RESEARCH PAPER

PREPARING TEACHERS TO USE TECHNOLOGY: EFFECTS OF TRAINING EXPERIENCE ON CONFIDENCE AND KNOWLEDGE

By

MICHELE ALFIERI, M.S.* JEREMY I. TUTTY**

ABSTRACT

The purpose of this study was to examine the relationship between computer technology training experiences and pre-service teachers' confidence and knowledge. Participants enrolled in one of four distinct training experiences at two universities (computer literacy only, computer integration only, separate integration and literacy, combined integration and literacy) completed a survey developed to measure their confidence and knowledge of computer skills and integration. Findings revealed that pre-service teachers, whose experience included both computer literacy and computer integration training, had more confidence for computer skills and integration than when the training experience included only one of the two. Results also indicated that participants who completed computer literacy training by itself or in combination with integration training had significantly more knowledge than those who did not complete the literacy course. Implications for training pre-service teachers on how to integrate technology are provided.

Keywords: Technology Integration, Pre-service Teacher Training, K-12 Education.

INTRODUCTION

The educational paradigm shift of recent decades is exemplified by the expectation of teachers to infuse technology into their classrooms to enhance learning. The implementation of national legislation such as No Child Left Behind (NCLB) and technology standards for teachers has increased the pressure on teacher preparation institutions to develop efficiencies in pre-service teacher training and professional development in technology integration.

The International Society for Technology in Education (ISTE) standards dictate the critical need for pre-service teachers to understand the important role of technology in their future career (Wright & Wilson, 2007). It is not enough for our teachers to know how to use computers; they must understand how to integrate the technology into their curriculum (Dexter, Doering & Riedel, 2006). A decade ago, a report by the Office of Technology Assessment (OTA) showed that only three percent of graduating teachers felt "very well prepared" to use technology in their teaching (U.S. Congress, 1995). In 2000, the situation was unchanged. The U.S. Department of Education reported that new teachers were still not being adequately trained to use technology (U.S. DOE, 2000).

Many universities are using a variety of methods to lessen the gap between the pre-service classroom and the actual usage of technology. From specialized programs to capstone courses, schools are revisiting how they are preparing future teachers to use technology (Rowley, 2005). The University of Alabama currently has a technology program, the Master Technology Teacher (MTT) initiative, which is a collaborative effort between pre-service teachers and university faculty. It has helped to bring meaning to the integration of technology in the classroom (Wright & Wilson, 2007).

A study conducted at Virginia Commonwealth University took a look at students who were part of a capstone course which covered software applications in mathematics. The study reported that after the course, students felt more comfortable with teaching and adopting technology into their classrooms (Ellington, 2007). The opponents of a required course argue that a single course characterizes computers as a non-integral part of instruction, and that technology should be integrated across all teacher education courses (Fox,

Thompson, & Chan, 1996). A study conducted by the ISTE questions the effectiveness of these courses: "We assumed formal course work would lead to the ability to integrate technology into instruction; this is not the case" (ISTE, 1999, p. 20).

Proponents argue that pre-service teachers do not learn basic technology literacy skills in their teacher education programs without a dedicated literacy course (Dugger, 2001; Leh, 1998; Simonson & Thompson, 1997; Wright & Shade, 1994). Others point to the positive impact of basic computer literacy on the attitudes and self-efficacy of pre-service teachers toward technology (Savenye, 1993). Willis & Sujo de Montes (2002) suggest that: "One answer may lie in implementing a…skills course in addition to (an integration course). In this way, the first course would focus on technology skills, while the second course would focus on technology integration into the curriculum" (p. 80).

The purpose of the current study was to investigate the effects of three different courses on preservice teachers' self-reported computer integration confidence and knowledge. An investigation by [Tutty, Klein and Sullivan (2005)] suggested that more investigation was necessary to address this question. This is an extension of that study.

The courses' effects on Knowledge

Teachers must possess basic knowledge and skills required to operate and integrate technology (Brush, 1998; Leh, 1998; U.S. DOE, 2001). Both the National Council for Accreditation of Teacher Education (NCATE) and ISTE specify that, "Teachers should be able to demonstrate a sound understanding of technology operations and concepts" (ISTE, 2002 P. 9). ISTE has provided guidelines for the knowledge classroom teachers should possess in order to successfully integrate technology into their classrooms. These include demonstrating technology concepts, planning and designing technology based experiences for the students, implementing technology based curriculum, utilizing technology based assessments and evaluation, using technology to increase professional productivity, and understanding the social, ethical, legal and human issues surrounding the use of technology (ISTE, 2000). Training must provide pre-service teachers with the knowledge of very basics of computer usage including how to operate a computer. The training should involve, how to operate the computer, knowledge of input and output devices, how to install and delete programs, how to manipulate directory structures, how to back up files, and how to create and delete files (Bitner & Bitner, 2002).

Successfully utilizing technology in the classroom relies on the teacher's skill and attitude (Bitner & Bitner, 2002). Anderson and Maninger (2007) found that it was not the level of technology education that predicted if pre-service teachers would use technology in their future classrooms, but how they have been taught about technology infusion and their ability to use it. Mullen (2001) agrees that pre-service teachers have a predetermined belief about technology integration, but it is up to the College of Education faculty to model computer technologies in a way that will positively influence the students to understand technology's role in the classroom.

The courses' effect on Confidence

Confidence is concerned with the judgment of what one can do with whatever skills one possesses. If teachers are to integrate technology into their teaching, they must feel confident in using it (Ertmer, 1994; Wetzel 1993). Pre-service teachers' confidence level and perceived skills may depend upon the level of observation and hands-on practice of technology applications in the classroom. The more the pre-service teacher observes and has hands-on-practice, the higher the teacher's confidence and perceived skill level (Fleming, Motamedi, and May, 2007). According to a study conducted by Pope, Hare and Howard (2005), findings show that there are a number of factors involved in increasing a teacher's confidence level about using technology. These factors include taking method courses that integrate technology and having technologies modeled by professors and supervising teachers.

Pope, Hare and Howard (2005) believe there are stages that teachers must go through in order to increase their confidence levels. First, the teacher must be receptive to

the importance of technology. Second, teachers must learn the skills in order to use the technology. Third, integration is modeled by professors and mentor teachers, and lastly, the teacher integrates technology when planning and implementing lessons for the classroom. Hall (2006) also agrees that modeling can be used to help pre-service teachers understand the usages of technology in the learning process, but believes that modeling cannot take place without the faculty being trained in technology integration first.

Etner (2001) suggests that modeling is also effective; in fact, the confidence level may be higher using modeling than with technology skills training. In Etner's study, students were given CD-ROMs to view as an alternative to in-person modeling. The CD-ROMs contained examples of teachers in realistic classroom situations. These situations included the organization of a classroom with technology and the assessment of technology products. Confidence levels may rise as students learn to organize and integrate technology in their classroom by way of modeling (Wang, 2004).

Method

Participants

The participants for this study were 240 pre-service teachers enrolled in one of three educational technology courses at one of two universities in the Western United States. Participants at one university were enrolled in either a dedicated computer integration or dedicated computer literacy course. The computer integration course was required for students enrolled in one of nine initial teacher certification programs. The computer literacy course satisfied a general studies requirement and was recommended for students in the teacher certification program. Participants at the other university were enrolled in an applied computer applications course for educators. This course was required for admission to the teacher certification program. The participants were predominantly Caucasian female (75%) pre-service teachers from all major content areas. The average reported computer use of the participants was 7-10 hours per week.

Four groups of pre-service teachers were used for comparisons. The groups were determined based upon the combination of their technology training experience: (i) computer integration course (computer integration only), (ii) computer literacy course (computer literacy only), (iii) computer integration course plus the computer literacy course (separate integration and literacy), and (iv) applied applications course (combined integration and literacy).

Training Experiences

Three different courses, Computer Literacy, Computers in Education, and Classroom Applications were the focus of this study to examine the relationship of differing computer technology training experience and pre-service teachers' computer integration confidence and knowledge. Computer Literacy introduced basic technology skills in word processing, spreadsheets and web development. Assignments were related to the basic function of each software package, productivity and data analysis. Computers in Education introduced technology integration. Assignments included an evaluation of educational software, lesson plans and the development of a technology-integrated lesson plan. Classroom Applications introduced basic skills in word processing, spreadsheets, presentation software, and databases. Assignments were related to the application of various technologies in the classroom.

All courses were designed for learner-centered classrooms and are taught in a similar manner. Instruction in the course features are illustrated as lectures, in-class discussions, on-line research and discussion, demonstrations, hands-on lab activities, and active student participation. They are offered through Educational Technology programs housed in the College of Education.

Computer Integration and Basic Skills Instrument for Pre-service Teachers

The Computer Integration and Basic Skills Instrument for Pre-service Teachers (CIBSI) used in this study was developed by the second author (Tutty, Klein, & Sullivan, 2005). The CIBSI contains 40 items comprising two 20-ed

item subscales: confidence and knowledge. The reported Cronbach alpha reliability co-efficient for the confidence subscale was .93, and .78 for the knowledge subscale (Tutty, et al., 2005). Each of the two subscales is divided into a computer skills and computer integration topic category. Additional demographic items identify the participant as a member of the computer integration group, computer literacy group, separate integration and literacy group, or combined integration and literacy group.

The confidence subscale consisted of 20, five-choice Likert-type items ranging from very confident (scored as 5) to not confident at all (scored as 1). The complete list of confidence items are shown in Figure 1. The knowledge subscale consists of 20 multiple-choice questions distributed evenly among the two topic categories of skills and integration. Items from each topic category were distributed randomly on the survey. The overall reliability co-efficient for this administration of the CIBSI was .90.

Procedures

Four subgroups of 60 participants, each were selected among pre-service teachers enrolled in the applicable courses: computer integration only (n=60); computer literacy only (n=60); separate integration and literacy (n=60); and combined integration and literacy (n=60). The groups were selected to represent the four different types of technology training experiences of the participants.

Members of the computer integration only group were the participants enrolled in the Computers in Education course who had not previously completed the Computer Literacy course and were not currently enrolled in it. Thus, the training experience of this group consisted solely of computer integration training. Members of the computer literacy only group were the participants enrolled in Computer Literacy course that had not previously completed or were not concurrently enrolled in Computers in Education. Thus, the training experience of this group consisted solely of computer skills training. Members of the separate integration and literacy group were the participants enrolled in the Computers in y. Thus,

Item
Skills Topics:
Productivity Tools
• Performing a cut or copy and paste between documents
• Attaching files to e-mail
• Developing a presentation with graphics and sound
• Sorting data in a database
• Using functions in a spreadsheet to perform calculations and Basic Operations
• Saving and retrieving files from a folder.
• Accessing information on a CD-ROM, diskette or hard drive.
• Accessing user settings: i.e. desktop wallpaper, screensaver, sounds.
• Connecting peripheral devices: i.e. printer, pda, portable audio device.
• Performing disk maintenance: i.e. disk defragmenter.
Integration Topics:
Tool Application
• Communicating with peers via multiple electronic means i.e. Email, discussion board/forum…
• Designing technology-enhanced lessons
• Evaluating instructional units that integrate technology
• Aligning objectives to national technology and content standards
• Discussing issues related to equitable access to technology in school
Professional Practice
• Using the Internet for lesson plan ideas
• Delivering a lesson with presentation software: i.e. PowerPoint
• Using a database in a discovery lesson for students
• Creating digital concept maps
• Writing a WebQuest

Figure 1. CIBSI Confidence Items

the training experience of this group consisted of both computer integration and computer skills training. Members of the combined integration and literacy group were participants enrolled in the Classroom Applications course. Thus, the training of this group consisted of both computer integration and computer skills training in a single course.

The researcher contacted each course instructor via e-mail and personally arranged to deliver and collect the CIBSI from each instructor. Each instructor received a packet containing directions for administering the instrument and sufficient copies for the instructor's

students. Course instructors administered the instrument to all students in their classes.

Data Analysis

Mean scores were calculated for each topic category for the four respondent groups. Separate one-way multivariate analyses of variances (MANOVAs) were conducted to analyze the survey scores of the four groups for significant differences in confidence and in knowledge. Analyses of variances (ANOVAs) on the two topic categories (skills and integration) were conducted as follow-up tests to each MANOVA. The univariate ANOVAs were followed by Tukey post hoc analyses. Alpha was set at .05 for all significance tests. A Pearson product-moment correlation coefficient was also computed between the overall confidence and knowledge scores.

Results

Confidence

Table 1 shows the mean confidence scores by topic category and respondent group. The overall mean confidence score for all groups and topic areas was 2.31 (5 = very confident to 1 = not confident at all). Overall mean confidence scores by respondent group were 2.76 for the combined integration and literacy group, 2.32 for separate integration and literacy group, 2.22 for the literacy only group, and 1.94 for the integration only group. Participants had higher overall confidence for computer integration ($\underline{M}$ = 2.40) than for computer skills ($\underline{M}$ = 2.22).

A one-way multivariate analysis of variance (MANOVA) conducted on the data in Table 1 yielded a significant main effect for the four technology training groups, Wilks's $\Lambda = .49$, $F(4,233) = 15.93$, $p < .05$. ANOVAs conducted as follow-up tests yielded a significant effect for computer skills, $F(3,236) = 25.98$, $p < .05$, and for computer integration, $F(3,236) = 5.78$, $p < .05$.

Tukey post hoc analyses yielded five significant differences between groups. For the category of computer skills, the combined integration and literacy group reported significantly higher confidence (M = 2.94) than the integration only group (M = 1.78) the literacy only group (M = 2.13), and the separate integration and group

Topic Category	Integration Only	Literacy Only	Separate Integration Literacy	Combined Integration Literacy
Skills	1.78_{a}	2.13_{b}	2.04_{c}	$2.94_{a, b, c}$
Integration	$2.12_{a,b}$	2.31	2.60_{a}	2.58_{b}
Total	1.94	$2.22_{b,d}$	$2.32_{c,d}$	$2.76_{a, b, c}$

Note. Scores are based on a 5-point scale (5=Very Confident, 1=Not Confident at All) Means in the same row denoted with subscripts differsignificantly from each other ($p < .05$).
*N=60 for each group

Table 1. Mean Confidence Scores by Topic Category and Respondent Group*

(M = 2.13), and the separate integration and literacy only group (M = 2.04). For the category of computer integration, both the separate integration and literacy (M = 2.60) and the combined integration and literacy group (M = 2.58) reported significantly higher confidence than the integration only group (M = 2.01).

Knowledge

Table 2 shows the mean knowledge scores by topic category and respondent group. The overall mean knowledge score for all groups and topic categories was 12.29 (61%) out of 20 items. Mean scores on the overall test were 13.78 (69%) for the combined integration and literacy group, 12.28 (61%) for the separate integration and literacy group, 11.90 (60%) for the literacy only group, and 11.18 (56%) for the integration only group. Participants received higher overall knowledge scores in the skills topic category ($\underline{M}$ = 6.78), and lower overall knowledge scores in the integration topic category ($\underline{M}$ = 5.50). The integration only group scored lowest in both topic categories.

A one-way multivariate analysis of variance (MANOVA) conducted on the knowledge scores yielded a significant main effect for the three groups, Wilks's Λ = .26,

Topic Category	Integration Only	Literacy Only	Separate Integration Literacy	Combined Integration Literacy
Skills	6.25_{a}	6.60_{b}	6.67_{c}	$7.60_{a, b, c}$
Integration	4.93_{a}	5.30_{b}	5.62	$6.18_{a, b}$
Total	11.18_{a}	11.90_{b}	12.28_{c}	$13.78_{a, b, c}$

Note. Scores are based on 1 point each for 10 questions per topic category. Means in the same row denoted with subscripts differ significantly from each other ($p < .05$).
*n=60 for each group

Table 2. Mean Knowledge Scores by Topic Category and Respondent Group*

$F(4,233) = 6.27, p < .05$. ANOVAs conducted as follow-up tests yielded a significant effect for both skills topics, $F(3,236) = 7.02$, $p < .05$, and integration topics, $F(3,236) = 5.74, p < .05$, within knowledge.

Tukey post hoc analysis yielded five significant differences between groups. For the category of computer skills, the combined integration and literacy group scored significantly higher (M = 7.60) than the separate integration and literacy group (M = 6.67), the literacy only group (M = 6.60), and the integration only group (M = 6.25). For the category of computer integration, the combined integration and literacy group scored significantly higher (M = 6.18) than both the literacy only group (M = 5.30) and the integration only group (M = 4.93).

Relationship between Confidence and Knowledge

A Pearson product-moment correlation coefficient was computed between overall confidence and knowledge scores. The calculated r of .16 revealed a significant correlation ($p < .05$) between scores on the confidence scale and scores on the knowledge scale.

Discussion

The purpose of this study was to examine the relationship between computer technology training experiences and pre-service teachers' confidence and knowledge.

Overall, findings confirm those of Tutty, et al., (2005); when pre-service teachers complete training in both computer literacy and computer integration, they have more confidence for computer skills and integration than when they complete only one of the two courses. Furthermore, students who receive computer literacy training demonstrate greater knowledge of computer skills and integration. The higher confidence of students who received literacy training indicates the importance of including the combination of training experiences in preparing preservice teachers.

Confidence

Surprisingly, the findings of the current study revealed that students who received only integration training did not have more confidence for computer integration than those students who received only literacy training. This finding is inconsistent with the original study (Tutty, et al., 2005). In addition, students who received only literacy training did not have significantly more confidence for computer skills than those who received only integration training. This later finding does not support other research suggesting that when pre-service teachers receive computer literacy training; it leads to greater confidence in regard to skills items (ITRC, 1998; Fleming, Motamedi, and May, 2007; Karsten & Roth, 1998). The anomaly is the combined integration and literacy group. This group reported significantly higher confidence for skills and integration than the integration only group.

A plausible explanation for these results may be found by examining the training experiences. Students in this study who received both integration and skills training typically either completed the computer literacy course before enrolling in the integration course, or the two were combined in a single course. This combination may have led to higher confidence scores because training on how to integrate technology provided students with additional opportunities to use the computer skills they acquired in an applied integration context. This opportunity was not available to the students who received training in only integration or literacy. Several other studies suggest the importance of providing applied practice in computer integration (Fleming, Motamedi, and May, 2007; Fox, Chan, & Thompson 1996; Wetzel, 1993; Wenglensky, 1999). The findings for knowledge also support this explanation.

Knowledge

The findings for knowledge also strongly support the inclusion of basic computer literacy in the training of pre-service teachers, particularly in combination with integration training. The trend of knowledge performance increases with literacy training and applied integration. Interestingly, performance on skills items was better than that on integration items for all groups including integration only group. Tutty, Klein, and Sullivan (2005) suggested that might be due to the instrument.

The items for skills included questions about basic operations and tools such as attaching files to e-mail

messages and saving and retrieving files from a folder. It is possible that a difference was not detected between the integration only and other groups in skills confidence because the items referred to technology commonly used by, or at least familiar to, the typical college student (p. 449).

In addition, the pre-service teachers receiving only literacy training had greater, although not significantly, knowledge for computer integration topics than those in the integration only group. This is contrary to expectations considering that the literacy only group was not trained on how to integrate computers, but appears to further support of a literacy training experience for pre-service teachers. While possible that pre-service teachers experiencing only literacy training may lack exposure to the integration vocabulary, due to their knowledge of technology tools, they are able to proficiently apply their knowledge to address integration tasks (Dugger, 2001; Leh, 1998; Simonson & Thompson, 1997; Wright & Shade, 1994).

Another surprising finding is the significant outperformance by the combined integration and literacy group of the other three groups in knowledge of computer skills. Differences between the participants who enrolled in each class may have contributed to these results. The combined integration and literacy course was taught at a different university. However, the students are similar in many respects.

Conclusion

If teachers are to integrate technology into their teaching, they must feel confident in using it (Ertmer, 1994; Wetzel 1993). In addition to confidence in using technology, teachers must possess the basic skills required to operate and integrate technology (Brush, 1998; Leh, 1998; U.S. DOE, 2001).

The motivation for conducting the current study was to examine the preparation of pre-service teachers at two universities with the expectation that the results would inform educational technology faculty, administrators, and K-12 district personnel of the effectiveness of the current methods being used. The results has suggested certain approaches that might be useful in directing teacher education programs in such a task.

This study seems to corroborate existing research that a single technology class focusing on either computer literacy or computer integration may not be sufficient to adequately prepare pre-service teachers to integrate technology (ISTE, 1999; Tutty, et al., 2005; Willis & Sujo de Montes, 2002; Willis & Tucker, 2001). The results, at the very least, seem to support the inclusion of a computer literacy course in the preparation of pre-service teachers. The most positive results were obtained from participants whose experience included both integration and literacy training. Several states have recognized this need and implemented technology competency standards and assessments for teachers (NASBE, 2003). The results for confidence further indicate that in order to graduate teachers with confidence and capablity to integrate technology into their teaching, they should have the opportunity to practice technology integration in an applied environment.

This research is limited to the extent that the impact of the training experiences examined in this study are not known for teachers in their own classrooms. Further research on technology integration following these pre-service teachers into their first year of teaching is needed to determine whether the pre-service educators who completed the computer literacy or computer integration course are actually using technology in their classroom.

References

[1]. Anderson, S. & Maninger, R. (2007). Preservice teachers' abilities, beliefs, and intention regarding technology integration. *Journal of Educational Computing Research*, 37(2) 151-172

[2]. Bitner, N. & Bitner J. (2002). Integrating technology into the classroom: Eight keys to success. *Journal of Technology and Teacher Education.* 10 (1), 95-100.

[3]. Brush, T. A. (1998). Teaching preservice teachers to use technology in the classroom. *Journal of Technology and Teacher Education*, 6(4), 243-258.

[4]. Collier, S., Weinburgh, M. & Rivera, M. (2004). Infusing

technology skills into a teacher education program: Change in students' knowledge about technology. *Journal of Technology and Teacher Education,* 12(3), 447-468.

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

[6]. Dugger, W. E. (2001). Standard for technological literacy. *Phi Delta Kappan, 82*(7), 513-517.

[7]. Ertmer, P. A. (1994). Enhancing self-efficacy for computer technologies through the use of positive classroom experiences. *Educational Technology Research & Development, 42*(3), 45-62.

[8]. Ellington, A.J. (2007). A capstone course for preservice mathematics and teachers which uses technology as its unifying theme, *Mathematics and Computer Education*, 41(1), 55-66.

[9]. Fleming, L., Motamedi, V., & May, L. (2007). Predicting preservice teacher competence in computer technology: Modeling and application in training environments. *Journal of Technology and Teacher Education*, 15(2), 207-231.

[10]. Fox, L., Thompson, D., & Chan, C. (1996). Computers and curriculum integration in teacher education. *Action in Teacher Education, 17*(4), 64-73.

[11]. Hall, L. (2006). Modeling technology integration for preservice teachers: A PT3 case study. *Contemporary Issues in Technology and Teacher Education.* 6 (4), 436-455.

[12]. International Society for Technology in Education, & Milken Family Foundation (1999). *Will new teachers be prepared to teach in a computer age?* Santa Monica, CA: Milken Exchange on Education Technology.

[13]. International Society for Technology in Education (2000). *NETS for teachers 2000*. Retrieved April 26, 2008, from http://www.iste.org/Content/NavigationMenu/ETS/ForTeachers/2000Standards/NETS_for_Teachers_2000.htm

[14]. Leh, A. (1998). Design of a computer literacy course in teacher education. *Technology and Teacher Education Annual,* 220-223. Retrieved November 12, 2004, from ERIC database (ED 421111).

[15]. Mullen, L. (2001). Beyond Infusion: Preservice students' understandings about educational technologies for teaching and learning. *Journal of Technology and Teacher Education*, 9(3), 447-466.

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

[17]. Rowley, J., Dysard, G., & Arnold, J. (2005). Developing a new technology infusion program for preparing tomorrow's teachers. *Journal of Technology and Teacher Education*, 13(1), 105-123.

[18]. Savenye, W. C. (1993, February). *Measuring teacher attitudes toward interactive computer technologies*. Paper presented at the meeting of the Association for Educational Communications and Technology. New Orleans, LA.

[19]. Simonson, M. R., & Thompson, A. (Eds.). (1997). *Educational computing foundations.* Columbus, OH: Merrill/Prince Hall.

[20]. Tutty, J. I., Klein, J. D., & Sullivan, H. (2006). Effects of computer integration training and computer literacy training on preservice teachers' confidence and proficiency related to technology use. *Proceedings of the Association for Educational Communications and Technology conference. Orlando, FL.*

[21]. U.S. Department of Education (2000). *Progress report on educational technology: state by state profiles* (3671). Washington, DC: U.S. Government Printing Office.

[22]. U.S. Department of Education. (2001). *Preparing tomorrow's teachers to use technology*. Retrieved October 16, 2004, from http://www.pt3.org

[23]. Wetzel, K. (1993). Teacher educator's use of computers in education. *Technology and Teacher Education Annual,* 407-410.

[24]. Willis, E. M., & Sujo de Montes, L. (2002). Does requiring a technology course in preservice teacher education affect student teacher's technology use in the

classroom? *Journal of Computing in Teacher Education, 18*(3), 76-80.

[25]. Wright, J. L., & Shade, D. D. (1994). *Young children: active learners in a technological age*. Washington, D.C.: NAEYC.

[26]. Wright, V.H. & Wilson, E.K. (2007). A partnership of educators to promote technology integration: Designing a master technology teacher program. *Education*, 128 (1), 80-86.

ABOUT THE AUTHORS

** Doctoral Student, Educational Technology, Northcentral University.*
*** Assistant Professor, Educational Technology, Boise State University.*

Michele Alfieri, M.S. is a doctoral student at Northcentral University and an Adjunct Instructor of Educational Technology at Boise State University. She can be contacted at michelealfieri@boisestate.edu.

Dr. Jeremy I. Tutty Ph.D, is an Assistant Professor, Educational Technology at Boise State University. He can be reached at jtutty@boisestate.edu