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ORIGINAL PAPER

Investigating Practices in Teacher Education that Promote and Inhibit Technology Integration Transfer in Early Career Teachers

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Abstract The purpose of this study was to identify instructional technology integration strategies and practices in preservice teacher education that contribute to the transfer of technology integration knowledge and skills to the instructional practices of early career teachers. This study used a two-phase, sequential explanatory strategy. Data were collected through surveys and interviews. Participating early career teachers assessed themselves as proficient users of instructional technologies and comfortable with their level of technology integration in the classroom. They identified modeling of, reflecting on, and experimenting with technology integration in their teacher education programs as prevalent promoters of technology integration, and ineffective field experiences as the most prominent barrier. Findings from this study lead to naturalistic recommendations, corroborated by the literature, on how to improve technology integration in teacher education programs. In addition, the study offers a survey that can be utilized in future studies to investigate further technology integration transfer factors in the education of preservice teachers.

Keywords Learning transfer · Systemic change · Teacher education · Technology integration

In the early 1990s, personal computers and the introduction of the Internet changed thinking regarding how instructional technology might be utilized in K-12 classrooms (Stallard and Cocker 2001). In partial response, the federal government introduced the Preparing Tomorrow's Teachers to Use Technology (PT3) initiative to bring technologies, teacher professional development, curricular change, and incentives to teacher education programs (Duffield and Moore 2006). With the conclusion of the final round of projects in 2007, PT3 had awarded over 400 grants (U.S. Department of Education 2006). Outcomes reported from the multi-million dollar PT3 investment demonstrated significant transformation of teacher education programs (Duffield and Moore 2006). Yet, the actual impact on K-12 teacher practice remained largely unknown. Did preservice teachers of the PT3 era transfer newly gained technology integration skills into their classrooms?

Since 1998, the International Society for Technology in Education's (ISTE) has promoted a second wave of transformation with its ISTE Standards for Students and ISTE Standards for Teachers (International Society for Technology in Education (ISTE) 2014). Last revised in 2007–08, ISTE standards pushed thinking forward by providing "a vision of technology integration that promoted active student learning and engagement in higher-order thinking as they used technology to increase productivity, solve problems, conduct research, and communicate with others" (Niederhauser et al. 2007, p. 485). Recent research indicates that the standards are impacting technology integration in teacher preparation programs, particular in regards to evaluation and improvement (Crompton 2014). The question remains: Have the ISTE

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standards influenced enhanced technology integration practices in early career teachers once they have completed preservice training and entered their own classrooms?

Evidence suggests that national initiatives like the PT3 funded projects and ISTE sponsored standards have promoted change in teacher education programs. Further, studies measuring preservice teachers' perceptions of technology, usage of technology, comfort level with technology, as well as efficacy with and knowledge of technology (Atkins and Vasu 2000; Grable et al. 2006; Niederhauser and Perkmen 2008; Swain 2006) are now part of the literature base. From these types of studies, researchers have tried to extrapolate whether transfer with regards to technology skills and knowledge would take place once preservice teachers had their own classrooms (Brown and Warschauer 2006; Gronseth et al. 2010; Howard 2002; Sexton et al. 2009; West and Graham 2007; Williams et al. 2009). Extrapolations, however, are lacking in actual evidence of transfer by early career teachers. Given the end goal is to promote technology integration best practices by teachers in K-12 classrooms, more research investigating the transfer of technology integration knowledge and skills by recent teacher education graduates is needed (Lei 2009). Thus, the purpose of this study was to identify instructional technology integration strategies and practices in preservice teacher education that contribute to the transfer of technology integration knowledge and skills to the instructional practices of early career teachers who have graduated from technology-supported graduate teacher education programs. Three questions informed this research:

1) How do early career teachers assess themselves with regards to technology integration knowledge, skills, and practices?
2) What technology integration barriers do early career teachers manifest or experience? What are the identified sources of these barriers?
3) What practices in their preservice teacher education do early career teachers identify as supportive or prohibitive of technology integration in their classrooms?

Literature Review

To inform a framework for data collection, the literature was reviewed for best practice technology integration models as well as exemplary technology integration programs. Since transfer was the study focus, the concept of transfer and studies attempting to support transfer principles were also examined. This review resulted in the identification of nine technology integration transfer factors that, in turn, informed construction of study instrumentation.

Models of Best Practice in Teacher Education

Three themes emerged from teacher education programs offering models of best practice with regards to preservice teachers and technology integration. The first theme involved technology training for preservice teachers in content-specific methods *and* instructional technology courses that also included models of technology integration by faculty (Brown and Warschauer 2006; Gronseth et al. 2010; Kay 2006; Kumar and Vigil 2011; Polly et al. 2010). A second commonality was opportunities for students to develop their own technology projects to support learning and teaching, as well as time to reflect on and critique these experiences (Brush et al. 2003; Brush and Saye 2009; Keeler 2008; Ottenbreit-Leftwich et al. 2011). The third theme emphasized technology-rich environments both in preservice classrooms and field-based experiences with collaborative support from teacher education faculty, instructional technology faculty, and supervising inservice teachers. (Brush et al. 2003; Brush and Saye 2009; Gronseth et al. 2010; Polly et al. 2010; Seels et al. 2003; Wright et al. 2002).

A review of four different university programs characterized as having innovative approaches to technology integration revealed four additional commonalities: the university's emphasis on technology integration in all education courses; the use of national standards, such as those put forth by ISTE, to develop program curricula; the integration of technology into lower level general courses; and distance learning opportunities for students located in remote areas (Strudler and Wetzel 1999). Best practices and exemplary programs certainly provide guidance for how to structure technology integration learning experiences in the preservice years. However, another consideration is whether these experiences promote the transfer of technology integration knowledge and skills to a new teacher's classroom.

Technology Integration Studies Focused on Transfer

Since teaching situations and resources beyond the preservice classroom are so diverse, developing preservice learning opportunities for integrating technology that will be relevant outside the scope of the preservice program is challenging (Alderman and Beyeler 2008; Kumar and Vigil 2011; Ottenbreit-Leftwich et al. 2011; Polly et al. 2010). A variety of studies have attempted to measure the transfer effects of technology integration instructional strategies that had been incorporated into some aspect of a teacher education program. All of these studies occurred following the introduction of the PT3 initiative and some were funded by it. Additionally, all of them were reflections of the national call to standards initiated by ISTE.

The technology integration studies with an eye on transfer identified either the presence of or need for seven attributes.

These are: (1) hands-on, authentic and meaningful activities incorporating technology (Brown and Warschauer 2006; Ottenbreit-Leftwich et al. 2011; West and Graham 2007); (2) meaningful contexts that are similar to future classrooms, such as field-based experiences (Brown and Warschauer 2006; Polly et al. 2010; Ottenbreit-Leftwich et al. 2011; Williams et al. 2009); (3) modeling of effective uses of technology in content-specific areas (Gronseth et al. 2010; Kumar and Vigil 2011; Polly et al. 2010; West and Graham 2007; Williams et al. 2009); (4) opportunities for collaboration with others (Brown and Warschauer 2006; Williams et al. 2009); (5) reflection upon learning activities utilizing technology (Polly et al. 2010; Ottenbreit-Leftwich et al. 2011; West and Graham 2007); (6) opportunities for practice and experimentation with technology (Brown and Warschauer 2006; Kumar and Vigil 2011; Polly et al. 2010; Ottenbreit-Leftwich et al. 2011; West and Graham 2007; Williams et al. 2009); and (7) access to expert assistance during the initial stages of adoption (Brown and Warschauer 2006; West and Graham 2007). When it comes to the goal of transfer, these studies suggest that student learning experiences must be situated and hands-on and that transfer must not be assumed, but designed for, across courses and curricula.

A Synthesis of Nine Technology Integration Transfer Factors

Overall, nine characteristics were synthesized from the studies examined for best practices, exemplary programs, and positive transfer of technology skills to the real world classroom. These nine characteristics are thought to be the most salient factors in preservice teacher education that will promote the transfer of technology integration knowledge and skills to the classrooms of early career teachers. As such, they served as a basis for data collection. Table 1 lists these factors and the corresponding survey questions that were developed to investigate their presence in an early career teacher's preservice teacher education experience.

Methodology

This study employed a two-phase, sequential explanatory strategy, utilizing a mixed methods approach in order to obtain data from a sample of early career teachers (Creswell 2009). The study was conducted in the School of Education at a large, United States research university. The sample population consisted of male and female early career teachers who had completed a graduate level teacher education program through the university between 2008 and 2010; earned licensure; and were teaching in the K-12 educational system. The study focused on examining the technology integration practices of teachers in their second through fourth years of teaching.

The survey instrument used, "Technology Integration Knowledge and Skills of Early Career Teachers," is a customized survey drawing from three existing surveys as well as the nine transfer factors derived from the literature (Table 1). The survey may be accessed at: http://tinyurl.com/tech-int-survey. The survey consists of 72 items that explore participant perceptions regarding technology skills, level of adoption of technologies, degree of technology integration, barriers to technology integration, and factors that support or inhibit technology integration in teacher education. Additionally, the last section contained questions based upon the nine literature-based factors that foster positive transfer of learning from the classroom to the workplace with regards to technology knowledge and skills.

After three contact attempts, 24 out of 330 individuals completed the survey. Six participants consented to follow-up interviews. The follow-up interview protocol was developed based upon the findings rendered from the survey and consisted of six open-ended questions. The protocol sought to more deeply investigate the survey findings. Five survey completers voluntarily participated in a 30-minute follow-up interview. Data collection was completed in Spring of 2012.

During Phase One of this study, the survey's quantitative data were analyzed for descriptive statistics and the qualitative data were coded for themes. For Phase Two, the interview strand, interviews were transcribed while simultaneously creating researcher memos. Transcripts were sent to each participant for member checking (Rossman and Rallis 2003). Next, transcripts were read again and open coded to focus on identifying categories of phenomena (Saldena 2009). A spreadsheet organized by each participant and individual interview questions was created. In reviewing the data again for selective coding, themes existing across the interview data were recognized (Saldena 2009). The survey qualitative data were included in this process.

Findings and Discussion

Findings from this study are organized through subheadings corresponding to the three research questions: early career teacher self-assessment of technology integration knowledge, skills, and practices (question 1); technology integration barriers experienced by early career teachers (question 2); identified sources of these barriers (question 2); practices in teacher education supportive of technology integration (question 3); and practices in teacher education prohibitive of technology integration (question 3). This section concludes with recommendations to improve teacher education programs.

Table 1 Nine Factors that Promote Transfer and Corresponding Survey Questions

Factor that promotes transfer	Corresponding survey question
Meaningful Activities (Howard 2002; Kumar and Vigil 2011; Ottenbreit-Leftwich et al. 2011; Polly et al. 2010)	The activities I engaged in with regards to learning how to use technology in K-12 instruction during the program were meaningful in a way that helped me to actually use it in my own classroom.
Expert Guidance (Howard 2002; Williams et al. 2009)	I had access to expert guidance with regards to using technology in K-12 instruction during my coursework and/or field experiences.
Knowledge Building Guidance (Howard 2002; Kumar and Vigil 2011; Ottenbreit-Leftwich et al. 2011; Royer and Richards 2009; West and Graham 2007)	Faculty members provided experiences in learning how to integrate technology that increasingly became more challenging in order to gradually build my knowledge about technology integration.
Authentic, Hands-on Activities (Kumar and Vigil 2011; Ottenbreit-Leftwich et al. 2011; Polly et al. 2010; West and Graham 2007)	The activities I engaged in with regards to learning how to use technology in K-12 instruction during the program included authentic, hands-on experiences with technology that helped me to actually use it in my own classroom.
Authentic Contexts (Brown and Warschauer 2006; Brush et al. 2003; Howard 2002; Royer and Richards 2009; West and Graham 2007)	I had opportunities to practice integrating technology in my instruction in real K-12 classrooms during my program through field experiences (e.g. internships, student teaching, special projects including students, etc.).
Modeling Effective Use of Technology in Content-Specific Areas (Brush and Saye 2009; Gronseth et al. 2010; Hofer 2005; Keeler 2008; Polly et al. 2010; Strudler and Wetzel 1999; West and Graham 2007; Williams et al. 2009)	The professor(s) who taught my content-area methods courses (e.g. English, Math, Science, etc.) modeled how to effectively integrate technology into instruction for K-12 students.
Opportunities for Collaboration with Others (Brush et al. 2003; Brush and Saye 2009; Polly et al. 2010; Seels et al. 2003; Williams et al. 2009; Wright et al. 2002)	I had opportunities to collaborate with others (e.g. peers, faculty, teachers, etc.) in learning how to integrate technology in the classroom during my program.
Opportunities for Practice and Experimentation with Technology (Brush et al. 2003; Keeler 2008; Kumar and Vigil 2011; Ottenbreit-Leftwich et al. 2011; Polly et al. 2010; Williams et al. 2009; Wright et al. 2002)	I was required to incorporate technology activities into some of the lessons I designed for my content-area methods courses in order to practice how to integrate technology to support student learning.
Reflection upon Learning Activities that Utilize Technology (Brush et al. 2003; Brush and Saye 2009; Howard 2002; Keeler 2008)	I spent time reflecting upon the uses of technology in the classroom during my program in order to improve my instruction when I had my own classroom.

Teacher Self-Assessment of Technology Integration Knowledge, Skills, and Practices

A majority (75–100 %) of the early career teachers surveyed reported having access to the Internet, email, portable laptop carts, computer labs, LCD projectors and SmartBoards. A strong majority (83 %) also reported having access to a technology resource teacher in their school or district. A small number (4–17 %) reported access to learning management systems, iPads, iPod Touches, and distance learning labs. Thus, despite the variation, participants had better than average access to technology resources.

In order to gage how participants viewed themselves as adopters and users of technology in teaching and learning, the survey asked participants to rate themselves along two established adoption measures established by Knezek et al. (2000), the Stages of Adoption (Knezek et al. 2000) and the Concerns-Based Adoption Model (CBAM) (Knezek et al. 2000). The Stages of Adoption question aids in identifying a teacher's adoption of technology level. This one-item assessment asked each respondent to consider six technology adoption stages and select the stage that most closely reflected their current status. The stages were: awareness; learning the process; understanding and application of the process; familiarity and confidence; adaptation to other contexts; and creative application to new contexts. CBAM also offers a one-item self-assessment of a technology user's behaviors as he/she progresses in usage of various technology tools (Hall et al. 1975). This question asked the respondents to self-rate by selecting one of eight levels: nonuse, orientation, preparation, mechanical use, routine, refinement, integration, and renewal.

For the Stages of Adoption, a majority of the early career teachers (58 %) aligned themselves with the top level, Stage 6: Creative Application to New Contexts, indicating the ability to apply technology knowledge to technology use as an instructional tool and integrate it into instruction. Twenty-nine percent aligned themselves with Stage 5: Adaptation to Other Contexts, meaning the use of technology as tools for the teaching context as well as applications for instructional aid. For the CBAM Levels of Use question, 8 % aligned themselves with the highest stage, Level 6: Renewal, indicating they consistently reevaluate their use of instructional technology and often explore new ways to utilize it with students so that instruction remains engaging and innovative. Forty-two percent identified themselves with Level 5: Integration, indicating they collaborate with other educators in order to share best practices with instructional technology and maximize its impact in the classroom. Thirty-eight percent aligned with Level 4B: Refinement, suggesting they utilize instructional technology in a variety of ways to maximize its impact and support of student learning. In comparing the two measures, Stages 5 and 6 of the Stages of Adoption and Levels 4B, 5, and 6 of CBAM can each be interpreted as corresponding to a high degree of adoption and transfer. Thus, 87 and 88 % of participants reported high levels of adoption and transfer on the Stages of Adoption and CBAM measures, respectively.

Another way to investigate teacher technology integration practice is through perceived degree of independence. Six instructional technologies rose to the top (79–88 %) as ones that the early career teachers could use independently: utilizing the advanced features of email; importing and capturing digital images; utilizing the advanced features of Web browsers; using digital spreadsheets; utilizing SmartBoards; and implementing digital presentations. Respondents reported less independence with three technologies: Web design authoring tools, digital video, and digital media.

Three survey statements investigating current technology integration for learning practices received highly positive responses (96 %) from the early career teachers. These items were: integrating technology-based activities into the curriculum; using technology to support content learning in the classroom; and using technology and its unique capabilities to design new learning experiences with students. Two statements that ranked lower included: having students use technology to demonstrate their knowledge of content in non-traditional ways (67 %), and requiring students to use a variety of software tools and digital resources to support learning (59 %).

Overall, it can be surmised that the early career teachers who responded to this survey assessed themselves as being proficient users of instructional technologies, as evidenced by their responses to the Stages of Adoption, CBAM Levels of Use, and degree of independent use questions. Not surprisingly, instructional technologies that may not be found in schools as often (e.g., Web design authoring tools, digital video, and digital media) had lower reported instances of use in the classroom. The lower instances of use could also correspond to those instructional technologies usually requiring more specialized instructional design knowledge, and often involving a higher learning curve than the previously mentioned instructional technologies.

These findings align with research reporting that preservice teachers felt quite proficient with basic technologies, but lacked enough experience with more advanced technologies, even though they expressed positive feelings towards utilizing technology in their instruction (Lei 2009).

With regards to survey statements exploring technology integration in the classroom, the early career teachers responded most favorably to statements about utilizing technology-based activities to support content learning; create new learning experiences with students; assist in the support of state/federal curricular standards; and meet student individual needs. Four statements that received less favorable responses included: using technology-based activities embedded in project- and problem-based learning; evaluating educational technology resources for student use; demonstrating student proficiencies in non-traditional ways; and using a variety of technology tools to support learning. The way the early career teachers responded to these statements could be due, at least in part, to the barriers they identified in integrating technology in the classroom.

Technology Integration Barriers Experienced by Teachers

The strongest technology integration barriers (58–83 %) recognized by the early career teachers included: too much content to cover; lack of time to create and implement technology-based lessons; and lack of software available in the school. These three issues often prevent the effective integration of technology by teachers, as cited in research over the last 15 years (Ertmer 1999; Fabry and Higgs 1997; Keengwe et al. 2008; Rogers 2000; Royer and Richards 2009). It is noteworthy that all of these barriers are external factors in that they are directly related to the classroom or school environment. Ertmer (1999) described external barriers that affect both preservice and inservice teachers in their integration of technology as first-order barriers. Items recognized by participants as less significant barriers (12–29 %) to technology integration included: lack of mentoring; lack of knowledge about technology integration; and lack of knowledge about technology. Ertmer (1999) described these internal factors as second-order barriers. Thus, study findings indicate that the early career teachers surveyed found their school environments (first-order barriers) to be more inhibitive of technology integration than their own knowledge or access to knowledge (second-order barriers).

Consistent with Creswell's (2009) sequential explanatory strategy, the results from this survey section were formulated into an interview question in order to further investigate these issues. Three of the five interviewees identified time as a barrier and two of these same participants identified content as a barrier in addition to the time. Two teachers did not feel that any of these items were barriers. They were able to integrate technology into their instruction comfortably and within the available time constraints, conveying a belief that if technology is utilized correctly and according to what is best for students, methods would account for content and meet the applicable standards. This idea is consistent with Brill's (2002) findings regarding innovative teachers and their tendency to innovate in systemic and strategic ways. None of the interviewees listed technology as a barrier as they each indicated that their respective schools possessed a high level of access to a variety of instructional technologies.

Practices in Teacher Education Supportive of Technology Integration

A review of the literature pinpointed nine factors characteristic of teacher education programs that promote the transfer of technology integration knowledge and skills by their graduates to the classroom (see Table 1). Survey respondents were asked to rank each of these factors using a Likert-scale that ranged from "Strongly Agree" to "Strongly Disagree" in regards to prevalence in their preservice teacher education. The factors were ranked, from most prevalent to least prevalent, in the following order: modeling; reflecting; practicing and experimenting with technology; expert guidance in coursework; collaboration; hands-on, authentic experiences; meaningful activities; scaffolding; practice utilizing technology in real K-12 classrooms; and expert guidance in field experiences.

Similar to the survey findings, the following transfer factors were mentioned by three of the five early career teachers interviewed as being the most prevalent in their respective teacher education programs: modeling; practicing and experimenting; and expert guidance from faculty. Further, all of the programs represented by interviewees included some sort of experimentation and practice with technology during their graduate course of study. Those interviewed from the Math and Science Education programs reported limited exposure to technology integration through one technology class. In contrast, the English Education graduates reported exposure to technology integration instruction throughout the program experience including English Education faculty that would travel to field experience schools to ensure that technology integration was carried out in these experiences as well as during coursework. Research supports that exemplary programs in technology training for preservice teachers integrate technology throughout all educational courses and often couple instructional technology courses with practicum experiences in order to provide more authentic applications of technology use in the classroom (Strudler and Wetzel 1999). Further, programs that integrated technology through all components of teacher education were found to be more successful than those who relied only on a stand-alone instructional technology course (Hofer 2005).

Weaving technology integration through the entire preservice teacher education experience, including field practice, seems to develop more agile teachers who are able to integrate instructional technologies despite common barriers (e.g., time, content, etc.), thus addressing the real challenge, as described by Jacobsen et al. (2002): to "develop fluency with teaching and learning with technology, not just with technology, itself" (p. 44).

Practices in Teacher Education Prohibitive of Technology Integration

Survey responses identified field experiences during teacher education as a component that prohibited technology integration knowledge and skills transfer. Research supports that providing preservice teachers with the opportunity to integrate technology during field experiences aids in transferring the subsequent knowledge and skills to future classrooms (Brush et al. 2003; Brush and Saye 2009; Gronseth et al. 2010; Polly et al. 2010; Seels et al. 2003; Wright et al. 2002). A question, therefore, was created for the interview protocol to explore the survey finding further.

Within the context of exploring barriers during field experiences, only one interviewee identified the cooperating teacher as being the main barrier to allowing technology integration. Another interviewee mentioned not getting to collaborate with classmates and faculty during her field experience, which she felt could have helped with the technology integration field experience. Two other interviewees identified a lack of time and technology resources as the factors within the field experience environment that prevented them from utilizing technology. These are the same barriers that the early career teachers recognized as factors impeding them from integrating technology once in their own classrooms.

Other teacher education practices that were mentioned by the interviewees to be prohibitive of technology integration included: guidance by faculty that was not necessarily expert; having only one instructional technology-related course; and limited opportunities to practice with technology in content-specific and methods courses. In contrast, teacher education programs having expert guidance and technology-infused coursework as well as field experiences rich with technology opportunities promote the transfer of technology integration knowledge and skills to the classrooms of early career teacher more than programs that do not (Brush et al. 2003; Brush and

Saye 2009; Gronseth et al. 2010; Polly et al. 2010; Seels et al. 2003; Wright et al. 2002).

Recommendations to Improve Technology Integration Transfer

When study participants were probed for suggestions, two ideas emerged regarding how to improve preservice field experiences. First, it was suggested that faculty ensure that cooperating teachers are aware of the technology requirements for the student teachers and travel to the participating schools to aid both the preservice and inservice teachers with integrating technology into the classroom. Wright et al. (2002) demonstrated that this practice was an effective component of the Master Technology Teacher (MIT) program through which education and instructional technology faculty from the university worked closely with preservice and supervising inservice teachers to brainstorm opportunities to integrate technology.

Second, participants suggested that faculty be aware of technology access in each participating school and supplement school technology resources with relevant, mobile instructional technologies that preservice teachers can checkout and take to the schools. Mobile instructional technologies were an important component of the MIT program discussed previously. Preservice teachers were able to utilize the university's Technology on Wheels (TOW) program to introduce hardware and software provided by the program to the field experience school sites (Wright et al. 2002). More broadly, research has indicated that teacher education programs incorporating faculty involvement and resource support for preservice teachers are more effective in the transfer of technology integration knowledge and skills (Brush et al. 2003; Brush and Saye 2009; Ottenbreit-Leftwich et al. 2011; Polly et al. 2010; Seels et al. 2003; Wright et al. 2002).

Study Limitations

This study has three limitations. The most outstanding limitation was the low response rate for both the surveys and interviews. Despite three solicitations and enlisting the support of the university School Director and the Director of Academic Programs, the study only had 24 respondents from a pool of 330 early career teachers (7 %). McMillan (2004) recommended a minimum of 30 subjects for non-experimental research while, for qualitative studies, there is no recommended minimum. A second limitation of this study was the sample population utilized. The research study only recruited early career teachers from a specific school of education at a large, United States research university that only offers graduate degree programs. Other types of teacher education programs should also be studied. A third limitation was that the study participants were guaranteed anonymity, a non-negotiable requirement of the organization providing participant emails. Thus, clarifications from respondents once the survey was submitted were not possible. Were the survey to be adapted for future studies, it is recommended that additional strategies to increase response rate and confidentiality, rather than anonymity, be used.

Contributions of the Study

Despite this study's limitations, the work provides three prominent contributions to the current literature base regarding technology integration training in teacher education programs. This study provides teacher educators and scholars with empirical findings related to technology integration strategies in teacher education that both support and hinder the transfer of new knowledge and skills to the classroom practices of early career teachers. Research in this realm is lacking. Secondly, this research provides teacher educators with naturalistic recommendations (Stake 1995) on how to improve their programs that are corroborated by the literature. Finally, the study offers an adapted survey that can be utilized by researchers to investigate technology integration transfer from the teacher education period to the early classroom practice period of new teachers. The survey can serve as a valuable source of data for teacher education programs in specifically pinpointing areas of strength and areas for improvement. Such evaluative data is vital in today's teacher education programs where preservice teachers are expected to be competent in the area of instructional technology and how to utilize it in the classroom to support student learning (Howard 2002; West and Graham 2007; Whittier and Lara 2006; Williams et al. 2009).

Conclusion

Teacher educators can learn a great deal about their own programs with regards to practices that foster technology integration knowledge and skills and promote transfer to the classrooms of early career teachers by employing some type of data collection method that regularly seeks input from recent graduates. The customized survey utilized in this study provides one such vehicle. However, more research needs to be conducted in order to fully understand the effectiveness of the transfer qualities investigated in this study and to identify other practices that may be useful as well. Determining which strategies to focus on may be different for each teacher education program given the characteristics that make it unique. Yet, this study provides evidence of a positive starting point as well as a survey for data collection. Teacher education programs need to provide enough technology skills and instructional theory for their teacher graduates to begin the early practice years smoothly. Just as important, programs need to foster the desire of new teachers to keep abreast of advancing instructional technologies in a dynamic field.

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