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AUTHOR	Willner, Elizabeth; Willner, Jonathan
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ABSTRACT

Preservice teachers had the opportunity to make use of computers while tutoring elementary and middle school children in reading, mathematics, and integrated reading and mathematics. These tutors (n=128) responded to a survey that was designed to elicit responses about the value of computer use for tutoring and the motivational and learning effects of computer use. Specifically, the study examined the following questions: (1) Do preservice teachers (tutors) believe gender affects tutees' desire to use the computers? (2) Do tutors believe their tutees were more motivated to learn when using computers than when using other instructional tools? (3) Do tutors believe their tutees learn more using the computers than using other instructional tools? and (4) Do tutors believe the computers were more useful for the math only, reading only, or the integrated math/reading tutoring instruction? Data analysis included frequencies, means, one sample t-tests, ANOVA, and ordinary least squares regression. Findings include the fact that while tutors did view the use of computers to be motivating for their tutees, they did not believe that learning was enhanced. The tutors' personal use of computers affected their willingness to use computers for tutoring as well as their perceptions of computers as being motivating and valuable teaching tools. A copy of the survey instrument is appended. (Contains 12 references, 6 figures, and 1 table.) (Author/MES)

Preservice Teachers' Perceptions about Computer Use for Tutoring

Elizabeth Willner* and Jonathan Willner**

* Assistant Professor of Education, University of Oklahoma, 820 Van Vleet Oval Room 114, Norman, OK 73019-0260, ewillner@ou.edu, (405) 325-3534

** Associate Professor of Economics, Oklahoma City University, 2501 N. Blackwelder, Oklahoma City, OK 73106-1493, jwillner@okcu.edu, (405) 521-5133

ABSTRACT

Preservice teachers had the opportunity to make use of computers while tutoring elementary and middle school children in reading, mathematics, and integrated reading and mathematics. These tutors responded to a survey that was designed to elicit responses about the value of computer use for tutoring and the motivational and learning effects of computer use. Data analysis included frequencies, means, one sample t-tests, ANOVA, and ordinary least squares regression. Findings include the fact that while tutors did view the use of computers to be motivating for their tutees, they did not believe that learning was enhanced. The tutors' personal use of computers affected their willingness to use computers for tutoring and well as their perceptions of computers as being motivating and valuable teaching tools.

INTRODUCTION

It is tempting to view the use of technology, especially computers, in schools as a panacea. However, even those in the field of educational technology feel the need to explain what the computer can and cannot do. The 1998 Yearbook of the Association for Supervision and Curriculum Development devoted the entire issue to technology use in schools. "The authors and editor of this volume see technology as a means, not an end in itself," wrote editor, Chris Dede. He further states that technology cannot be seen as a "'vitamin' whose mere presence in schools can catalyze better educational outcomes" (Dede, 1998, p. v.). Instead, Dede and others promote the use of technology in schools as a way to further enhance teachers' and administrators' efforts to help students learn better. The technology does not replace the teacher, but can help him/her develop teaching and learning strategies that are appropriate for students.

Preservice teachers in a mid-western university town had the opportunity to make use of computers while tutoring elementary and middle school children in reading and mathematics. An hour a week for ten weeks was devoted to teaching students using computers, paper and pencil activities, games, and other learning activities. A lab that was equipped with ten Macintosh computers and 47 software programs was available for tutor/tutee use. In order to ascertain the usefulness of this computer lab to the tutoring program, a survey was developed and completed by 128 preservice teacher tutors after their last tutoring session of the semester. This survey provided the data to evaluate the use of computers in the tutoring program and to address the larger questions of computer use in education in general. Specifically, the purpose of this study was to attempt to answer the following questions:

- Do preservice teachers (tutors) believe gender affects tutees' desire to use the computers?
- Do tutors believe their tutees were more motivated to learn when using computers than when using other instructional tools?
- Do tutors believe their tutees learn more using the computers than using other instructional tools?
- Do tutors believe the computers were more useful for the math only, reading only, or the integrated math/reading tutoring instruction?

LITERATURE REVIEW

Preservice teachers' personal views and experiences with education form the basis of their future classroom practice, hence their understandings are worthy of consideration. Kellenberger (1996) considered preservice teachers' motivation and perceived computer self-efficacy in a study of students in a computer education course. "Unlike experienced teachers, preservice teachers often have little knowledge about students upon which to draw" (Kellenberger, 1996, p. 124). Kagan wrote that preservice teachers "instead rely heavily upon their own beliefs, and that these beliefs follow candidates into their own classrooms" (Kagan, 1992). Therefore, it is worthwhile for preservice teachers' beliefs about the use of computers in tutoring to be investigated.

Literature that addresses research question one, the role that gender plays in technology use in schools, has been discussed in the popular press as well as in professional journals. Computer use is now an accepted part of the everyday routine of elementary and middle schools in the United States. It is valuable to note that in most studies, boys have been found to be more

avid and enthusiastic computer users. Girls are more likely to be anxious about using computers as well as less confident about their own abilities to use the technology (Temple & Lips, 1989; Loyd, Loyd, & Gressard, 1987). "In the educational context, a number of studies confirm that the masculine image of computing exists as much within the school as outside" (Comber, Colley, Hargreaves, & Dorn, 1997, p. 124).

Research questions two and three address the level of motivation and learning associated with the use of computers as opposed to other learning tools. Newell (1996) found computers use to be the main motivator that fueled a cross-age computer tutoring program. Behrman (1998) found that the use of computers not only was motivating for children in special education, but was also a valuable tool that promoted learning.

Research question four addresses the perceptions of preservice teachers of how useful the computers were to their tutoring of an elementary or middle school child. Reeves (1996) bemoans the marginalization of technology in schools of education, writing, "A primary reason for the failure of technology to become an integral component of educational practice has been the misunderstanding of appropriate roles for technology" (p.74). He is concerned that educators assume that students can learn "from" computers as opposed to "through" them. This is a noteworthy consideration when assessing preservice teachers' perceptions about the value of computer use for tutoring. As Guzdial (1998) notes, "Teachers must be taught to work with technology; their role as gatekeeper and shepherd of innovation is critical for student success" (p.68).

METHOD

Subjects: One hundred-twenty-eight juniors and seniors in a school of education, during 2 semesters, completed the survey, answering questions about their use of computers with an

elementary or middle school child. Seventy-four of the tutees were female and fifty-four were male. *Figure 1* displays the grade levels of the tutees. Tutoring sessions were scheduled for one hour a week for ten weeks and computers were one option for them to choose when planning lessons. Twenty-two preservice teachers were enrolled in a mathematics methods course, forty-two were enrolled in a reading methods course, and sixty-four were enrolled in an integrated reading and math methods course. The tutoring component was a major focus of these courses.

Instrument: The survey instrument was designed to elicit responses that would attempt to answer the four research questions as well as collect information that would be useful to the instructors for the course and the coordinators of tutoring. Six questions used a Likert-like scale for responses, while other items asked for written responses from the preservice teachers. *Appendix 1* is the complete survey form.

Procedure: The survey instrument was distributed in the university classes and time was given for its completion. No names were requested on the survey and the tutors were told that information would not be used in determining grades for the course. Preservice teachers were asked to be as thorough as possible so that the use of computers for tutoring in the future could be improved. After the survey was complete, many preservice teachers discussed with each other their opinions, successes, and tribulations with using computers for this semester's tutoring.

Analysis: Analysis of the data included calculating frequencies, means, one sample t-tests, analysis of variance (ANOVA), and ordinary least squares regression.

RESULTS

Research Question One: Tutors had a choice of five responses on this question that read, "Did your tutee express the desire to use computers: constantly, often, sometimes, rarely, or

never?" *Table 1* provides summary statistics for the variable "Desire" and all other variables used in this study. The mean value of "Desire" is 3.00 and not significantly different from 3 (t-statistic = 0).

To look for what might be influencing this neutral perception (and for similar examinations of other questions in this paper) a simple linear regression of the form given below was run.

$$DESIRE = \alpha + \beta_1*MATHONLY + \beta_2*MATHREAD + \beta_3*M0F1 + \beta_4*USEPERS + \beta_5*COMPPROJ + \beta_6*GRADE + \varepsilon$$

The results of this regression are given in *Figure 2*. Contrary to much current research and intuition, tutee's gender did not influence his/her desire to use the computer for tutoring (p = 0.1335). The tutee's grade and whether or not the tutor had a computer project as part of their course work were also insignificant. Tutors who used computers for their own purposes felt that the "DESIRE" was enhanced by the use of computers. Whether this is a reality or a perception is an interesting future question to answer. In general it would seem that the desire to use a computer was not strong in the tutees.

Research Question Two: Tutors had a choice of three responses for this question that read, "Do you think your tutee is motivated more, the same, or less when using the computer as opposed to other learning tools?" Computer use was found to be motivating for tutees according to their tutors' perceptions. A reported value of "1" is roughly equivalent to a neutral effect, given the scale of the instrument. In this case a two-tailed t-test reveals that the mean is significantly different from 1. A one-tailed t-test where the null hypothesis is that MOTIVE is

neutral or negative leads to a rejection of the null (t-statistic = 6.446). This provides support for the motivational impact of computers.

Figure 3 shows the result of a regression similar to that used in Research Question 1 to find explanatory values. All the results hold, suggesting again that a tutor's use of computers strongly influences his/her perception of the ability of computers to motivate others.

Research Question Three: Tutors had a choice of three responses for this question that read, "Do you think your tutee learned more, the same, or less when using the computer as opposed to other learning tools?" Computer use was not found to increase learning for tutees, according to their tutors' perceptions. The learning effect was essentially zero (mean = 1.11, t-statistic = 1.839, *p-value* = 0.0685). At a lower level of significance (note the *p-value*), however, there is some support for enhanced learning with computers.

Figure 4 shows the results for the regression used to control for tutor influences. The same results hold, but the intercept term is not significant, indicating a 0 value (negative effect on learning) when we control for the tutor's personal use of computers. *Figure 5* illustrates the correlation between learning, desire and motivation. Though the correlation coefficients themselves are not large, their *p-values* indicate they are, in fact correlated. In addition, they are all correlated with the tutor's personal use of computers.

Research Question Four: Computers were found to be most useful to the tutors in the integrated reading and math methods course. The mean value of USETUTOR, 0.5375 was significantly greater than 0, but significantly less than 1. This supports a slight level of usefulness in the eyes of the tutors. A regression was used to analyze the Likert-like scale of 1

through 5 for USETUTOR. In this regression the role of the type of course in which the tutor was enrolled was assumed to be of importance. *Figure 6* shows the result of the regression:

$$USETUTOR = \alpha + \beta_1*MATHONLY + \beta_2*MATHREAD + \beta_3*M0F1 + \beta_4*USEPERS + \beta_5*COMPPROJ + \beta_6*GRADE + \varepsilon$$

When we control for the type of methods course the students are taking and their own personal use of computers, the explanation of the usefulness of computers becomes more clear. As occurred in all the previous regressions, the students' personal use explains a great deal of whether or not the computer is perceived as useful. The integrated course has a weak but positive effect on usefulness. However, the intercept term has become significantly negative, indicating that a great deal of the perceived usefulness is dependent on the tutor's familiarity with computers.

DISCUSSION

The results of this study will impact the design of the particular methods courses in which tutoring is a large component; they could also add to the body of research investigating the use of computers for educational purposes and the research concerning how preservice teachers are introduced to technology. It is interesting to note that the result showing the lack of significant difference between boys' and girls' desires to use computers is counter-intuitive, but may represent a coming trend in the United States. A mitigating factor may be that the gender split does not show up in some research until junior high or high school (Comber, Colley, Hargreaves, & Dorn, 1997).

The findings demonstrate that tutees were believed to be more motivated when using computers. David Ruenzel (1998) described the concerns of a history teacher: "...she talked about the computer as a valuable tool, but one that has to be used with caution. 'It's easy to get swept up in the technology, to hide behind it'" (p.28). Former teacher Jennifer New worked for Microsoft and became aware of the "glitzy products that promise to teach as well as entertain" (p.46). It IS easy for preservice teachers and their tutees to use the computer for entertainment purposes rather than as educational tools. More research needs to be done to determine effective ways to use computers as learning aids as opposed to showmanship crutches.

While it is advisable to exercise caution about the expense, time, and effort put into the use of computers for education, it would be inadvisable to underutilize valuable resources that can help our students. Chris Dede (1998) speaks well for the intelligent use of computers and all technology in schools when he writes, "By balancing investments in advanced technology and standardized tests with investments in sophisticated curriculum, assessment, and educators--in and out of school--we can successfully prepare children for the tremendous challenges of the 21st century" (p. 215). This view is mirrored by one of the tutors in the study who wisely wrote:

> Computers aren't the be-all and end-all, but they are certainly useful tools, just as attribute blocks and fraction dominoes are useful tools. Computers can help students who are differently-abled; my tutee can express herself better using a keyboard than a pencil, for instance. (Survey Response, 1998)

A note of concern is that the greatest explanatory variable in all the regressions is the tutor's familiarity with computers. It seems that if the tutor uses computers personally, the use of computers for tutoring is perceived to be more motivating and computers are viewed as being better teaching tools. Since all measures were based on the tutors' perceptions, it seems

reasonable to ask if these results were due to a desire to be current with the latest teaching techniques regardless of substantive impact. This self-confirming possibility is further supported by use patterns. While 47 programs were available, only 26 were actually used. Of the 166 times computer programs were used, 102 (61%) of the uses were of only 5 programs.

The challenge for those in this particular preservice teacher tutoring program and for those in educational technology in general is to thoughtfully consider how our use of computers can be adjusted to fit the needs of individual preservice teachers and their future students. Further, the role of technology within the broader context of curriculum development and reform should be examined to determine the alterations necessary to help technology become a part of the curriculum as opposed to being apart from it.

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Figure 1: Tutee Grade Level

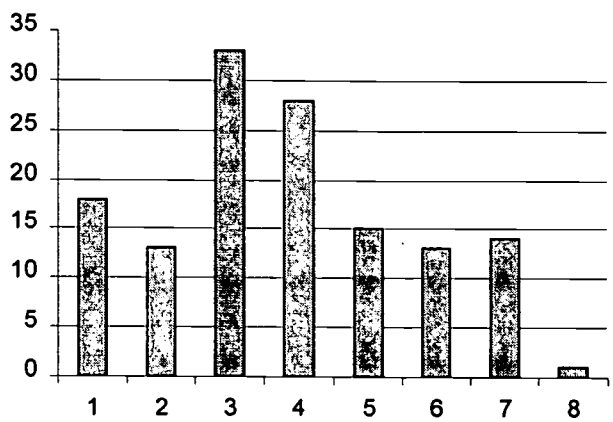

Table 1: Variable Definitions and Summary Statistics

Symbol	Variable Definition	Mean Value	Standard Deviation	N
GRADE	The tutee's grade level at the time of the survey (1-8)	3.796875	1.8244161	128
M0F1	Sex of the tutee (1 = female, 0 = male)	0.5703125*	0.4969766	128
MATHONLY	Tutor Was in a math methods class (0 = no, 1 = yes)	0.1718750*	0.3787542	128
READONLY	Tutor was in a reading methods class (0 = no, 1 = yes)	0.3281250*	0.4713755	128
MATHREAD	Tutor was in an integrated math/reading methods class (0 = no, 1 = yes)	0.5000000*	0.5019646	128
DESIRE	Level of desire to use computers as expressed by the tutee and interpreted by the tutor (1 – 5)	3.0000000	1.2279807	127
MOTIVE	Perception of the tutor as to whether computers served to motivate the tutee (0 – 2)	1.4016393	0.6882705	122
LEARN	Perception of the tutor as to whether computers helped the tutee learn. (0 – 2)	1.1101695	0.6508889	118
FOCUS	Perception of the tutor as to whether computers helped the tutee stay more focused on learning (0 = no, 1 = yes)	0.7230769*	0.4509605	65
PLAYWORK	Perception of whether the tutee viewed the use of computers more as "play" or "work". (1 – 5)	2.3655462	1.0306684	119
USETUTOR	Perception of the tutor as to whether computers were useful learning tools (1 – 5, adjusted to –2 – 2)	0.5375000	1.2454328	120
USEPURS	How useful the tutor found computers for their own purposes (1 –5)	3.8305785	1.1466504	121
COMPROJ	Whether or not the student completed a computer project as part of the methods class. (0 = no, 1 = yes)	0.5937500*	0.4930621	128
* = proportion				

Figure 2: Regression results for DESIRE

Variable	Coefficient (Standard Error in Parenthesis)
Intercept	1.88008** (0.46285)
M0F1	-0.28956 (0.23120)
MATHONLY	0.06793 (0.40080)
MATHREAD	0.46970 (0.29757)
USEPERS	0.30676** (0.09297)
COMPPROJ	0.12709 (0.22763)
GRADE	-0.03357 (0.07429)
F = 2.75**	
Adj R2 = 0.0852	
N = 113	
* significant at 10% ** significant at 5%	

Figure 3: Regression results for MOTIVE

Variable	Coefficient (Standard Error in Parenthesis)
Intercept	0.69927** (0.26018)
M0F1	-0.10880 (0.12996)
MATHONLY	-0.04922 (0.22530)
MATHREAD	-0.06150 (0.16727)
USEPERS	0.19988** (0.05226)
COMPPROJ	-0.23389* (0.12796)
GRADE	0.05300 (0.04176)
F = 3.13**	
Adj R2 = 0.1016	
N = 113	
* significant at 10% ** significant at 5%	

Figure 4: Regression Results for LEARN

Variable	Coefficient (Standard Error in Parenthesis)
Intercept	0.18007 (0.25037)
M0F1	0.11104 (0.12506)
MATHONLY	-0.09860 (0.21680)
MATHREAD	0.09601 (0.16096)
USEPERS	0.23030** (0.05029)
COMPPROJ	0.05236 (0.12313)
GRADE	-0.01904 (0.04019)
F = 4.12**	
Adj R2 = 0.1421	
N = 113	
* significant at 10% ** significant at 5%	

Figure 5: Correlations on Tutees' Perceptions towards Computers

Pearson Correlation Coefficients

	DESIRE	MOTIVE	LEARN
DESIRE	-		
MOTIVE	0.54402**	-	
	(121)		
LEARN	0.28971**	0.49782**	-
	(117)	(118)	
USEPERS	0.27781**	0.32783**	0.40972**
	(120)	(119)	(115)

* significant at 10%
** significant at 5%
N in parenthesis

Figure 6: Regression Results on USETUTOR

Variable	Coefficient (Standard Error in Parenthesis)
Intercept	-1.67224** (0.42398)
M0F1	-0.03933 (0.21179)
MATHONLY	-0.21766 (0.36715)
MATHREAD	0.52995** (0.27258)
USEPERS	0.58588** (0.08517)
COMPPROJ	-0.06588 (0.20852)
GRADE	-0.05107 (0.06806)
F = 9.58**	
Adj R2 = 0.3129	
N = 113	
* significant at 10% ** significant at 5%	

Appendix I: COMPUTER USE SURVEY FOR READING AND MATH TUTORING

This survey addresses the use of computers as a tool in your tutoring of an elementary or middle school aged student this semester. Please answer the following questions as completely as possible.

1. Grade Level of Your Tutee: _____ 2. Gender of Your Tutee: _____

3. Type of Tutoring (Circle One): Math Only Reading Only Math/Rdg. Integrated

4. Circle One. Did you tutee express the desire to use computers:
Constantly Often Sometimes Rarely Never

5. Please circle each program you have used yourself and write the number of times you have used it with your tutee on the line next to it.

Action Fraction Fun House	_____	Fraction Attraction	_____
Counting on Frank	_____	Logo Plus	_____
Discover Time	_____	Math Blaster I	_____
Math Majors	_____	Math Munchers Deluxe	_____
Math Workshop	_____	Millie's Math	_____
Money Challenge	_____	Outnumbered! Super Solvers	_____
Safari Search	_____	Touchdown Math	_____
Treasure Galaxy	_____	Turbo Math Facts	_____
Work Prob. Square Off	_____	Amazing Writing Machine	_____
Bailey's Book House	_____	Brain Quest	_____
Cinderella	_____	Cross Country	_____
Early Language Connections	_____	Just Grandma and Me	_____
Kids' Works	_____	Mud Puddle	_____
Muppets on Stage	_____	Oceans Below	_____
Oregon Trail (Ages 5-8)	_____	Oregon Train II (Ages 10 up)	_____
Reader Rabbit 2	_____	Reader Rabbit 3	_____
Reading Galaxy	_____	Reading More	_____
Sammy's Science	_____	Spellbound! Super Solvers	_____
Storybook Weaver	_____	Paper Bag Princess	_____
Tale of Peter Rabbit	_____	Thinkin' Things II (Gr. 1-6)	_____
Thinkin' Things III (Gr. 3-8)	_____	U.S. Atlas & Almanac	_____
Where in the World is Carmen Sandiego?	_____	World Atlas	_____

6. Which **one** computer program has been the **most useful** to you?

7. Why has this one been particularly useful?

8. Which **one** computer program (that you have used) has been the **least useful** to you?

9. Why was this one not useful to you?

10. Other learning tools include books, paper and pencil, games, etc. Do you think your tutee is **motivated** more, the same, or less when using the computer as opposed to other learning tools?

Motivated More Motivated the Same Motivated Less

Why do you think this?

11. Do you think your tutee **learns** more, the same, or less when using computers as opposed to other learning tools?

Learns More Learns the Same Learns Less

Why do you think this?

12. Please answer this question if you had a tutee who seemed to be easily distracted. Do you think the use of computers helped this tutee stay focused better than the use of other learning tools?

13. On a scale of 1 to 5, with 1 being "play" and 5 being "work," how do you think your tutee viewed the use of computers during tutoring sessions this semester?

(Play) 1 2 3 4 5 (Work)

14. On a scale of 1 to 5, with 5 being the most useful, how useful has the use of computers been for your tutoring sessions this semester?

(Not Useful) 1 2 3 4 5 (Very Useful)

15. On a scale of 1 to 5, with 5 being the most useful, how useful has the use of computers for tutoring been to you personally this semester (i.e. How useful has it been for your future teaching to use computers?)?

(Not Useful) 1 2 3 4 5 (Very Useful)

THANK YOU FOR YOUR HELP!

Please write any additional comments about the use of computers in tutoring on the back.

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