "I went to the ELA (English language Arts) room. I wondered, Did she have a computer?"

In addition to descriptions of physical machines, most were surprisingly critical of the ways teachers used technology:

- "I've seen some technology in schools, but "not as much as I'd like."
- "I didn't see any computers. I thought that was sad."
- "The mini-lab is new, and I have a feeling [the computers] are not used."
- "She had one computer and used it only for taking attendance. . . . It's like they were just there as a prop, just sitting on a cart."
- "Teachers are so stuck on the overhead. It gets boring."
- "I think a lot of teachers are scared of it. Mainly they don't open their minds."

Reactions that surprised us at first began to make sense when the timing is considered. At the same time that they are enrolled in educational technology courses, held in state of the art computers labs at the university and regularly forced to deal with topics of integration, they are placed in real classroom contexts with much different priorities. So as light bulbs go off in the sheltered context of our educational technology courses where we are raising their awareness of the uses of technology, these young teachers are simultaneously met with their mentor teachers' varying perspectives.

Another informal policy that raised concern is the hesitancy of letting students actual use the computer for real purposes. In commenting on her observation of a computer lab lesson, one participant reflected: "The kids are not trusted. They have an [Acceptable] Use Policy, thing they send home with parents to sign. It's wonderful, but they're not doing those things. The kids don't go online."

Her frustration, it turned out, related to the technology not being used in an authentic way for these students. Although complimentary of this teacher in general, this participant noted some missed opportunities for technology use, such as when a boy went to Florida and instead of the computer, [the teacher] went to a science book to look it up. "It would have been the perfect opportunity [to use technology]." She noted that this teacher regularly changed out the activities in the other learning centers in the classroom, "but that tech thing never changes." This student's growing awareness of the integrated role of technology has made this type of inconsistency in the integration of technology jump out at her.

Are our courses painting too optimistic of a picture of technology's role in the classroom? In their developing vision of using technology for teaching and learning, preservice teachers are being exposed to two conflicting viewpoints. This sheds light on a broad disconnect between the university and school-based settings and highlights an area on which we will continue to work.

Importance of Technology

We pushed our participants to consider just how vital technology was in their developing vision of teaching by asking them what they would do if they got a job teaching in a school with little or no technology. Most couldn't imagine being in a classroom without technology. "It would be difficult to do anything," one summarized, and another thought it would be "harder to be creative."

Almost all noted that they would be willing to put their own personal resources behind an effort to bring technology into the classroom, mentioning bringing in their own laptops or purchasing other computers. "It's just important!" one participant insisted, voicing others' thoughts. Some even proposed doing what they could without computer hardware: "I would look for ways to expose them and not have to have the district pay. I would make side comments so it is always in their minds, even if it is not physically there."

There was concern for the effect a lack of technology would have on the students.

By removing something from daily life (and I mean that technology is a huge part of kids' daily life and will become more so as time goes on) we will be sending a message that learning is a chore, something that you have to be harder than it should or could be, something that isn't continuing or evolving.

Almost all anticipated that parents would expect computers to be a part of their children's classroom experience: "Parents will expect it. My generation will be parents when I am really in my career; it is their kids I will be teaching. They will expect more."

For now, the visions of these novice teachers include technology as an inseparable part of their teaching. It is the job of teacher educators to keep these tools firmly implanted in that vision so that these teachers begin their careers with an integrated sense of teaching rather than playing "catch-up" to convince them to use technology once their careers have begun.

Future Directions

As is common in our College, our diverse student base and multiple degree and certification completion avenues means that cohorts do not stay neatly together; this project is no different. Of the eight participants, five expect to be enrolled in their "block-type" school-based methods courses, one will be student teaching, and two will be completing an internship which will place them directly into a year-long, paid, mentored teaching position in lieu of the student teaching requirement. Regardless, all will be moving into real school contexts, faced with the prospect of real students and real teachers using technology. Their visions of technology-rich teaching will continue to develop; whether their current visions will become reality remains to be seen and will be the focus of future writing from this project. Other papers resulting from this project will explore the implications of the research for preservice technology instruction and the ways in which the growing experience of these participants impacts the role they see for technology in their teaching.

We believe we are structuring a forum through which these novice teachers can tell their own story and come to connections, both individually and jointly, that not only will help shed light on becoming a teacher in the age of technology but will ultimately form the basis for improved self-reflection and in turn, technology-rich teaching practices. Participants have been invited to co-present on this research in order to share in telling their own stories. It is difficult to say with any certainty exactly where this project, driven by all participants, will lead us, but we are encouraged by the possibility of group and self discovery and of the strengthening of what we understand about the role of technology in the emerging pedagogical understandings of new teachers.

References

- Abbott, J., & Faris, S. (2001). Integrating Technology into Preservice Literacy Instruction; A Survey of Elementary Education Students' Attitudes toward Computers. *Journal of Research on Computing in Education*, 33(2), 149-161.
- Balli, S. J., Wright, M. D., & Foster, P. N. (1997). Preservice teachers' field experiences with technology. *Educational Technology*, 37(5), 40-46.
- Beyerbach, B., Walsh, C., & Vannatta, R. (2001). From Teaching Technology to Using Technology to Enhance Student Learning: Preservice Teachers' Changing Perceptions of Technology Infusion. *Journal of Technology and Teacher Education*, 9(1), 105-127.
- Butler, D.L., Sellbom, M. (2002). Barriers to Adopting Technology for Teaching and Learning. *Educause Quarterly*, 8(4), 22-28.
- Francis-Pelton, L., & Pelton, T. W. (1996). Building attitudes: How a technology course affects preservice teachers' attitudes about technology. Retrieved March 3, 2000 from the World Wide Web: <http://www.math.byu.edu/~lfrancis/tim's-page/attitudesite.html>
- Keiper, T., Harwood, A., & Larson, B. (2000). Preservice Teachers' Perceptions of Infusing computer Technology into Social Studies Instruction. *Theory and Research in Social Education*, 28(4), 556-579.
- Marcinkiewicz, H., & Wittman, T. (1995). From preservice to practice: A longitudinal study of teachers and computer use. *Journal of Computing in Teacher Education*, 11(2), 12-17.
- McRobbie, C., Ginns, I., & Stein, S. (2000). Preservice Primary Teachers' Thinking About Technology and Technology Education. *International Journal of Technology and Design Education*, 10(1), 81-101.
- Mowrer-Popiel, E., Pollard, C., & Pollard, R. (1992). An analysis of the perceptions of preservice teachers toward technology and its use in the classroom. *Journal of Instructional Psychology*, 21(2), 131-138.
- Mullen, L. (2001). Beyond Infusion: Preservice Students' Understandings About Educational Technologies for Teaching and Learning. *Journal of Technology and Teacher Education*, 9(3), 447-466.
- Palacio-Cayetano, J., Schmier, S., Dexter, S., Stevens, R.(2002). Experience Counts: Comparing Inservice and Preservice Teachers Technology-Integration Decisions. *Proceedings of the 23rd annual National Educational Computing Conference, San Antonio, TX.*
- Pope, M., Hare, D., & Howard, E. (2002). Technology Integration: Closing the Gap between What Preservice Teachers Are Taught To Do and What They Can Do. *Journal of Technology and Teacher Education*, 10(2), 191-203.
- Stringer, E. (1999). *Action research: A handbook for practitioners. (2nd Ed.)*. Thousand Oaks, CA: Sage.

Acknowledgement

The authors would like to thank the study participants, who for now will remain anonymous to protect their confidentiality. Their enthusiasm for the profession and their willingness to engage in self-reflection will continue to inspire this project as they step closer toward their teaching careers.