# Investigating Teacher Candidate's Use of Technology in Methods Coursework

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**Abstract**: Teacher candidates take a Reading Methods course and a Health and Physical Education Methods course as part of their elementary program requirements. Methods' instructors in both classes modeled the use of technology resources in the classroom, and these Teacher Candidates were required to use technology resources throughout the courses for assignments and development of lessons for teaching. Participants completed a pre and post survey that measured their use of basic computer and software applications and a survey that measured any changes in terms of technology competence (ISTE, 2003). Findings indicate that utilizing technology resources increased Teacher Candidates' technology competence scores in all six quarters of the study. Furthermore, the results of the study indicate that Teacher Candidates' scores improved from pre to posttest on the computer and software use in all quarters of the study. These findings suggest that course activities that incorporate the use of technology increase Teacher Candidates' technology use and their technological confidence.

**Keywords** [Preservice teachers, Teacher Candidates, technology integration, methods coursework]

# Introduction

In the *Report to the President on the Use of Technology to Strengthen K-12 Education in the United States* (March, 1997), the President's Committee of Advisors on Science and Technology stated that students will benefit from the technology in the schools only to the degree that teachers are able to use the new tools. A survey conducted by the International Society for Technology in Education (ISTE), commissioned by the Milken Exchange on Education Technology, found that teacher preparation programs are not preparing teachers to effectively teach with technology (Moursund & Bielefeldt, 1999).

Why is this relevant, and why should there be a concern? Every year, students are coming to school with more experience in using technology. In the U.S. Department of Education report *Computer and Internet Usage by Students in 2003*, 91 percent of children age 3 through grade 12 were found to use computers, and 59 percent were found to use the Internet (DeBell and Chapman, 2006). Findings also indicated that 76 percent of private school students used computers at home compared to 66 percent of public school students. Other findings in this report indicated that public school students were more likely to use computers and the Internet at school and overall. Findings from the *National Council of Educational Statistics (NCES)* (2006) indicate that in 2003 the average public school contained 136 instructional computers, and the proportion of instructional rooms with Internet access increased from 51 percent in 1998 to 93 percent in 2003. In fact, nearly all schools had access to the Internet in 2003 (NCES, 2006).

A report from the United States Department of Education (2007) stated that educational technologies, when used properly and in coordination with a variety of school reforms, have been shown to enrich learning environments and enhance students' conceptual understanding. A

major goal for educators should be to: a) use technology as a tool to enhance learning, and b) integrate technology into the curriculum to improve student achievement (USDOE, 2004).

To help promote change at the Inservice teacher level, it is necessary to build literacy and technical skills at the Preservice teacher level (Pittman, 2002). University faculty need to model appropriate uses of technology within specific courses, which will illustrate the many ways Preservice teachers become confident in their ability to use the technology in their own classrooms. Technology integration is often referred to as the multiple ways that technology can be used to support educational goals and activities (USDOE, 2007). It can encompass anything from teacher or student use of computers to the administrative uses of technology, such as to develop curriculum, promote communication, and analyze data related to student academic achievement. When students are able "to choose and use technology tools to help themselves obtain information, analyze, synthesize, and assimilate it, and then present it in an acceptable manner, then technology integration has taken place" (USDOE, 2002, p. 79).

In a longitudinal study tracking eight Preservice teachers' changing vision of technology, Pierson and Cozart (2004/2005) found that a common complaint was that their professors had the expectation that students would use technology to complete assignments. However, in their university coursework, the Preservice teachers did not see their instructors demonstrate any significant instructional use of technology. These findings reinforce the need for university faculty to model how to use technology as part of the course. In a related study, Stuhlmann (1998) emphasized that teacher educators who integrate technology into their university classrooms provide Preservice teachers with realistic models to emulate, which helps them to build their own confidence as they strive to integrate technology into their own teaching.

"Reinforcement and practice in technology over time had an enormous impact on Preservice teachers' abilities to transfer skills to other educational situations" (p. 137).

The technology training students receive should be continuous and include the use of multiple applications, such as through in-class presentations, demonstrations, assignments, and teaching applications (Schrum, Skeele, and Grant, 2002/2003). When Preservice teachers are immersed in the use of technology, they will be more confident users of that technology. In a study examining changes in Preservice teacher's patterns of use of different technology resources, the findings indicated that students had a higher self-efficacy towards particular software, such as word-processing and email, because both were used more frequently by the students (Milbrath and Kinzie, 2000). In contrast, students' self-efficacy levels were the lowest for software that was used less frequently, such as data base management tools and spreadsheets. Milbrath and Kinzie emphasized the need to coordinate the teaching of different software as they relate to specific content. Implications for these findings are that we need to expose prospective teachers to a variety of software, and encourage them to use the software frequently as it relates to particular content, such as showing students how to use a spreadsheet to organize and analyze data in a math methods course.

The bottom line is that a goal of teacher education programs should be to help prepare Teacher Candidates to learn how to use a variety of technology resources. Hare, Howard, and Pope (2002) found that Teacher Candidates who were exposed to the technologies while learning teaching practices in their method courses, and who could see the technologies modeled by the methods faculty, showed an increase in their confidence levels. This reinforces the importance of university faculty showing Teacher Candidates how to use technology to teach. Technology

cannot teach students; rather learners should use the technology to teach themselves and others (Jonassen, Howland, Moore, & Marra, 1999).

Key themes that emerge from this review of literature relate to the need to address the integration of technology at the Preservice level (Hare, Howard, & Pope, 2002; Pierson & Cozart, 2004/2005; Pittman, 2002; USDOE, 2004), that Teacher Candidates have to use the technology to become confident and proficient technology users (Hare, Howard, & Pope, 2002; Milbrath & Kinzie, 2000; Pierson & Cozart, 2004/2005; Stuhlmann, 1998), and that university instructors need to model how to use the technology for Teacher Candidates (Hare, Howard, & Pope, 2002; Pierson & Cozart, 2004/2005; Schrumm, Skeele, & Grant, 2002/2003; Stuhlmann, 1998). The need for integration of technology modeling and use by university instructors provided the impetus for the research undertaken in this study.

## Theoretical Framework

The social constructivist framework of this study reinforces the fact that cognitive development occurs as we interact with our environment. Social interaction helps us to know ourselves as we interact with others (Dixon-Krauss, 1996; Vygotsky, 1978). This study reinforced the importance of teacher modeling when introducing how to use various technology tools and resources. Students benefit from seeing their university professors use various technology tools and resources, followed by opportunities to practice those tools and resources within the context of a small group. The idea is that teacher support is gradually minimized as students begin to demonstrate mastery, which is a type of scaffolding where responsibility is gradually released from teacher to student (Pearson and Gallagher, 1983). Meaningful learning was evident in the classroom activities as students drew upon such constructivist principles of

knowledge construction, conversation, articulation, collaboration, and reflection (Jonassen, Howland, Moore, and Mara, 2003).

## The Study

A major purpose of this study was to investigate any changes in Teacher Candidates' use of technology over the course of a ten-week period. Participants were Teacher Candidates enrolled in either a Reading Methods course or a Health and Physical Education Methods course. In some cases, participants might be simultaneously enrolled in both classes. As part of the coursework, Teacher Candidates were required to utilize technology resources in correspondence with the instructor and in the development of required class assignments.

The researchers hypothesized that when Teacher Candidates utilized technology resources, their scores on the technology competence survey would increase. Secondly, the researchers hypothesized that when Teacher Candidates utilized technology resources, their scores on the computer and software application survey would also increase.

### Participants

Participants were 153 Teacher Candidates, 9 males and 144 females enrolled in a Reading Methods course, a Health and Physical Education course, or both, and required of all elementary education majors. Of the 153 participants, 17 were African Americans, 135 were Caucasians, and one individual identified as "other." Additionally, class standing of the participants included 5 sophomores, 52 juniors, 81 seniors, and 15 alternative certification Teacher Candidates from seven different programs (refer to Table 1).

**Table 1.** Participants by program.

| Program | Fall 2004 | Winter 2005/ 2006 | Spring 2005 | Fall 2005 | Winter 2005/ 2006 | Spring 2006 | Total |
|---|---|---|---|---|---|---|---|
| PK-3 | 6 | 2 | 4 | 12 | 8 | 3 | 35 |
| 1-5 | 18 | 17 | 21 | 20 | 9 | 8 | 93 |
| 1-5 Mild/Moderate | 4 | 0 | 4 | 1 | 1 | 1 | 11 |
| 1-8 (old program) | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| K-12 HPE | 4 | 0 | 3 | 0 | 0 | 0 | 7 |
| Family Child Studies | 1 | 1 | 1 | 0 | 0 | 0 | 3 |
| Speech Language Hearing | 0 | 3 | 0 | 0 | 0 | 0 | 3 |
| **Total** | **34** | **23** | **33** | **33** | **18** | **12** | **153** |

Both the *Methods and Materials for Teaching Reading in the Elementary School* class and the *Methods and Materials for Teaching Health/Physical Education* class are required courses in all of these programs of studies. However, when Teacher Candidates take the program can vary. Teacher Candidates in the P-3 program are required to complete a sequence of three 3-hour student teachings. This is generally accomplished by doing one or two of the 3-hour classes

(i.e., total 6 hours) in the second quarter of their senior year, followed by taking the remaining 3-hour courses in the third quarter of their senior year. The P-3 majors are required to take the *Methods and Materials for Teaching Reading in the Elementary School* course prior to beginning any student teaching experiences, but they could take the *Methods and Materials for Teaching Health/Physical Education* along with their student teaching. All of the other majors (i.e., 1-5, 1-5 Mild/Moderate, 1-8, K-12 HPE, FCS, and Speech) must complete both courses before they can do student teaching, which is usually in the last quarter of the program. Teacher Candidates were usually a junior level status or senior level status when enrolled in either of the courses.

**Integration of Technology**

The university calendar is arranged in quarters with classes taken in ten-week cycles, with each class meeting for a total time of three hours and forty-five minutes per week. Instructors modeled the use of technology when delivering course content and Teacher Candidates also had access to technology resources when doing many of the class activities. In addition, Teacher Candidates in both classes were required to use technology resources for all projects. Class activities and projects primarily required students to use such software as word processing, web editors, and presentation programs. In addition, students also used such software as Inspiration and CD-ROM storybooks. Rubrics delineating specific criteria for projects were provided by each instructor at the beginning of the quarter.

1. Word Processing—Teacher Candidates were required to word-process all lesson plans that were taught as part of their field experiences. In addition, they used word-processing to create other projects, such as the Author Bulletin Board project required in *Materials and Methods of Teaching Reading in the Elementary School* or the Annual Plan developed in *Methods and Materials for Teaching Health/Physical Education.*

2. Web-Editors—Teacher Candidates used web-page editors to develop a WebQuest project, which is a web-based inquiry project. The WebQuest was required to incorporate the specific method's course content, to be focused on a related theme or topic, and be relevant to teaching of elementary students in their area of certification. For example, a WebQuest in *Methods and Materials for Teaching Health/Physical Education* might be focused on Nutrition, whereas a WebQuest in *Materials and Methods of Teaching Reading in the Elementary School* could be focused on a specific fiction or nonfiction book or a broader content-area theme, such as an exploration of the digestive, respiratory, and circulatory systems.
3. Presentation programs—Teacher Candidates used presentation programs in activities completed in class where they worked with partners to summarize text-based content. For example, Teacher Candidates often researched information in the text, then explored related information available through Internet sources, followed by using the presentation program to present a summary of the key ideas to the rest of the class. In addition, they developed interactive PowerPoint slideshows that were designed as a review of specific material. For example, Teacher Candidates in *Materials and Methods of Teaching Reading in the Elementary School* would develop a PowerPoint slideshow focused on a phonic skill or element. Each slide would pose a question with three possible answers displayed. If the correct answer was chosen, then the slideshow proceeded to the next question. If the incorrect slide was selected, then a feedback slide was viewed, which then helped the viewer to select the correct answer.

For class activities that incorporated technology, the instructors would also demonstrate for Teacher Candidates how to utilize the software more effectively, such as through the use of

specific shortcuts (i..e., cut/paste, search, find and replace, go to, etc.) or special features of the software (i.e., inserting tables, change of formatting, and using the labels feature of envelopes/labels). In addition, the course instructors often found it necessary to demonstrate how to save files, use naming conventions, and use alternate storage devices (i.e., jump drive, burn CDs, etc.). The major purpose of projects was to introduce course content to Teacher Candidates and to prepare Teacher Candidates by focusing on planning and methodologies for instruction in an elementary education program.

**Data Source and Analysis**

The Teacher Candidates involved in the project were given a pre- and post- 17-item survey that measured their level of technology use (ISTE, 2003). Participants were asked to respond using these categories: strongly disagree, disagree, neither, agree, or strongly agree. This technology competence survey has been shown to measure basic technology competence and technology integration skills and is effective in measuring changes in skill levels over time (ISTE, 2003). In addition, participants were also asked to respond to a 20-item survey that examined their use of computer and software applications. This instrument was administered as a pre- and post-survey in order to more effectively evaluate changes across the ten weeks of the study for Teacher Candidates. Participants were asked to respond using these categories: strongly disagree, disagree, neither, agree, or strongly agree. The pretest was administered at the beginning of the first class meeting, and the posttest was administered at the end of the last class meeting.

Paired-samples *t*-tests were used to analyze the data. Paired-samples *t*-tests determine whether there is a significant difference between two means across time. In this case, the two

measures were pretest and posttest technology competence scores and pre- and post- computer and software use scores.

## Results

The researchers hypothesized that when Teacher Candidates used technology resources as part of a course requirement, their technology competence scores would increase. Secondly, the researchers hypothesized that when Teacher Candidates utilized technology resources as part of a course requirement technical use scores would increase. The hypotheses were supported in both academic years and the two years combined. Missing data were replaced with the mean of the individual's scale scores. One case was eliminated due to greater than 20% non-response on a single scale.

In the 2004 - 2005 academic year, researchers conducted a paired samples *t*-test to determine if the course assignment significantly affected Teacher Candidates' scores on the ISTE technology competence instrument. A significant increase in technology competence scores was observed from pretest ($M$ = 62.46, $SD$ = 7.41) to posttest ($M$= 67.54, $SD$ = 6.88), $t(89) = -6.57$, Cohen's $d = .69$, $p < .05$. The average difference in technology competence scores from pretest to posttest was ($M$ = -5.09, $SD$ = 7.35). The researchers conducted a paired samples *t*-test to determine if the course assignment significantly affected Teacher Candidates' scores on the technical use scale. A significant increase in technical use scores was observed from pretest ($M$ = 56.26, $SD$ = 9.26) to posttest ($M$ = 60.48, $SD$ = 8.57), $t(89) = -5.29$, Cohen's $d = .56$, $p < .05$. The average difference in technical use scores for Teacher Candidates from pretest to posttest was ($M$ = -4.22, $SD$ = 7.57).

In the 2005 - 2006 academic year, researchers conducted a paired samples *t*-test to determine if the course assignment significantly affected Teacher Candidates' scores on the ISTE technology competence instrument. Results indicate a significant increase in technology competence scores from pretest ($M$ = 63.82, $SD$ = 8.52) to posttest ($M$= 70.05, $SD$ = 9.80), $t(62)$ = -4.64, Cohen's $d$ = .58, $p < .05$. The average difference in technology competence scores from pretest to posttest was ($M$ = -6.22, $SD$ = 10.65). The researchers conducted a paired samples *t*-test to determine if the course assignment significantly affected Teacher Candidates' scores on the technical use scale. Results were a significant increase in technical use scores from pretest ($M$ = 55.84, $SD$ = 7.12) to posttest ($M$ = 63.74, $SD$ = 7.27), $t(62)$ = -8.73, Cohen's $d$ = 1.10., $p < .05$. The average difference in technical use scores for Teacher Candidates from pretest to posttest was ($M$ = -7.89, $SD$ = 7.18).

Additionally, data were interpreted using paired-samples *t*-tests over the two years combined, revealing a significant increase in technology competence scores from pretest ($M$ = 63.02, $SD$ = 7.89) to posttest ($M$ = 68.58, $SD$ = 8.27), $t(152)$ = -7.77, Cohen's $d$ = .63, $p < .05$. The average difference in technology competence scores from pretest to posttest was ($M$ = -5.56, $SD$ = 8.84). Furthermore, results revealed a significant increase in technical use scores from pretest ($M$ = 56.09, $SD$ = 8.42) to posttest ($M$ = 61.82, $SD$ = 8.19), $t(152)$ = -9.32, Cohen's $d$ = 75, $p < .05$. The average difference in technical use scores for Teacher Candidates from pretest to posttest was ($M$ = -5.73, $SD$ = 7.61).

## Discussion

This study investigated two major hypotheses. First, researchers hypothesized that when Teacher Candidates used technology resources as part of a course requirement, their technology

competence scores would increase. Secondly, the researchers hypothesized that when Teacher Candidates utilized technology resources as part of a course requirement, then technical use scores would increase for those students.

Findings for the first hypothesis indicated a significant increase in technology competence scores was evident from pretest to posttest for both the 2004-2005 group (N=90) and the 2005-2006 group (n=63). Additionally, the combined data for both years of the study indicated a significant increase in technology competence scores was also evident from pretest to posttest. These findings suggest that Teacher Candidates' competence levels increase when they are exposed to methods coursework that requires the use of varied technology resources.

Findings for the second hypothesis indicate a significant increase in technical use scores from pretest to posttest for 2004-2005 and 2005-2006 as well as for the combined study (2004-2006). These findings also suggest that Teacher Candidates' technical use scores increase when they are in methods coursework that requires them to use a variety of technology applications and resources to complete required elements of assignments.

## Conclusions

Results of this study indicated that Teacher Candidates who utilized technology resources as part of their course assignments had improved technology competence scores and improved scores for computer and software applications. These findings suggest that course activities requiring Teacher Candidates to utilize technology can have an impact on their use of various software programs. When they were required to use these technology resources, it helped to increase their levels of technology competence. A critical component that is necessary to facilitate an increase in students' technology competence and their knowledge of varied

computer applications related to the importance of teacher modeling. University instructors must model (Hare, Howard, & Pope, 2002; Pierson & Cozart, 2004/2005; Schrumm, Skeele, & Grant, 2002/2003; Stuhlmann, 1998) how to use technology resources for their Teacher Candidates, and most importantly, how to use the technology resources to support planning, development, and implementation of teaching activities in their area of certification. As Teacher Candidates become proficient in the use of these technology resources, they become more confident in their ability to be a technology user (Hare, Howard, & Pope, 2002; Milbrath & Kinzie, 2000; Pierson & Cozart, 2004/2005; Stuhlmann, 1998).

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