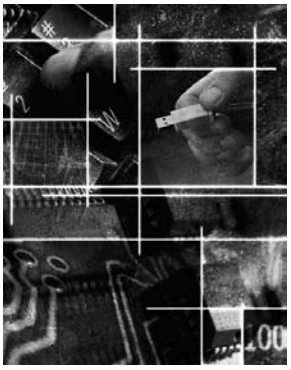

Are We There Yet?: The Power of Creating an Innovation Configuration Map on the Integration of Technology into Your Teacher Education Program

Colleen Swain

"I called you at home because I wanted to check with you about what Wes thinks he heard in class today." This was the start to a phone call I received when I taught junior high school mathematics earlier in my career. I remember this conversation distinctly because as I listened to what Wes told his mother, I remember thinking "Wow—where on earth did he get that idea?" Wes completely misunderstood an important component for the project demonstrating his understanding of the mathematics concept we were studying. Situations such as this remind us to not neglect the importance of the social aspect of understanding that occurs when dealing with what we might consider commonplace terms or concepts. This incident from my earlier teaching career came to mind after listening to different comments made by colleagues in the college of education where I teach regarding the effective use of technology in our teacher education programs. I began to wonder if we were all operating from the same working definition when we talk about integrating technology into our teacher education program.

This article presents one strand of findings from a two-fold descriptive exploratory case study designed to 1) investigate teacher educators' decisions regarding the use of technology in his or her teacher education courses and 2) determine what the phrase "integrating technology into our teacher education program" means to teacher educators. This article will specifically address the second research purpose of exploring the meaning of the phrase "integrating technology into our teacher education program" and the subsequent production of foundational work for an innovation configuration map regarding the infusion of technology into the teacher education programs at a large, research-oriented university in the southeast.

Research Study Background

This study was a descriptive exploratory case study because an in-depth study of the situation within a bounded place and period of time was needed due to the researcher's interest in "process rather than outcomes, in context rather than a specific variable, in discovery rather than confirmation." (Merriam, 2001, p. 19) Taking an interpretive inquiry stance allowed the researcher to better understand teacher educators' meaning behind the phrase "integrating technology into our teacher education programs" and their perceptions of what the integration of technology into teacher education programs would look like at a specific college of education.

Guidance from Literature

Two major areas of research and literature informed the work of this entire study. Both areas of research and literature were used to guide the interviews as well as interpret the interview data and the creation of the innovation configuration map.

The first area was change theory literature. This body of work provided guidance in understanding how teacher educators conceive of the integration of technology into teacher education programs. Change models that guided the study were Rogers' (2003) *Diffusion of Innovations*, Ely's (1976) *Conditions for Change*, Hall, Wallace, and Dossett's (1973) *Concerns-based Adoption Model* (CBAM), and Zaltman and Duncan's (1977) work on resistance factors. These educational change models provide great insight into how change agents can better understand individuals involved in the change process, the environmental conditions needed for change to successfully occur, resistance factors ripe for environments and individuals when innovations that influence change are inserted into organizations, and ways to attempt to address the concerns of the individuals most directly influenced by a new innovation or change. Literature critical to addressing the second purpose of this study, determining what the phrase "integrating technology into our teacher education program" means, is Hall, Wallace, and Dossett's (1973) *Concerns-based Adoption Model*. When innovations are introduced into an organization, the implementation of the innovation is often drastically different for each stakeholder. "This is particularly problematic when what is being done under the name of the innovation is different in different classrooms." (Hall & Hord, 2001, p. 36) In order to address the differences in understandings for an innovation and determine how to move toward meaningful change with the innovation, a beneficial step is the creation of an innovation configuration (IC) map, Hall and Associates' third component in the *Concerns-based Adoption Model*. "The focus in the IC diagnostic dimension is on developing and applying word-picture descriptions of what the use of an innovation can look like" (p. 38). The purpose of the IC map is to develop descriptions of different ways the innovation could be implemented within the educational institution. "Three key questions that should be asked throughout the process are: 1) What does the innovation look like when it is in use?, 2) What would I see in classrooms where it is used well (and not as well)?, and 3) What will teachers and students be doing when the innovation is in use?" (p. 49). These questions were used to obtain word images of teacher educators' perceptions of unacceptable, acceptable, and ideal implementations of technology into the teacher education program.

The second area of research and literature grounding this study was faculty decision-making regarding instructional planning. Findings and recommendations from the works of Borko and Shavelson (1990), Borko, Livingston, and Shavelson (1990), and Ertmer (1999, 2005) shaped the study. The works by Borko, Shavelson, and Livingston provide insight into what factors (such as beliefs, the role of the teacher, etc.) influence the instructional decisions of classroom teachers. Ertmer's work deals with the barriers to integrating technology into teaching. Ertmer's work deals specifically with how beliefs are intertwined with these barriers. This second area of literature was primarily used to address the first goal of the case study, which is not the primary focus of this specific paper. However, this literature did help the researcher better understand the underlying rationales or factors for how the teacher educators responded to the questions regarding the building of an IC map.

Study Procedure

Fifteen teacher education faculty members from the School of Teaching & Learning, the organizational unit that houses a majority of the teacher education programs at this university, agreed to be interviewed twice from August to October. Upon completion of each interview, the audiotape was transcribed and interview notes were assembled. Subsequent discussions with some participants took place in order for the researcher to more fully understand participants' perspectives. Once a deep understanding of participants' responses was reached, a single IC map for the integration of technology into the teacher education program was created. Member checking took place by providing drafts of transcripts, interpretations, and the IC map to all participants and allowing them to make corrections, clarifications, deletions, and provide general feedback.

Study Sample

The researcher announced that this study was going to occur at a faculty meeting and that she would be seeking the assistance of faculty. She explained the study, the benefits of this work, and then answered questions the faculty had. After that, she sent an individual email to every faculty member seeking his or her participation in the study. Fifteen of the 28 faculty members from the School of Teaching & Learning agreed to participate in this study. These faculty members represented a cross-section of the school in terms of program areas, years of experience, tenured versus tenure accruing, and expertise with computers. Faculty members with full-time teaching/research, part-time administrative/teaching, and full-time administrative responsibilities took part in the study. Nine of the participants had tenure. The average years of experience as a teacher educator was 16 with a median of 14. The range of experience as a teacher educator was four to 33 years.

As part of the demographic data collected, study participants were asked to self-assess their overall experience with computers and their comfort levels in using technology for productivity purposes and in teaching. Four participants rated themselves as beginners, six as intermediate users, two as advanced beginners (a category created by participants), and three as advanced. In terms of using the computer for productivity purposes, 11 of the participants were comfortable with technology and four were somewhat comfortable. However, in terms of using technology in their teaching, six participants were comfortable, three were somewhat comfortable, and six were uncomfortable.

The Researcher

The researcher in this study was a tenured faculty member who taught primarily in the educational technology program area but also taught courses in the curriculum and instruction and secondary education programs. The researcher was well known by faculty and moved easily back and forth between tenured and tenure-accruing faculty. Therefore, the issue of power and trust in the interviews was not perceived as an area of concern with regards to the questions asked of teacher educators or what was shared with the researcher.

Data Analysis

Due to the researcher's knowledge of the literature regarding change and instructional decision-making, the researcher did have a priori categories in mind as initial coding took place. For example, the researcher was prepared for questions about beliefs regarding instructional decisions and the integration of technology to mesh with the works of Borko, Livingston, Shavelson, and Ertmer. Nevertheless, the researcher was cognizant of this and took care to have an open mind and eye for new categories in the data. After initial open coding took place, the next stage was axial coding where the researcher sought to make connections between categories and subcategories. Here is where many of the categories from literature were used. After the axial coding occurred, selective coding was used to select and identify core categories and systematically relate the core categories to other data categories.

Developing the Innovation Configuration Map

Although technology is an element of the various teacher education programs at this university, a true integration of technology into the entire teacher education program has not occurred. There have been discussions and implementation among some teacher education programs (i.e., elementary education, English education) of how this would happen but true, seamless integration of technology across all teacher education programs is not evident. To facilitate the beginnings of a shared vision among faculty about what integrating technology into all teacher education programs would look like, data to begin an innovation configuration (IC) map were collected. As part of the interviews, faculty were asked to share their vision of integration into the overall teacher education program from three perspectives: an unacceptable implementation, an acceptable implementation, and an ideal implementation. The questions that were used to get to these word pictures were: 1) What does the integration of technology into our teacher education program look like if at the unacceptable, acceptable, or ideal level?, 2) What do you see in the classroom where technology is integrated into the teacher education course at that level?, and 3) What would students and the teacher be doing if technology was being implemented at that level?

Because there are numerous programs within the overall teacher education program at this university, the teacher educators were asked to express views from the program in which they taught and then to state whether their views would apply to just their program (i.e., elementary education, early childhood education, etc.) or the entire teacher education program. As the teacher educators spoke about the integration of technology into their specific education program, they all noted their views and ideas could be considered for all of the teacher education programs.

Findings

An interesting result of the interviews dealing with the IC map was two of the perspectives of implementing technology into the teacher education program had remarkably consistent meanings among the faculty. The "word pictures" created by faculty for an unacceptable implementation of technology into the teacher education program were very similar. This situation was the same when exploring the ideal implementation of technology into the teacher education program. Where great variation in ideas occurred was in what an acceptable implementation would look like for the teacher education program. Interesting enough, most of the faculty noted this university had an acceptable implementation level in terms of technology integration. Each perspective will be briefly discussed and a copy of the first version of the IC map provided. As more discussions take place among the faculty, this IC map will become more descriptive, detailed, and refined.

An Unacceptable Implementation

Participants stated going to either extreme of the technology spectrum—no technology or all technology—was inappropriate. Comments such as "Well, no technology is certainly unacceptable." (Participant 4) and "Using technology for technology's sake is unacceptable. If it is not connected and is not enhancing the teacher education curriculum, it is unacceptable." (Participant 1) were contained in all interviews. Faculty believed it was extremely important to "teach students to use technology in appropriate ways. Students need to think about the learning context and environment when deciding when and how to use technology in teaching. Inappropriate use of resources is unacceptable." (Participant 5)

An Ideal Implementation

Again, teacher educators were relatively like-minded in this area. Faculty expressed a desire for technology to provide new and richer context for preservice teachers through the use of simulations. For example, one faculty member expressed the value of simulations which

> Allows students to view classrooms with ESL students so all students could have powerful observations. This would also allow better teacher direction in what to look for in an ESL classroom. These simulations where students could view and then have meaningful discussions around issues surrounding the ESL students would be ideal. (Participant 9)

There was a desire by the teacher educators for all preservice students to have field placements and internships where students would see computers used in meaningful ways. "Our preservice students would actually be going into classrooms and seeing kids use computers in meaningful ways—not just AR [Accelerated Reader]." (Participant 5) In addition, the need for all teacher educators to model the use of technology in teaching was noted. "They [preservice teachers] need to know that technology is a part of what we do in teaching." (Participant 10)

Faculty also noted for an ideal implementation of technology into the teacher education programs, the schools would need to be different. "Ideally the public schools would be very different. The public schools and teacher education programs would be liaisoning very closely together. You work on development of preservice teachers and inservice teachers on two levels." (Participant 4)

Finally, faculty expressed issues surrounding the ease of technology use within teacher education programs. Faculty would not have to worry about access, setup, or support issues.

> Technology would be just a part of teacher education and not apart from teacher education. It would look like the content of the teacher education concept that happened to use technology—not where it looks like technology. Technology would be everywhere but it wouldn't be noticed because it was so embedded in the lesson, course, and context. (Participant 1)

An Acceptable Implementation

Attempting to address what was an acceptable implementation of integrating technology into the teacher education program was the most difficult for faculty. Many expressed it was easy to talk about extremes—the unacceptable and the ideal—but deciding about appropriate "middle ground" was more complex. A common view portrayed was

> I'm not big on acceptable. I want the ideal. Kind of what we're doing now. We have lots of individual efforts to integrate technology into courses and activities but they are not united or connected. I think here at [X] we're on a journey to an ideal. (Participant 10)

Therefore, faculty views were sometimes expressed in general terms. Faculty mentioned the critical need for courses related to the integration of technology and the importance of a field experience with technology in the schools. "What would be acceptable across [the teacher education program] would be students getting at least one course with hopefully a field component using technology in meaningful ways with students." (Participant 14) Faculty thought it was important for students to have courses utilizing technology to create more vivid pictures for preservice teachers to consider and understand the complexity and messiness of teaching and where students can learn to use Internet resources to appropriately respond to instructional needs, planning needs, and professional development growth needs.

> Technology should create more interactive context for students. We need to give students more independent power via technology. For example, inside of class, webquest or scavenger hunt kinds of things. Here's a case of what situation a student is in—use the web to discover alternative strategies to meet this child's needs. Yet, conversation is important so students would work together in groups in this kind of activity. (Participant 2)

There were also more extreme differences between faculty responses on what was an acceptable implementation. These ranged from a minimalist approach such as "Incorporating minimal things that don't really change the kinds of experiences that preservice teachers have." (Participant 5) to a more elaborate approach of technology into the teacher education program.

> Every teacher educator recognizing that technology is an important facet of 21st century teaching and doing something to promote it within their area. It might be disconnected from what is happening in the schools or in different areas but every instructor uses technology to their benefit. EME 4401 [educational technology course in elementary program] would bring more of what is happening in all the other classes instead of the major focus on technology. True integration. (Participant 4)

The vision of an acceptable implementation of technology into the teacher education program, the stage at which most faculty agreed this institution was at, is actually the stage where the most discussions need to occur. There is a large disconnect between what happens in the different program areas and the expectations of students and faculty within these programs regarding the use of technology in education. Although there are common elements mentioned in interview responses, there is not a common vision of what the classroom would look like where technology is used and what teachers and students would be doing with the technology as Hall and Hord (2001) suggest. Further discussions among the faculty need to take place in order for the IC map to be more descriptive and fully developed.

Initial IC Map for the Integration of Technology into the Teacher Education Program

For this study, this initial version of the IC map is to provide word-pictures of what integrating technology into the teacher education program at this specific institution might look like at three implementation levels: unacceptable, acceptable, and ideal. Nearly all participants in this study stated that this institution is currently at an acceptable implementation level in terms of integrating technology into the teacher education program. See Table 1, page 146.

Study Implications

Although this study provides very contextual findings in terms of an IC map for this specific university, there are points that extend beyond the contextual boundaries that can provide insight for other teacher education programs, educational technologists, teacher educators that use technology, and instructional designers and developers. First and foremost, this study provides a model for all institutions of how to consider using the IC map within teacher education programs as new innovations are infused into 21st century teacher education programs. The CBAM (Hall, Wallace, & Dossett, 1973) has certainly been used widely in the field of educational technology but more as a method to determine what concerns teachers and teacher educators have regarding the use of technology and then de-

Table 1: Initial IC Map for the Integration of Technology into the Teacher Education Program

Unacceptable Implementation	Acceptable Implementation	Ideal Implementation
• Having no technology and having only technology used in teaching and learning • When technology is disconnected from teaching and learning • Considering technology as a means into itself • Attempting to have technology replace real classroom experiences	• Having a course about technology for students to take with a field component • To have technology facilitate learning experiences for preservice teachers and facilitate teaching for instructors • To have courses create more vivid pictures for preservice teachers to consider and understand the messiness of teaching • Where students use Internet resources to appropriately respond to instructional needs, planning needs, and professional development needs	• Technology is used to provide new and richer contexts for students through simulations. These simulations could: –provide experiences they would not encounter during an internship but which they should be exposed –allow teacher educators to assess preservice teachers in various instructional situations –allow preservice teachers to analyze situations related to planning, instruction, classroom management, and reflection • Seamless integration into instruction where the instructor does not have to agonize over the technology • Students in all field placements and internships would see students using computers in meaningful ways. • Faculty would model technology for teaching and learning in all courses • Technology is in the schools and used in meaningful ways.

veloping appropriate professional development opportunities for faculty. However, this study highlights the importance and need for continued conversations about the integration of technology into teacher education programs and what this means in terms of student learning for preservice teachers and the students they will serve in the future. A majority of the teacher educators in this study noted the integration of technology into the teacher education programs at this university was at an acceptable level. However, others would strongly disagree when looking at the big picture of technology in the teacher education programs at this university. For many of the teacher education programs, technology is only addressed in the "token" technology course. Educational technologist and other teacher educators that use technology might be totally surprised to learn their colleagues are completely satisfied with the technology integration into the teacher education programs; hence, the anticipated increase in integrating technology into courses is not occurring. Starting dialog where teacher educators have the opportunity to discuss their ideas on what teacher education courses and programs look like when teachers and students are seamlessly integrating technology into teaching and learning environments is critical.

A second yet related issue in the findings from this study support the recent calls in educational technology journals (Bull, Knezek, Roblyer, Schrum, & Thompson, 2005; Robyler & Knezek, 2003; Strudler, 2003; Thompson, 2005) for research in our field to provide data-driven research studies showing the value added of technology on student learning.

> Future research must address squarely the question of why teachers should use technology-based methods. The emerging theory base demands that studies look at technologies not as delivery systems, but as components of solutions to educational problems, and that research questions be stated in a way that contributions of methods can be examined and tested. (Robyler & Knezek, 2003, p. 63)

It is clear that faculty at this institution have not been convinced that the integration of technology is better, more effective for different groups of students, or adds value to student learning. Yet, many of the teacher educators in this study specifically mentioned the power of using simulations to help prepare preservice teachers. Applications such as simSchool (http://simschool.org) should be presented to teacher educators and other similar applications developed. This also shows the need for research studies that show the value or worth of using technology with different groups of students using the technology-based methods Robyler and Knezek (2003) mention.

Another aspect of integrating technology into the teacher education programs is to provide teacher educators with practical and relevant examples of how technology meshes with social justice, a disposition espoused by many teacher educators. The quality of experiences K–12 students have with technology in learning situations does influence their future schooling and employment opportunities. Therefore, we need to make these connections more transparent to teacher educators so modeling decision-making regarding the use of technology in instruction with social justice implications in mind occurs for preservice teachers. In turn, consider the ways technology can be used in teaching and learning if these preservice teachers all go into their classrooms with the mindset that technology is not just an instructional decision they make but also a social justice influence. These preservice teachers can and will go out and change the educational contexts in which they teach

Developing an IC map for implementing technology into teacher education programs at every institution will not ensure true integration of technology into teacher education programs. It will, however, provide a common language and starting point for conversations on whether change needs to take place, how change might look (by using the word-pictures generated by the faculty), and what kind of uses of technology are considered important by the faculty. The continued conversations can spur collaborative research projects to provide the data-driven research studies with technology-based methods and so much more. By starting conversations to build these word-pictures of ideal implementation of technology in teacher education programs, we can continue to work toward that ideal implementation where technology is not even noticed—it is just part of the teacher education concept being studied. The integration of technology into teacher education programs is truly a long journey. Yet, if we do not have meaningful and longitudinal conversations about what this will look like for our specific contexts and institutions, we will never really know whether we are even close to our goal or as the child in a backseat often asks "are we there yet?" Creating an innovation configuration map is a powerful tool in this journey. Hopefully, we are all making progress in our journey to "true integration" of technology into our teacher education programs.

Finally, developing an IC map regarding the innovation of technology into our teacher education program also allows teacher educators who use technology in their teaching an opportunity to show how technology can be seamlessly intertwined with other important concepts in teacher education: culturally responsive teaching, classroom management, and effective instructional strategies. Some participants interviewed in this study still express the view that technology is an "add-on" for teacher education programs. Even though technologists are seldom told this

explicitly, the thoughts and attitudes of some teacher education faculty regarding technology as something to be added if time, energy, or resources are there. The criticalness of using technology in teaching and learning is not truly seen. By developing models where we have word pictures which detail how technology clearly meshes and supports the goals of teacher education in general, there is a better chance of reaching true integration—where technology is used to teach teacher education concepts and not the focus of the concept. We are still far away from that point, but with more institutions increasing communications in terms of what does "it" look like in terms of faculty and students actions with technology as they learn how to effectively teach 21st-century students, we are bound to get closer to that point of true integration of technology into all teacher education programs.

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