Preservice and In-Service Teachers' Perceptions toward Technology Benefits and Integration

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ABSTRACT

This study examined preservice teacher attitudes toward and expected technology integration practices as compared to in-service teachers' attitudes toward and actual (self-reported) practice of technology integration. The preservice teachers revealed a greater level of confidence in their ability to integrate technology and more positive beliefs in the benefits of using technology to improve teaching and learning than did in-service teachers. However, these differences were not evidenced when examining perceptions on the basis of self-reported technology skill levels. Both preservice and in-service teachers who reported above average technology skills revealed significantly more positive attitudes and perceptions about technology integration than those who indicated less skill. These findings confirm the need to continue preservice and in-service initiatives that not only better prepare K-12 teachers to effectively integrate technology into the classroom, but also increase their technology skills.

Many believe that technology use by K-12 students will result in overall gains in student achievement and better preparation of students for future careers in a digital society. As a result, over $2.5 billion in federal funding have been spent on preservice and in-service teachers to better prepare them to effectively integrate technology into their instruction (U.S. Department of Education, 2007). Although positive trends have emerged from these initiatives, the overall results still fall below general expectations regarding the potential benefits of using technology in K-12 classrooms (Parsad & Jones, 2003; Swanson, 2006; U.S. Department of Education, 2007). Research has not yet clearly identified where problems may exist along the continuum from preservice teacher preparation to in-service teacher professional development. In order to address a portion of this problem, this study investigated the perceptions regarding technology integration and abilities of preservice (at the student-teacher level) and in-service teachers in order to determine possible differences that might influence technology integration efforts.

In order to investigate technology integration efforts, it is important to clarify the meaning of technology integration. The International Society for Technology in Education's (ISTE) National Education Technology Standards (NETS) states that "the integration of technology in teaching and learning is a natural, seamless act of selecting the right tool for the learning task that effectively facilitates learning, fosters self-motivated, self-regulated learning with multifaceted assessment and accountability" (ISTE, 2008). This description of technology integration will be used for this study.

When examining technology integration from this viewpoint, there have been various benefits noted in multiple research studies. For example, the use of multimedia in the classroom is becoming more prevalent due to its ability to create more positive attitudes toward higher level learning skills (Harris, 2002), its ability to produce a more hands-on, interactive learning environment that accelerates student performance (Wang, 2000), and also its ability to provide a self-paced environment in which students are free to work at varying levels (Doe, 2006).

STATEMENT OF THE PROBLEM

Research that identifies causes for infrequent or ineffective use of technology is abundant. Results of many studies have identified inadequate preparation of preservice teachers and under-prepared in-service teachers as influential factors with regard to use of technology in K-12 classrooms (Bauer & Kenton, 2005; Brinkerhoff, 2006; Russell, Bebell, O'Dwyer, & O'Conner,

2003; Wozney, Venkatesh, & Abrami, 2006). Research has suggested that properly prepared preservice and in-service teachers are more apt to utilize technology in their classroom than are under-prepared preservice and in-service teachers. Based on this premise, it would appear that if these teachers are indeed more prepared to integrate technology, then this would have a positive effect on their perceptions of the benefits of technology and technology integration and their own abilities to use technology as well. If teachers perceive themselves as prepared to use technology and perceive technology integration to be beneficial to the learning process for their students, then they would be more inclined to do so. However, although most researchers now recognize the importance positive perceptions and beliefs have on actual integration, to date very little if any research has investigated the influence these perceptions have on the actual integration practices of preservice and in-service teachers.

REVIEW OF THE RELEVANT LITERATURE

In regards to teacher perceived readiness to use and implement technology, this study focused on research from two viewpoints: preservice teacher attitudes toward and *expected* technology integration practices (Brown & Warschauer, 2006; Lipscomb & Doppen, 2004; Sheffield, 1996) and in-service teachers' attitudes toward and *actual* (self-reported) practice of technology integration (Christensen, 2002; Judson, 2006; Wozney, Venkatesh, & Abrami, 2006).

Preservice Teachers

Research has shown that the need to feel prepared and comfortable to use technology in the classroom is perhaps the most critical aspect of achieving effective technology integration practices among preservice teachers. The responsibility of properly preparing preservice teachers to integrate technology falls on the teacher preparation programs. It furthermore is the responsibility of these programs to provide preservice teachers with a comfort level in doing so while also instilling in them an understanding of the benefits of integration. Research insists that by doing this, preservice teachers will develop more positive perceptions toward technology integration. Although significant progress has been made by using coursework designed to teach integration methods, proper use of modeling through various methods, as well as through observation of proper integration techniques, often the preservice teachers remain inadequately prepared. This idea is echoed through a study in which 49 preservice teachers were surveyed concerning the importance of computers. Results indicated that although 95% of them felt that computers were 'very' important in schools, only 21% of them had ever voluntarily taken a computer course (Whetstone & Carr-Chellman, 2001). The results also revealed that preservice teachers often displayed overconfidence in using technology in the classroom, which may lead to little or no actual use of technology when preservice teachers enter the field as practicing teachers.

In-service Teachers

Research indicates that in order to incorporate technology into the classroom effectively, teachers must first have positive attitudes toward the benefits of technology and integration. So, while the use of workshops/seminars, professional development and graduate coursework is successful in preparing in-service teachers to integrate technology, researchers have learned that it is equally important to identify the perceptions and beliefs that many in-service teachers have toward technology integration (Mouza & Wong, 2009). This is especially true for negative perceptions that may hinder their integration efforts (Russell, Bebell, O'Dwyer, & O'Conner, 2003).

Additionally, Goktas, Yildirim and Yildirim (2009) found that there are other barriers such as lack of training, software/materials, skills, and hardware that play a large role in the decision of in-service teachers to integrate technology into their classroom. Al-Bataineh, Anderson, Toledo and Wellinski (2008) found that access and availability of technology were other significant barriers to using technology in the classroom. Both of these studies tended to point to increasing the budgets in this area to help eliminate some of the more important barriers to implementation of technology.

SIGNIFICANCE OF THE STUDY

Lack of effective use of technology integration is a well-documented issue within the educational arena. However, trying to identify exactly where the problems exist (preservice or in-service) in

order to make improvements can be a bit challenging if not misleading for university programs and schools in general. In an effort to identify exactly where the problems appear to be, this study focused on trying to identify the weak link and either identify the need for either more technology integration training for preservice teachers within their teacher educational programs or support the need for more professional development for in-service teachers. Thus, the following research question was utilized in this study: Do differences exist between the perceptions of preservice (at student teacher level) and in-service teachers regarding the benefits of technology for classroom instruction, the benefits for student learning, and regarding personal readiness to integrate technology into educational practices?

METHODOLOGY

Participants

There were a total of 230 participants in this study. Of those, 112 were preservice teachers from a total population of 125 and 118 were in-service teachers from a total population of approximately 309 teachers.

Preservice teachers. All preservice teachers in this sample were beginning the student teaching portion of the teacher education degree program at a mid-sized, southeast rural university with an enrollment of approximately 6,300. It is important to note that the survey had been administered prior to their actually going into the schools to student teach. Thus, they have not had that experience of being in the classroom teaching at the time the survey was administered. However, it is equally important to note that the students have been through the required technology course specifically designed to teach students to properly integrate technology in the classroom. The course also includes exposure to many of the technology related resources and/or Web sites needed to properly integrate technology. Each student is required to evaluate many integrated lessons and must create at least one fully detailed integrated lesson in their field.

Prior to student teaching, all preservice teachers were fully admitted into the teacher education program, which is accredited by the National Council for the Accreditation of Teacher Education (NCATE) and grants bachelors and masters degrees, and were in their senior year with a minimum cumulative grade point average of 2.50. Participants had completed 80% of the coursework in their endorsement area and must have completed all specialized teaching strategies courses and all reading requirements. All respondents had obtained approval for their Professional Portfolio, which included information about themselves, their experience, past employment, awards, and activities relevant to the profession as well as their philosophy of teaching. Table 1 below displays the demographic characteristics of the preservice group.

In-service teachers. The in-service teachers represented a wide variety of curriculum areas taught in grades K-12 in schools located in the same county as the university. This included two high schools, two elementary schools, two middle schools, two K-12 schools, one K-8 school, and one primary school. As of 2004, there were 208 elementary teachers and 101 secondary teachers for a total of 309 total teachers in this county. There were approximately 5,085 students total in the county school systems, which is an average of 508.5 per school. Table 2 displays the demographic characteristics of the in-service group.

As shown in the demographic tables, the majority of preservice respondents (40.2%) were middle school while the majority of in-service respondents (44.1%) were elementary. It is also important to note that while all preservice respondents were from the same university, 76.3% of the in-service respondents were also graduates from that same university. The largest percentage of preservice respondents (74.1%) were between the ages of 20-25 years old while the largest percentage of in-service respondents (32.2%) were between the ages of 46-55 years old. Additionally, the majority of both preservice (73.2%) and in-service (83.9%) respondents were female.

Instrument

The Teacher Technology Questionnaire (TTQ) (Lowther, Ross, & Alberg, 2001) was used to assess teacher perceptions about technology. There were two versions of the survey, one for preservice teachers (Preservice Teacher Technology Questionnaire (PTTQ) and one for in-service teachers (In-service Teacher Technology Questionnaire (ITTQ) (see Table 3).

Table 1
Demographic Characteristics of Preservice Respondents (N = 112)

Characteristic	f	P
Grade Level		
Elementary	35	31.3
Middle	45	40.2
Secondary	32	28.6
Age		
20 to 25 Years	83	74.1
26 to 30 Years	16	14.3
31 to 35 Years	6	5.4
36 to 45 Years	4	3.6
46 to 55 Years	3	2.7
56 and up	0	0
Race		
Caucasian	105	93.8
African American	6	5.4
Hispanic	1	.9
Asian	0	0
Other	0	0
Sex		
Male	30	26.8
Female	82	73.2
Lab Access		
Yes	101	90.2
No	11	9.8
Computers in the Cooperating Teacher's Classroom		
None	35	31.3
One	22	19.6
Two	13	11.6
Three	10	8.9
Four	14	12.5
More than Four	18	16.1
Computer Type		
No computer	4	3.6
A laptop	6	5.4
A computer station	88	78.6
A laptop and a computer station	14	12.5

Table 2
Demographic Characteristics of In-service Respondents (N = 118)

Characteristic	f	P
Grade Level		
Elementary	52	44.1
Middle	29	24.6
Secondary	37	31.4
Curriculum Area		
Math	9	7.6
Science	9	7.6
Language Arts	18	15.3
Technology/Vocational	11	9.3
Fine Arts	2	1.7
Social Studies	6	5.1
Special Education	13	11.0
Physical Education/Wellness	8	6.8
Foreign Language	2	1.7
Business	1	.8
Elementary	39	33.1
Graduate of Same University as Student Teachers		
Yes	90	76.3
No	28	23.7
Age		
20 to 25 Years	3	2.5
26 to 30 Years	11	9.3
31 to 35 Years	15	12.7
36 to 45 Years	34	28.8
46 to 55 Years	38	32.2
56 and up	17	14.4
Race		
Caucasian	117	99.2
African American	1	.8
Hispanic	0	0
Asian	0	0
Other	0	0
Sex		
Male	19	16.1
Female	99	83.9

Table 2 (continued)		
Years of Experience		
One Year	5	4.2
Two to Five Years	6	5.1
Six to Seven Years	10	8.5
Eight to Ten Years	15	12.7
Eleven to Fifteen Years	23	19.5
Fifteen or More Years	59	50.0
Lab Access		
Yes	104	88.1
No	14	11.9
Computers in the Classroom		
None	27	22.9
One	17	14.4
Two	12	10.2
Three	13	11.0
Four	23	19.5
More than Four	26	22.0
Computer Type		
No computer	2	1.7
A laptop	3	2.5
A computer station	100	84.7
A laptop and a computer station	13	11.0

Table 3
Comparison of Preservice and In-service TTQ

Preservice	In-service
Impact on Classroom Instruction	
1. My teaching will be more student-centered when technology is integrated into the lessons.	1. My teaching is more student-centered when computers are integrated into the lessons.
2. I will routinely integrate the use of computers into my instruction.	2. I routinely integrate the use of computers into my instruction.
3. Technology integration efforts have changed classroom learning activities in a very positive way.	3. Technology integration efforts have changed classroom learning activities in a very positive way.
4. My teaching will be more interactive when technology is integrated into the lessons.	4. My teaching is more interactive when computers are integrated into the lessons.
Impact on Students	
5. The use of computers increases the level of student interaction and/or collaboration.	5. The use of computers has increased the level of student interaction and/or collaboration.
6. The integration of technology positively impacts student learning and achievement.	6. The integration of technology has positively impacted student learning and achievement.
7. Most of my students will be able to capably use computers at an age-appropriate level.	7. Most of my students can capably use computers at an age-appropriate level.
8. The use of technology improves the quality of student work.	8. The use of technology has improved the quality of student work.
Teacher Readiness to Integrate Technology	
9. I know how to meaningfully integrate computers into lessons.	9. I know how to meaningfully integrate computers into lessons.
10. I am able to align technology use with standards-based curriculum.	10. I am able to align use of computers with my district's standards-based curriculum.
11. I have received adequate training to incorporate computers into my instruction.	11. I have received adequate training to incorporate computers into my instruction.
12. My computer skills are adequate to conduct classes that have students using computers.	12. My computer skills are adequate to conduct classes that have students using computers.

The Teacher Technology Questionnaire (TTQ) is a 20-item instrument designed to assess teacher *perceptions* concerning the following five constructs: *Impact on Classroom Instruction, Impact on Students, Teacher Readiness to Integrate Technology, Overall Support for Technology in the School,* and *Technical Support*. However, only three of these were addressed in the present study using a total of 12 questions: *Impact on Classroom Instruction*, *Impact on Student Learning*, and *Teacher Readiness to Integrate Technology*. Respondents used the following 5-point Likert-type scale to indicate whether they agreed or disagreed with the comments. The scale included the following options: *1 = Strongly Disagree, 2 =Disagree, 3 = Neutral, 4 = Agree* or *5 = Strongly Agree*. For the purposes of this study, it was only necessary to determine whether the participants 'agreed' or 'disagreed' with the statements and

not necessarily how 'strongly' they agreed or disagreed. Thus, for this study results for Strongly Disagree and Disagree were combined as were Agree and Strongly Agree.

The TTQ descriptions of technology tasks were developed and validated at the Center for Research in Educational Policy at the University of Memphis (Lowther, Thompson, Ross, McDonald, & Wang, 2004). Internal consistency reliability (Cronbach's alpha) results for this sample for each subscale were as follows: *Impact on Classroom Instruction* (preservice = .88; in-service = .83); for *Impact on Student Learning* (preservice = .73; in-service = .73); *Teacher Readiness to Integrate Technology* (preservice = .77; in-service = .83).

The first section, *Impact on Classroom Instruction*, consisted of four statements that address the perceived impact technology integration has on lessons and teaching styles of both the preservice and in-service teachers.

The second section, *Impact of Technology on the Students*, consisted of four statements that address the perceived impact technology use in the classroom has had on the students. Specifically, it assessed the impact on student interaction/collaboration, learning and achievement, quality of work and to how they perceive student ability to use computers at an age-appropriate level.

The third section, *Teacher Readiness to Integrate Technology*, consisted of four statements that addressed how prepared the teachers feel they are to meaningfully integrate computers into lessons. They were also asked to address their perceived abilities to align technology use with curriculum standards and if they felt they had adequate computer skills and were adequately prepared to incorporate technology into their instruction.

Procedures

The researcher contacted all 125 members of a student teacher class via email to solicit volunteers to participate in this study. The email explained the purpose of the study and provided brief details regarding the amount of time and computer equipment needed to complete the survey. The email contained a direct link to the online questionnaire. The survey site provided the Informed Consent Form and instructions for completing the questionnaire. A follow-up email was sent to each preservice teacher one week after distribution of the original email to solicit participation from those who had not yet responded and to thank those who had completed the questionnaire.

To solicit participation of at least 50-75 volunteer in-service teachers that fit the requirements of this study, an email was sent to the school system's Assistant Director who forwarded the email to the principals of all (10) schools in the district. The email consisted of a brief description of the study consent process, and the questionnaire, including an estimation of the time it should take to complete the questionnaire and its Web address. In-service teachers who agreed to participate were presented with the informed consent statement before beginning the online questionnaire and were informed that submission of the completed form indicated their willingness to participate.

Questionnaires were completed during one online session. All responses were anonymous. Once the questionnaires were completed, the results were automatically sent to a secure server. The survey instruments were administered online using Dragon Web surveys, a companion to the FileMaker Pro database software. The questionnaire was designed to prevent submission of incomplete forms. If participants attempted to submit a form with blank items, they were prompted as to which items were left blank and asked to go back and complete those items.

RESEARCH DESIGN

Data were analyzed using a Multivariate Analysis of Variance (MANOVA) to compare preservice and in-service teachers' responses to the TTQ. Specifically, data from three categories were included from the TTQ (*Impact on Classroom Instruction*, *Impact on Student Learning*, and *Teacher Readiness to Integrate Technology*).

The data were used to determine if differences existed between preservice and in-service teacher perceptions regarding the benefits of technology for classroom instruction, for student learning, and regarding personal readiness to integrate technology into educational practices (see Table 4).

Table 4
Teacher Technology Questionnaire by Group, Frequency and Percent per Response Level, Mean, and Standard Deviation by Item
Pre-service N = 112
In-service N = 118

Category and Related Items*	Group	Strongly Disagree (1) Disagree (2) n (%)		Neutral (3) n (%)		Agree (4) and Strongly Agree (5) n (%)		M (SD)	
		Pre-service	In-service	Pre-service	In-service	Pre-service	In-service	Pre-service	In-service
Impact on Classroom Instruction	Overall	26 (5.8)	84 (17.8)	85 (19.0)	119 (25.2)	337 (75.2)	269 (57.0)	3.90 (.809)	3.48 (.948)
Impact on Students	Overall	11 (2.5)	54 (11.4)	105 (23.4)	103 (21.8)	332 (74.1)	315 (66.7)	3.99 (.787)	3.69 (.881)
Readiness to Integrate Technology	Overall	23 (5.2)	59 (12.5)	59 (13.1)	93 (19.7)	366 (81.7)	320 (67.8)	4.03 (.793)	3.69 (.920)

*Preservice item differences noted in parenthesis

RESULTS

Results from a Multivariate Analysis of Variance (MANOVA) revealed an overall significant difference between preservice and in-service teachers' perceptions, Wilks's $\Lambda = .92$, $F(3, 226) = 6.67$, $p < .01$. The effect sizes as represented by partial eta squared were found to be moderate (Cohen, 1988). A summary of descriptive statistics is presented in Table 5.

Follow-up univariate analyses revealed a significant difference ($F(1, 228) = 18.601$, $p < .001$, $\Lambda^2 = .07$) between the two groups for *Impact on Classroom Instruction*. Examination of the mean scores revealed that the preservice teachers ($M = 3.90$, $SD = .81$) ($M = 3.5$, $SD = .95$) had a significantly higher level of agreement than in-service teachers that technology has a positive impact on instruction. Similar differences were shown with regard to participant perceptions of *Impact on Student Learning* ($F(1, 228) = 13.16$, $p < .001$, $\Lambda^2 = .06$). The preservice teachers revealed significantly more positive perceptions than in-service teachers about the benefits of technology for student learning (preservice $M = 4.0$, $SD = .79$; in-service $M = 3.69$, $SD = .88$).

Table 5
Multivariate/Univariate Results by Teacher Group on Impact on Classroom Instruction, Impact on Student Learning, and Teacher Readiness to Integrate Technology into Their Teaching

Source/Dependent Variable	Λ	F	df	p	η^2
Teacher Group	.919	6.667	3/226	.000*	0.081
Impact on Classroom Instruction		18.601	1/228	.000*	0.075
Impact on Student Learning		13.159	1/228	.000*	0.055
Teacher Readiness to Integrate		14.302	1/228	.000*	0.059

*$p < .01$

When examining the final component of the research question, *Teacher Readiness to Integrate Technology*, significant differences were once again revealed that favored the preservice teachers ($F(1, 228) = 14.30, p < .001, \Lambda^2 = .06$). The effect size as represented by eta squared was found to be moderate. In particular, the preservice teachers exhibited a higher agreement ($M = 4.03$, $SD = .79$) than in-service teachers ($M = 3.69$, $SD = .92$) that they were prepared to integrate technology into their teaching.

DISCUSSION

The results of this study revealed that significant differences did exist between the preservice and in-service teachers with regard to their perceptions about the benefits of educational uses of technology as well as their perceived readiness to integrate technology into their teaching. The preservice teacher (with no teaching experience) had significantly more positive agreement that technology integration efforts will change classroom activities in a very positive way in contrast to in-service teachers (with teaching experience) who reported less positive perceptions. This trend was also found when examining impressions regarding the positive impact of technology integration on student learning and achievement as the in-service teachers' responses were significantly less positive than the preservice teachers.

Technology's Impact on Students and Instruction. The preservice teachers had significantly more positive agreement that technology integration efforts will change classroom activities in a very positive way as compared to in-service teachers who reported less positive perceptions. This trend was also seen when examining perceptions regarding the positive impact of technology integration on student learning and achievement. The in-service teachers' responses were less positive than the preservice teachers'.

These findings concerning teacher perceptions are consistent with studies investigating similar questions. For example, exposure to proper integration techniques enhances preservice teachers' self-efficacy toward integration (Dexter, Doering, & Riedel, 2006; Wang et al., 2004). However, it is often difficult for teacher education programs to find opportunities for preservice teachers to observe, and more importantly to practice, effective integration techniques (Strudler, Archambault, Bendixen, Anderson, & Weiss, 2003). Thus, their perceptions frequently lack the substantiation of real-world experiences (from in-service teachers properly modeling) that impact technology integration practices. On the other hand, the perceptions of in-service teachers reflect the actual context of classroom settings and educational expectations placed on teachers. Specifically, in-service teachers are often reluctant to integrate technology because of factors such as lack of time and/or insufficient access to technology resources (Friedman, 2006; Wepner & Tao, 2002).

Readiness to Integrate Technology. The third component of the research question examined teacher perceptions of their readiness to integrate technology into their teaching. This study found that overall, preservice teachers felt more prepared than in-service teachers to integrate technology. Possible reasons for these results include increased emphasis on improving teacher preparation programs and data revealing that in-service teachers need more professional development focused on effective technology integration (Jeffs & Banister, 2006; Whetstone & Carr-Chellman, 2001).

Teacher education programs, PT3s, and other initiatives, have implemented innovative strategies to better prepare preservice teachers to use and integrate technology that have resulted in positive trends in overall teacher confidence (Beyerbach, Walsh, & Vannatta, 2001; Ertmer et al., 2003; Jeffs & Banister, 2006; Pope, Hare, & Howard, 2005; Whetstone & Carr-Chellman, 2001). The goal is that in time, these programs will produce in-service teachers who are better prepared to integrate effective uses of technology into their teaching. The results of this study suggest that the preservice teachers participated in a teacher education program that instilled greater confidence to integrate technology into their teaching. Another contributing factor could be related to age of the participants in that 88.4% of the preservice teaches were aged 30 or younger as opposed to 11.8% of the in-service teachers in that same age range. Research has shown that younger adults, often referred to as Digital Natives, have used computers and other technologies their entire lives and thus are more comfortable using and learning in this manner (Prensky, 2001).

Findings regarding in-service teacher perceptions regarding their readiness to integrate are consis-

tent with those revealed in a recent nationwide study conducted by Swanson (2006). In particular, data from 47 states indicated that the majority (67%) of the states' respondents identified professional development as the greatest technology related need. While professional development has been found to be the most needed component in raising self-efficacy levels by better preparing in-service teachers to integrate (Rother, 2004), the level of self-efficacy among in-service teachers is noted as a major influence on their actual decision to integrate (Russell et al., 2003). Results from these and other studies that addressed the role of self-efficacy and the need to feel prepared found that the use of multimedia instruction, needs-based instruction, graduate courses and various types of instructional workshops can greatly improve self-efficacy levels among in-service teachers (Adams, 2005; Albion & Ertmer, 2002; Brinkerhoff, 2006; Christensen, 2002; Cole et al., 2002; Harris, 2002; Watson, 2006; Yildirim, 2000).

As the study suggests, preservice teachers appear to have more positive perceptions than in-service teachers in the area of integration which supports previous research in which professional development was identified as a major need for in-service teachers. However, in-service teachers are not modeling integration skills to the preservice teachers that train under them which may adversely affect the positive perceptions preservice teachers develop in the teacher education program. Consequently, these favorable perceptions apparently do not follow them once they become in-service teachers. Ideally if schools provide the proper professional development and support systems to teach in-service teachers to integrate and consistently enhance their integration skills, in-service teachers may better model the use of technology and integration practice for the preservice teachers that often work with them as student teachers.

In-service teachers need to be exposed to integration methods through the use of workshops and also need to be exposed to the latest technology that will be available in their schools. They need a support system they can access if they have problems or need help. This along with proper use of technology resources in schools would provide a much better environment for in-service teachers' use of technology in a variety of ways in their classroom.

LIMITATIONS AND FUTURE RESEARCH

Limitations. The preservice teachers in this study were all from the same rural university and thus had participated in the same teacher education program. They were also all in the student teaching portion of their program. This is a limitation because the preservice sample contained little or no diversity that might be found if sampled from other universities in other parts of the country. The preservice group also provided self-reported data, which may also be different from researcher-observed or performance data. Additionally, it should also be noted that some questionnaire items asked preservice teachers in this study to "project" how they might respond to a certain situation if they were the actual teacher. This may obviously be different from what they might actually do when they become a classroom teacher.

The in-service group was based solely on volunteers. However, it is important to note that over three-fourths of the in-service volunteers were graduates of the same university as the preservice group. Only in-service teachers from a certain county in one state were asked to participate. This again inhibits diversity based on the participants all being from the same socioeconomic area, thus the results may not be indicative of the general population of preservice and in-service teachers.

Future Research. Further research involving teachers' perceptions of technology integration is needed in a number of areas. Future research should further explore opportunities by which teacher education programs may better prepare preservice teachers to integrate technology. It may also be important to conduct a follow-up study of these same preservice teachers, as they become in-service teachers, to compare their survey results in this study to their future responses to determine if they are actually integrating and using the technology skills that they "projected" themselves as using as preservice teachers. Future research may also extend this study to include a more diverse population by including other universities and/or school systems in other states.

Other important questions raised by the results of this study include: What factors affect the shift in perceptions as preservice teachers transition to in-service teachers? When does this shift in perceptions occur? What specific professional development interventions can moderate or prevent this shift in perceptions? The impact of such

professional development programs on experienced teachers' perceptions of technology use should be thoroughly evaluated.

CONCLUSION

Classroom teachers with negative perceptions of their ability to integrate technology effectively are in need of targeted professional development. Teachers holding such perceptions are not likely to use technology in their instructional practices in ways that will ultimately have a positive impact on student learning.

This study demonstrated a distinct difference in the perceptions of preparedness to use technology and potential benefits of technology use between preservice and in-service teachers. This finding has enormous implications for future research as teacher educators attempt to identify the best means by which to close this gap between the two groups. If teacher educators intend to maximize the use of technology by in-service teachers, it is important to identify factors that negatively affect teachers' technology-related perceptions as they move from their role as students to classroom teachers.

REFERENCES

Adams, S. T. (2005). A strategy for technology training as part of a master's program conducted at a school site [Electronic version]. *Journal of Technology and Teacher Education, 13*(3), 493-515.

Al-Bataineh, A., Anderson, S., Toledo, C., & Wellinski, S. (2008). A study of technology integration in the classroom. *International Journal of Instructional Media, 35*(4), 381-387.

Albion, P. R., & Ertmer, P. A. (2002). Beyond the foundations: The role of vision and belief in teachers' preparation for integration of technology. *TechTrends, 46*(5), 34-39.

Bauer, J., & Kenton, J. (2005). Toward technology integration in the schools: Why it isn't happening [Electronic version]. *Journal of Technology and Teacher, 13*(4), 519-547.

Beyerback, B., Walsh, C., & Vannatta, R. (2001). From teaching technology to using technology to enhance student learning: Preservice teachers' changing perceptions of technology infusion [Electronic version]. *Journal of Technology and Teacher Education, 9*(1), 105-127.

Brinkerhoff, J. (2006). Effects of a long-duration, professional development academy on technology skills, computer self-efficacy, and technology integration beliefs and practices [Electronic version]. *Journal of Research on Technology in Education, 39*(1), 22-43.

Brown, D., & Warschauer, M. (2006). From the university to the elementary classroom: Students' experiences in learning to integrate technology in instruction [Electronic version]. *Journal of Technology and Teacher Education, 14*(3), 599-622.

Christensen, R. (2002). Effects of technology integration education on the attitudes of teachers and students [Electronic version]. *Journal of Research on Technology in Education, 34*(4), 411-434.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Erlbaum.

Cole, K., Simkins, M., & Penuel, W. R. (2002). Learning to teach with technology: Strategies for in-service professional development [Electronic version]. *Journal of Technology and Teacher Education, 10*(3), 431-455.

Dexter, S., Doering, A. H., & Riedel, E. S. (2006). Content area specific technology integration: A model for educating teachers [Electronic version]. *Journal of Technology and Teacher Education, 14*(2), 325-345.

Doe, C. (2006). Lively language arts: The digital age invades the English classroom [Electronic version]. *Multmedia & Internet @ Schools, 13*(5), 30-33.

Ertmer, P. A., Conklin, D., Lewandowski, J., Osika, E., Selo, M., & Wignall, E. (2003). Increasing preservice teachers' capacity for technology integration through the use of electronic models [Electronic version]. *Teacher Education Quarterly, 30*(1), 95-113.

Friedman, A. (2006). K-12 teachers' use of course websites [Electronic version]. *Journal of Technology and Teacher Education, 14*(4), 795-815.

Goktas, Y., Yildirim, S., & Yildirim, Z. (2009). Main barriers and possible enablers of ICT's integration into pre-service teacher education

programs. *Educational Technology & Society, 12*(1), 193-204.

Harris, C. M. (2002). Is multimedia-based instruction Hawthorne revisited? Is difference the difference [Electronic version]. *Education, 122*(4), 839-843.

International Society for Technology in Education. (2008). *National educational technology standards for teachers* [Electronic version]. Available: http://www.iste.org/standards/nets-for-teachers.aspx

International Society for Technology in Education. (2008). *National educational technology standards for students* [Electronic version]. Available: http://www.iste.org/standards/nets-for-students.aspx

Jeffs, T., & Banister, S. (2006). Enhancing collaboration and skill acquisition through the use of technology [Electronic version]. *Journal of Technology and Teacher Education, 14*(2), 407-434.

Judson, E. (2006). How teachers integrate technology and their beliefs about learning: Is there a connection [Electronic version]? *Journal of Technology and Teacher Education, 14*(3), 581-598.

Libscomb, G. B., & Doppen, F. H. (2004). Climbing the stairs: Pre-service social studies teachers' perceptions of technology integration [Electronic version]. *International Journal of Social Education, 19*(2), 70-87.

Lowther, D. L., Ross, S. M., & Alberg, M. (2001). *Teacher Technology Questionnaire*. Memphis, TN: The University of Memphis, Center for Research in Educational Policy.

Lowther, D.L., Thompson, L., Ross, S.M., McDonald, A., & Wang, W. (2004). *West Orange Collaborative STARK Program 2003-2004 Evaluation Report*. The University of Memphis: Center for Research in Educational Policy. ERIC Document Reproduction Service No. ED484273.

Mouza, C. & Wong, W. (2009). Studying classroom practice: Case development for professional learning in technology integration. *Journal of Technology and Teacher Education, 17*(2), 175-202.

Parsad, B., & Jones, J. (2003). Internet access in U.S. public schools and classrooms: 1994-2003 [Electronic version]. *Education Statistics Quarterly, 7*(1), 1-90.

Pope, M., Hare, D., & Howard, E. (2005). Enhancing technology use in student teaching: A case study [Electronic version]. *Journal of Technology and Teacher Education, 13*(4), 573-618.

Prensky, M. (2001). Digital natives, digital immigrants part 1 [Electronic version]. *On the Horizon, 9*(5), 1-6.

Rother, C. (2004). Evaluating technology's role in the classroom [Electronic version]. *T.H.E. Journal, 32*(3), 43-48.

Russell, M., Bebell, D., O'Dwyer, L., & O'Connor, K. (2003). Examining teacher technology use: Implications for preservice and in-service teacher preparation [Electronic version]. *Journal of Teacher Education, 54*(4), 297-310.

Sheffield, C. J. (1996). An examination of self-reported computer literacy skills of preservice teachers [Electronic version]. *Action in Teacher Education, 17,* 45-52.

Strudler, N., Archambault, L., Bendixen, L., Anderson, D., & Weiss, R. (2003). Project thread: Technology helping restructure educational access and delivery [Electronic version]. *Educational Technology Research and Development, 51*(1), 41-56.

Swanson, C. B. (2006). Tracking U.S. trends [Electronic version]. *Education Week, 25*(35), 50-53.

U.S. Department of Education. (2007). State Strategies and Practices for Educational Technology. Retrieved from www2.ed.gov/rschstat/eval/tech/netts/netts-vol1.doc.

Wang, L., Ertmer, P. A., & Newby, T. J. (2004). Increasing preservice teachers' self-efficacy beliefs for technology integration [Electronic version]. *Journal of Research on Technology in Education, 36*(3), 231-251.

Wang, S. (2000). Multimedia and some of its technical issues [Electronic version]. *International Journal of Instructional Media, 27*(3), 303-313.

Watson, G. (2006). Technology professional development: Long-term effects on teacher self-

efficacy [Electronic version]. *Journal of Technology and Teacher Education, 14*(1), 151-166.

Wepner, S. B., & Tao, L. (2002). From master teachers to master novie: Shifting responsibilities in technology-infused classrooms [Electronic version]. *The Reading Teacher, 55*(7), 642-652.

Whetstone, L., & Carr-Chellman, A. A. (2001). Preparing preservice teachers to use technology: Survey results [Electronic version]. *TechTrends, 45*(4), 11-19.

Wozney, L., Venkatesh, V., & Abrami, P. C. (2006). Implementing computer technologies: Teachers' perceptions and practices [Electronic version]. *Journal of Technology and Teacher Education, 14*(1), 173-208.

Yildirim, S. (2000). Effects of an educational computing course on preservice and in-service teachers: A discussion and analysis of attitudes and use [Electronic version]. *Journal of Research on Computing in Education, 32*(4), 479-496.