Perceptions Vs. Performance Abilities

Malinda Boyd Butler, PhD
Mississippi State University
Alcorn State University
1000 ASU Dr. # 989, Alcorn State, MS 39096
United States of America

Dorothy Boyd Stokes, EdD
Jackson State University
Jackson, MS
United States of America

Abstract

*This study was conducted to determine if statistically significant differences existed between the perception and performance abilities of teacher candidates (n=79). Two instruments were used, the Basic Computer Skills Performance-Based Assessment instrument and the Basic Computer Skill Self-Reported Survey, measuring four of the ISTE NETS-S competency: **B**asic operation and concepts; Technology productivity tools; Technology research tools; and Technology problem-solving and decision-making tools, selected based on their alignment with two nationally recognized instruments: The ISTE On-line Technology Assessment, and courseware objectives for preparation for the Internet and Computer Core Certification. Statistically significant differences between a teacher candidate's perception and performance were found in all sub-categories. A Paired t-test identified the tasks within each of the sub-categories where perception was significantly higher than teacher candidates' performances. Teacher candidates mean score indicated satisfactory performance in Basic Operation and Concept category (M=1.92) and unsatisfactory performance in Technology Problem Solving and Decision-Making Tools category (M=1.37).*

Key Words: Teacher Candidates, Technology, Technology Standards, Technology literacy, Basic Computer Skills

1.0 Introduction

Current educational reforms and legislation at the national, state, and local levels (International Society for Technology in Education, 2002; No Child Left Behind, 2002; and National Council for the Accreditation of Teacher Education, 2002) have incorporated standards requiring teachers and students to perform at high levels while they are engaged in challenging curriculum. As higher standards of accountability are implemented, clarity is needed regarding the technological abilities of various groups. Teachers are expected to help all K-12 students learn to value content, become confident in their ability to solve problems in specific content areas, and learn to reason and communicate from a content-specific discipline. Revolving around these goals is the recommendation that meaningful use of technology be incorporated in all areas (International Society for Technology in Education, 2000).

According to an April, 2005 report from the National Center for Education Statistics, schools have an estimated 10 million computers nationally and the annual school expenditure for technology is about $6 billion. The report further informs that the ratio of instructional computers per pupil is 1 to 4.4, 100 percent of all public schools in our nation's classrooms have access to the Internet and in 2003, 95 percent of these used broadband connections (National Center for Education Statistics, 2005). From 1995 to 2001, federal expenditures on educational technology increased from $21 to $729 million (Russell, Bebell, O'Dwyer, & O'Conner, 2003).

From 1999-2003, the Preparing Tomorrow's Teachers To Use Technology (PT^3) program awarded over 400 grants and $399.6 million dollars to assist teachers and teacher candidates in becoming more technologically proficient (U. S. DOE, n.d.).

1.1 Statement of the Problem

To prepare teachers for the classroom in the 21st century, schools, departments and colleges of education must determine if the educational needs of all teacher-candidates are being met. As higher standards of accountability are implemented, teacher preparation programs must be able to show proof of the technological skills of teacher candidates. What is frequently available is the result of self-reported surveys, which provide indications of what teacher candidates perceive themselves as being capable of doing. Clarity is needed regarding the actual technological ability of teacher candidates in meeting the needs of students in today's classroom. Performance-based assessments may provide a clearer indication of the teacher candidates' technological ability in the use of computers. Educators are obligated to prepare teacher candidates for the classrooms they will enter soon. Additionally, demographic factors such as gender, age, prior formal technology training, and grade level certification all could influence the education one receives during formal preparation. Knowledge of the influence of these variables could provide insight in decreasing digital inequities and aid in the comprehensive technological preparedness of our nation's educators.

1.2 Purpose of the Study

The purpose of the study was to investigate the perceived and actual basic computer skills of teacher candidates entering the last phase of their teacher education training and to determine if differences exist based on gender, age, educational background, years of experience, and grade level teacher certification. Often research has focused on teacher candidates' perceptions of how well they are prepared and not on the actual skills the teacher candidates possess.

Research Questions

1. What is the perceived level of basic computer skills of teacher candidates?
2. What is the actual level of basic computer skills of teacher candidates?
3. Is there a difference between teacher candidates' perceived basic computer skills and their actual performance-based skills?

1.3 Rationale for Study

The need for a performance-based assessment of teachers' technology skills, together with the awareness that limited measurements to assess the actual skills are currently present, provides the rationale for clearly identifying the basic computer skill levels of teacher candidates. A measurement of such skills with a consideration of influencing variables such as gender, age, prior formal technology training, and grade-level certification, could provide insight into how prepared teacher candidates are in basic computer skills. The issues are especially significant considering that, despite the money and time spent on equipment, training, and infrastructure for technology integration, the use of technology in the classroom is still moving at a slow pace. Therefore, a need for more extensive and insightful research in assessing the skills of teacher candidates in basic computer skills is evident.

Performance-Based assessments could provide a true measure of what tasks teacher candidates are able to do in relation to computer skills. Such assessments will provide more reliable information about teacher candidates' preparation than the results of self-reported surveys alone.

1.4 Participants

The participants were recruited through their methods classes in the teacher education program at a major southeastern university in Mississippi in the spring semester and first summer session of 2006.. There were approximately 120 students enrolled in the methods classes during the spring semester and summer session of 2006, of which 79 undergraduate and graduate students volunteered. Of the 79 teacher candidate volunteers 22 (27.8%) were male and 57 (72.2%) were female.

The demographic information on respondents was obtained using the Self-Reported survey. Two-thirds of the teacher candidates (63.3%) were in the secondary education concentration, 27.8% were in the elementary school concentration. Only a few of them were in the middle school concentration (8.9%) and the pre-school concentration (1.3%). The majority of the teacher candidates (72.2%) were female, and 27.8% were male.

The majority of the participants (68.4%) were between the ages of 20 and 24; other age groups were represented in small numbers. Over half of the teacher candidates (55.7%) had no teaching experience, and another 10.1% had between 1 and 2 years of experience. About 15.2% of them had less than one year experience in education. The teacher candidates also provided information about their experience with computer courses. Only 38.5% (30 of 79) of the participants had completed merely one computer class. Approximately half of them (50.6%) had completed two to three computer classes in high school , and about one-third (25 of 79) of them had completed computer non-credit workshops. Only 15.4% of the teach candidates had not completed computer classes at the university. The remaining teacher candidates had completed between one and seven computer classes. The majority of them (85.9%) reported that they had more than six years of experience working with computers. When asked to give an overall rating of their computer ability, 10.1% rated themselves very high, and 86.0% rated themselves between average and above average. Only 3.8% considered themselves to have a low level of computer ability. The majority of them were exposed to the PC (Windows-based systems).

2.0 . Instruments

The two instruments used in this study were the Basic Computer Skills Performance-Based Assessment instrument and the Basic Computer Skills Self-Reported Survey. The Basic Computer Skills Performance-Based Assessment was developed first by the researcher and then the Basic Computer Skill Self-Reported Survey. Both assessment and survey were administered online. The items on the self-reported survey were directly aligned with the items on the performance-based assessment. A matrix was designed that aligned all components, the performance test items(BCSPBA), the self-reported survey (BCSSRS)items, objectives from the IC^3 courseware, and objectives of ISTE On-line Technology Assessment with the NETS-S. The intent of the design was to present a clear indication of how well teacher candidates can actually perform tasks in relation to their perceived abilities with such skills. Attention was placed on basic computer skills for the foundational role they play in technology integration. Indicator A, "demonstrate introductory knowledge skills and understanding of concepts related to technology (as described in the ISTE National Educational Technology Standards for Students)" (ISTE-NETS, 2000; ISTE-NETS-T, 2001) of the NET-T provided the foundation for question selection. The limitation of standards criteria used in the study was based on the capability of the Sam2003 ®Assessment software program.

By design, the performance assessment and the self-reported survey primarily address four of the ISTE NETS-S. They are as follows: NETS-S (1), Basic operation and concepts; NETS-S (3), Technology productivity tools; NETS-S (5), Technology research tools; and NETS-S (6), Technology problem-solving and decision-making tools. The skills were selected based on their alignment with the objectives of two nationally recognized instruments. The ISTE On-line Technology Assessment was developed and used to help teachers' measure students' skills in using software applications and to measure student progress towards meeting the NETS-S, and the courseware.

2.1 Basic Computer Skills Performance-Based Assessment

The Basic Computer Skills Performance-Based Assessment instrument was developed by the researcher to assess the performance abilities of the participants. The assessment is a 50-item skill-based assessment divided in three categories related to basic computer skills. The categories and number of items per section include: Basic Operation and Concepts (7), Technology Productivity Tools (14), Technology Research Tools (12), and Technology Problem-Solving and Decision Making Tools (17). The skills were then matched with Sam2003® Assessment software skill items. The online environment for performance-based assessment is Sam2003® Assessment software, a product of Thomson Learning.

The Sam2003® Assessment software was designed to assess skills of individuals by asking them to perform certain tasks in an interactive environment. The assessment addresses skills found in the Microsoft Windows XP, Microsoft Office Suite (Word, Excel, PowerPoint and Access), and Internet environments. The participants demonstrate the skills in any number of ways. The mouse and keyboard movement of each participant is captured as part of the grading process in Sam2003® Assessment software Version 3.0 program, thus indicating if the task is completed correctly or incorrectly. If the skill is demonstrated correctly, the software gives a "completed" prompt and if the skills is not demonstrated properly, the software gives an "incorrect" prompt, and moves to the next question. A skip option is also present and the participant by choice to skip the skill. The software program will allow the administrator to assign a specific number of trials for the completion of each skill item. In this particular instrument the researcher, the administrator for this assessment, assigned three trials for every skill item.

Thus, the Performance-Based Assessment was developed using the Sam2003® Assessment software program. Scoring of the Performance-Based Assessment was accomplished electronically through the Course Technology's Software design. As the participant completed the task, a correct, incorrect or skipped value was assigned to each task based on correct, incorrect and skipped standards pre-set by software designers (Sam2003® Assessment software). These choices were later converted to a consistent response pattern "perform" = 2, "can not perform" =1, Skipped =0 or missing values. Additionally, missing values were transposed using series means (consistent for both instruments) for the purposes of analysis and comparison of the responses between instruments. The scores for each of the categories (Basic Operation and Concepts; Technology Productivity Tools, Technology Research Tools, and Technology Problem-Solving and Decision-Making Tools) were assigned as follows: Can perform = 1.5 to 2; Can not perform = anything < 1.5. The data were examined to determine how well the students performed. The intent of the design was to provide a clear indication of how well participants can perform basic computer skill tasks in relation to their perceived abilities with such skills.

2.2 Basic Computer Skills Self-Reported Survey

The Basic Computer Skills Self-Reported Survey **was** an online instrument designed to assess the perceived level of technological literacy of teacher candidates as it related to their actual basic computer skills. There are 63 numbered items on this assessment divided into three sections: computer task section, demographics and computer background. Item one asked the participant to enter a research number. The computer task section mirrored the skill categories on the performance-based assessment. The computer task section contained 50 items divided in categories based on the competency category in which they are found in the NETS-S. The categories and number of items per section include Basic Operation and Concepts (7), Technology Productivity Tools (14), Technology Research Tools (12), and Technology Problem-Solving and Decision Making Tools (17). Participants were asked to specify their self perceived ability to complete relevant computer tasks by selecting one of five Likert categories, The following categories were used: Definitely cannot, Possibly cannot, Unsure, Probably can or Definitely can. These choices were later recoded to a "yes" = 2, "no" =1. Additionally, missing values were transposed using series means (consistent for both instruments) for the purposes of analysis and comparison of the responses between instruments.

The feature of the software used in posting the Self-Reported Survey on-line automatically generate a report based on the participants' selection of an option listed in the assessment. This report could be obtained by the researcher upon completion of the survey by downloading the file in spreadsheet format. Once the information was downloaded, the following values were assigned to each response: "Definitely cannot" =1, "Possibly cannot" =2, "Unsure" = 3, "Probably can" =4, or "Definitely can" =5. These choices were later recoded to a "yes", "no". Missing values were transposed using series means (consistent for both instruments) for the purposes of analysis and comparison of the responses between instruments.

The tabulation of the score for the instrument would be based on the performance Mean. Mean scores implications for each of the four sub-categories (Basic Operation and Concepts; Technology Productivity Tools, Technology Research Tools, and Technology Problem-Solving and Decision-Making Tools) and on individual items were assigned as follows: Can perform = 1.5 to 2; Can not perform = anything < 1.5. This scoring would be consistence for both instruments.

3.0 Pilot Study

Prior to the actual study, the BCSSRS and BCSPBA instruments were disseminated to a group of 15 students previously enrolled in courses which utilized the SAM2003® Assessment Software Program. These students were not part of the chosen population for the actual study. This pilot study allowed the researcher the opportunity to observe how the survey and assessment worked with on-line dissemination, and how data collection was accomplished. Throughout the pilot study, the researcher sought to work through any systematic and technological issues prior to the actual study and make any necessary changes. The researcher documented changes. Changes were made in the logistics of administering the instruments. In the pilot study, the researcher set up the workstation by using a teacher login and opened a document which contained the link to the BCSSRS. Revisions to the procedures included the login to the workstation by the participants rather than by the researcher.

4.0 Data Collection

The study was conducted in a computer lab located on the university's campus. The computer lab is equipped with Dell computer workstations, networked to a university server system with Internet connection.

Because the lab had only 40 workstations, and the availability of the participants' varied, different sessions were conducted in the same lab to control for environment. One session of approximately 60 minutes was the time frame of contact for each participant.

Volunteers appeared in the computer lab to participate in the study at times that were convenient for them. Each participant was assigned a research number as a login and a password to enter the instruments. The login (research number) and the password were found on a label on an envelope given to each participant upon entering the lab. Once entrance was gained to the Basic Computer Skill Self-Reported-Survey, software features did not allow the participant to continue with the survey unless a research number was re-entered correctly when asked. The identical number was used as the pre-assigned login to gain entrance to the performance-based assessment, the Course Technology's SAM2003 Assessment® software. The password "research" was used by all participants. Participants completed the BCSSRS and the BCSPBA on-line and submitted responses electronically.

The participants were administered the self-reported survey, which assessed their perceived basic computer skills, first. Once the self-reported survey was completed, the software automatically took the participants to the login screen of the performance-based assessment. The participants completed the performance-based assessment and selected the exit test option when completed. The assessment was scored electronically.

5.0 Findings

Research question one asked what was the perceived level of basic computer skills of teacher candidates. For the perception evaluation, teacher candidates were asked to assess their ability to complete a skill. The ratings were collapsed into two categories, one category representing the students' perception that they could not perform the tasks, and the other represented the students' perception that they could perform the tasks. In order to classify the students into the "can perform" and the "cannot perform" categories, the mean scores on each of the sub-scales were used. Considering the mean results of this analysis, teacher candidates rated their performance in basic computer skills very high in all categories. The mean score in the Basic Operation and Concepts was the highest (M=1.99), and Technology Research Tools was the lowest (M=1.83). Thus, teacher candidates' perception was that they could perform skills in each sub-category on the BCSSRS.

A further examination of the perceived abilities of teacher candidates using each skill on the self-reported survey (BCSSRS) revealed that in all 50 of the basic skills listed, the majority of the teacher candidates perceived themselves as having the ability to perform the required tasks. Only in two basic computer skills mean scores were below than 1.70. The skill that represented the most uncertainty among teacher candidates was, "When creating a PowerPoint presentation, can you add a placeholder to a slide?" Twenty-eight (28) of the respondents provided an unsure response about completing the skill.

Research question two asked, what was the actual level of basic computer skills of teacher candidates? The actual level of basic computer skills of the teacher candidates was derived from data generated when teacher candidates attempted to perform task on a performance-based assessment (BCSPBA). Teacher Candidates were asked to perform 50 skill tasks matching the description of those found on the self-reported survey (BCSSRS). For the actual performance analysis, the students' skill assessment was placed into two categories: one category representing the students' inability to perform the tasks, and the other category representing the students' ability to perform the tasks. In order to classify the students into the "can perform" and the "can not perform" categories for each of the sub-categories of the survey, the mean scores on each of the individual sub-categories were used. Teacher candidates Perform the skills in the "Basic Operation and Concepts" (M=1.92 SD =.267), and "Technology Productivity Tools" (M=1.76 SD=.430) categories at satisfactory levels. However, unsatisfactory levels of completion were recorded for the two remaining categories; Technology Research Tools (M= 1.42, SD =.496), and Technology Problem- Solving and Decision Making Tools ((M = 1.37, SD=.485) categories.

To identify the specific skill performed by teacher candidates on the performance-based assessment, descriptive statistics frequencies were used. Results revealed three skills which all teacher candidates performed correctly at 100%. There were 37 additional skills where teacher candidates mean scores were above 1.5. Approximately, one fifth (20%) of the skills were performed at an unsatisfactory level. Teacher candidates' performance was most notably weak on skills that involved presentation, spreadsheet applications, and the Internet.

Research question three asked if there was a difference between teacher candidates' perceived computer skills and their actual performance-based skills.

The students' responses on the survey regarding their perceptions of their computer technology skills were compared to their actual performance of those skills, which served to establish their true computer technology ability. An examination of the "Basic Operation and Concepts" category shows that 23 of the teacher candidates who believed that they could perform the skills did not perform the skills, and 50 of the students who believed that they could perform the tasks, did actually perform the tasks. Within the "Technology Productivity Tools" category, five of the students who believed that they could not perform the skills, actually did perform the skills, and 33 of the students who believed that they could perform the skills, did not perform the skills. In addition, 27 of the students who believed that they could perform the skills did perform the skills. Within the "Technology Research Tools" category, 32 of the students who believed that they could perform the skills did not perform and 46 of the teacher candidates, who believed they could not perform the skills, did not perform the skills. In addition, only one student who believed that he could perform the skills, did perform the skills. Within the "Technology Problem-Solving and Decision-Making Tools" category, 27 of the students who believed that they could perform the skills actually did not perform the skills, and, all 50 of the students who believed that they could not perform the tasks, did not perform the tasks. The "Technology Productivity Tools," the "Technology Research Tools," and the "Technology Problem-Solving and Decision-Making Tools" categories showed the greatest degree of incongruence between the students' perceptions of their basic computer skills and their actual performing ability. In order to further assess differences in perception and performance abilities of students' basic computer ability, a paired *t*-test analysis was computed. Results of the analysis revealed significant differences in each of the paired sub-categories.

A comparison was made using frequencies and percentages to determine differences between the teacher candidates' perceived results and the candidates' actual performance abilities considering specific skills within the various sub-groups, the teacher candidates' perceptions were far greater than their actual ability levels in 38 of the 50 skills teacher candidates over-rated their abilities to complete the skills. In only eight of the skill categories, the same or approximately the same number of teacher candidates displayed an actual basic computer ability that was matched with their perceived ability. In four of the 50 skills, the number of teacher candidates who actually performed the skill exceeded their perceived ability ratings.

6.0 Conclusions

Several implications and conclusions emerged from this study. An overarching argument is the importance of teacher candidates possessing basic computer skills, which are fundamental to the use of computers and other technologies in the classroom. The major finding of this study was that teacher candidates have a higher perception than performance ability in basic computer skills. Findings of this study confirmed what other research has reported previously (Marvin, 2004). This study also validated Bandura's (1997) claim that in many instances, individuals' perceptions of their personal capabilities to initiate and successfully perform specified tasks at designated levels have been in conflict with their actual performance abilities.

Considering the descriptive findings of this study, teacher candidates overrated their abilities in 26 of 50 (52%) skills listed on the assessments. This overrating of basic computer skills by teacher candidates could lead to inaccurate assessments of teacher candidates' abilities, thus resulting in less use of technology in the classroom. These implications support previously recognized needs to better prepare teacher candidates on the use of technology. These concerns that have been highlighted by such legislation (NCLB, 2002) and educational organizations (ISTE, 2000, PT3, 2002) are valid. Conversely, a high self-efficacy may substantiate why teachers who were at best "Somewhat" prepared to use technology in their teaching are willing to assign students work with productivity tools (U.S.DOE, NCES, 2000). Thus, such perceptions can possibly increase teachers' actual use of such skills in the classroom learning environment.

Another finding from this study indicated the importance of an assessment tool to measure computer skills of teacher candidates. So far, assessment of teacher candidates' computer skills has been based, at best, on self-reported measures (Albee, 2003; Molebash & Milman, 2000; Weston & Barker, 2002; Yaghi, 2001; Yuen & Ma, 2002) or on the arbitrary assumptions that student come into the programs already prepared. Very few studies have sought to determine what teacher candidates can actually perform with reference to their perceived computer skills (Archambault et al., 2002; Gallagher, 2003; Marvin, 2004). These findings shed light on the need to develop a better assessment tool in relation to teacher candidates' computer preparation. Reliable assessments will enable educators to place teacher candidates in suitable training curricula where they can acquire the appropriate computer skills needed for the classroom.

References

Albee, J. J. (2003). A Study of preservice elementary teachers' technology skill preparedness and examples of how it can be increased. *Journal of Technology and Teacher Education, 11*(1), 53-71.

Archambault, F. X., Kulikowich, J. M., Brown, S. W., & Rezendes, G. J. (2002). Developing performance assessment to measure teacher competency in the use of educational technology. Paper presented at the Annual meeting of the American Educational Research Association. New Orleans, LA, April 2002. (ERIC Document Reproduction Service no. ED 465 759*).*

Bandura, A. (1994). *Self-efficacy. Encyclopedia of Human Behavior, 4*, 71-81. New York Academic Press.

Gallagher, B. J. (2003). The validity of self-reporting surveys as a tool for assessing teacher computer competency skills. *Dissertation Abstract International, 64*(07), 2461. (UMI No. 3099976)

International Society for Technology in Education (2002). National educational technology standards for teachers: Preparing teachers to use technology. Eugene, OR: ISTE.

International Society for Technology in Education. (2000). *National Educational Standards for Teachers.* Eugene, OR: ISTE

ISTE-NETS-International Society for Technology in Education (2000). Educational technology standards and performance indicators for all teachers. Retrieved on June 13, 2005 from http://cnets.iste.org.

Marvin, E. (2004). Preservice teachers' perception and performance-based abilities with technology-integration-related computer skills. *Dissertation Abstract International, 65*(03), 901. (UMI No. 3127343).

Molebash, P., & Milman, N. (2000, February). Technology in teaching: Just how confident are preservice teachers? In Society for Information Technology & Teacher Education International Conference: Proceeding of SITE 2000, Vol. 1-3. San Diego, CA (ERIC Document Reproduction Service No ED 444548).

National Center for Education Statistics. (2000). Teacher' tools for the 21st century: A report on teacher' use of technology. (NCES No. 2000-102) U. S. Department of Education, Washington, DC; Retrieved on March 23, 2005 from http://nces.ed.gov/surveys/frss/publications/2000102/.

National Center for Education Statistics (2005). Internet access in U. S. public schools and classrooms: 1994-2003. (NCES 2005-015) U. S. Department of Education, Washington, DC; Retrieved on September 23, 2005 from http://nces.ed.gov/surveys/frss/publications/2005015/2.asp.

National Council for Accreditation of Teacher Education (2002). Professional standards for the accreditation of schools, colleges, and departments of education. Retrieved on May 15, 2005 from http://www.ncate.org/documents/unit_stnds_2002.pdf.

No Child Left Behind Act (2002) Public law 107-110, 107th Congress. 115 STAT 1425. Retrieved on March 8, 2005 from http://www.ed.gov/policy/elsec/leg/esea02/107-110.pdf.

Partnership for 21st Century Skills (2003). Learning for the 21st century. Washington, DC: Retrieved on May 15, 2005 from http://www.21stcenturyskills.org.

PT3 –Preparing Tomorrow's Teachers to Use Technology (2002). Transforming teacher education through technology infusion. Retrieved on May 15, 2005 from http://www.pt3.org/.

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

U. S. Department of Education (n.d.). Preparing tomorrow's teachers to use technology program. Retrieved on March 8, 2005 from http://www.ed.gov/programs/teachtech/funding.html.

Weston, T. J., & Barker. L. J. (2002). A profile of students computing use, training, and proficiency. *Journal of Computing in Higher Education, 14*(1), 87-112.

Yaghi, H. M. (2001). Subject matter as a factor in educational computing by teachers in international settings. *Journal of Educational Computing Research, 24*(2), 139-154.

Yuen, A. H. K., & Ma, W. W. K. (2002). Gender differences in teacher in computer acceptance. *Journal of Technology and Teacher Education, 10*(3), 365-382.