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Abstract

The purpose of this study was to examine student attitudes toward technology in the economics classroom in a magnet high school in Augusta, Georgia over a period of a semester. A survey was used to measure attitudes towards computer use, any changes at the end of the semester, and any differences by gender. Structured observations were notated in a teacher log once a week to note any differences in aggressiveness towards computer use by gender. The results indicate that although males scored higher on attitude surveys, there were no significant differences between gender. Twelve students were lost because of failing to qualify academically or moving away. While female students demonstrated a higher level of aggression in mixed pair groups, male students responded more positively towards the use of computers than female students. This study concluded that high school students of both genders respond positively to the use of computers in the study of economics.

Technology in the High School Classroom

Many educators understand that to compete in a global market, students entering college or the workforce must possess technological literacy. Public schools across the country are stressing the importance of combining technology across the curriculum. Teachers are willing to learn and adapt to better prepare students. Studies suggest that technology empowers students and deepens their understanding and enjoyment of current curriculum (Keogh, 2000).

Pressure is being placed on teachers to prepare students to compete in a global society. To compete as adults in this society, students must have both critical thinking and technology skills. For example, in the Japanese school systems, students focus on higher order thinking skills (Richards, 2000). Students are questioned not only on the answer that they present but also emphasis is placed on the process in which it took to formulate the correct answer. Students can then take the skills of formulating an answer and technology skills and apply it to different situations.

In the last ten years the use of technology has spread across the

world. Students who enter the workforce from high school must possess computer skills to function in many low level jobs. Computer skills are essential to prepare students for the real world. With access to the Internet and advanced software, teachers are not only facing the challenges of teaching new technology but the challenge of teaching students how to use technology. High school students have a variety of computer skills and backgrounds. In addition, some studies show that only about one-quarter of seniors and fewer eighth and tenth graders are computer proficient (Richards, 2000). These studies suggest that gender may play an important role in attitudes towards technology. Even though modern computer technology may be compelling to teachers and students, it is the quality of curriculum and motivation techniques that influence students' attitudes, performance, and success (Charlton, 1995). Therefore it is important to understand how to motivate students and integrate technology in the classroom through meaningful lessons. In addition to content, judgment, retention of information, higher order thinking skills and technology skills are very important for the literacy of all students.

Standards are rising across America and teachers must be able to motivate students to understand and retain technological lessons. As in other areas of content, students have a variety of backgrounds, knowledge and computer skills. Individualized instruction is more important than ever so that all students can achieve their maximum potential in reaching for higher standards. There is a growing consensus that computers are influential tools in enhancing the potential of individuals by facilitating the learning process. Knowledge and confidence with computer technology will soon be required in every facet of the competitive employment market (Jones, 2000).

Attitudes of High School Students

Although computers are becoming more available, the use of technology is perceived by many as requiring complex technical skills (Sexton, 1999). In fact, one study suggested that up to one-third of individuals may be afraid of using computers and tend to avoid contact with technology. The term "computer anxiety" has been used widely to indicate the fear or apprehension felt by individuals when they use computers or when they consider using a computer (Charlton, 1995).

In a recent study conducted in an urban school in Illinois (Al Jabir, 1997) focused on the attitudes of high school students and com-

puter use. Surveys were administered to suburban high school students to inventory their attitudes towards using technology. Only ten percent of the students surveyed had access to computers at home. The attitudes among the ten percent that had computers at home were significantly higher than those students without computers. A large scale, cross curriculum projects linking technology, english, and social studies were adapted at this high school. A pretest and posttest were given to the students and found that attitudes were more positive towards computers at the end of this project. There were three cause and effect relationships that were observed between attitude change, use, and benefits of computerization. This study examined three factors that could be linked to a positive experience when using computers, (Al Jabir, 1997). The three relationships that caused positive attitudes towards computers in the classroom were the amount of prior exposure to computers, access to computers, and length and meaningfulness of computer use. First, students who used computers at home or played video games were more comfortable and successful in their computer assignments than those students that did not have computers at home. Students who had access to computers at home were more familiar with basic commands and more comfortable with the navigation of the computer. Students who did not have access to computers at home illustrated apprehension and fear of pushing the wrong key and had trouble locating the different commands.

Secondly, students who had access to computers at home or other resources were more likely than those without access to use and explore the computers. The additional use of computers outside of the classroom improved familiarity and attitude towards the assignments over the course of the semester. Students who did not have access to computers took longer to complete assignments and their overall attitude was less positive than those who had access to computers. A third relationship was found between length of computer use at school and attitude towards computers. Students who used the computers over the semester demonstrated with time a more positive attitude toward the computer. Evidence indicated that over a prolonged period of usage that attitudes about computers were more positive than with limited exposure. There was a significant difference in males and females; males tended to answer more positively than female students.

Gender Attitudes and Bias

Rothschild (2000) completed a study of 82 high school students conducted in the United States, focusing on gender differences in computer attitudes and behavior. He reported in general that males have higher computer efficacy and have more positive attitudes towards computers than females. He also found that men and boys tend to have greater experience with computers than women and girls. Janssen, Reinen and Plomp (1997) carried out an extensive study of gender and educational computer use in several countries. They found that female students knew less about technology than male students, enjoyed using computers less and perceived more problems with navigation and computer software. Other studies have reported that the ratio of female students enrolling for computer related careers is significantly lower than male counterparts (Richards, 2000). Each study questioned why females might not have the same positive attitudes towards computers as male. Explanations were given for the gender gap, such as the theory by Janssen, Reinen and Plomp (1997) who suggested that the gap could be linked to social adaptation. Males tend to prefer games, random play, and females seem to prefer socialization with other children. The computer industry focuses computer and electronic games towards males and video games with a bias towards boys' interests. Boys are more likely to play with video games thus becoming more familiar with technology than girls. Boys were also more likely to use computers and technology at home. In addition, girls (especially during early adolescence) tended not to find the social atmosphere of computers appealing to their social development. Many girls preferred more social games with other girls. There is a cultural bias that technology is a "male" domain. This perception is that computer technology is linked to mathematics; a field that girls feel is identified more with males. This study also noted that there is a lack of women teachers as role models in the computer field. All of these observations can affect the attitudes of females towards computers.

One of the more consistent findings in this literature was that when boys and girls were paired in cooperative learning groups, that behavior and attitudes changed. Boys in boy-girl pairs dominated the interaction with the computer by dominating the control of the mouse and/ or keyboard. Siann and Macleod (1986) observed that boys dominated the control of the mouse in boy-girl pairs. Boys were also found

to become more verbally active than girls when paired in a mixed gender group. Girls became more submissive and less active in mixed pair groups. There were significant differences, both in terms of the amount of verbal interaction, type of verbal interaction and physical manipulation of the materials, between girls and boys in the mixed-gender pairs compared with girls and boys in the same gender pairs. In a non-computer task with mixed gender groups there were no gender differences. This could suggest as the study noted that boys are perceived as more expert with computers taking the lead role and the female partner perceived as less expert, taking the supportive role.

The purpose of this study was to investigate the attitudes towards using technology in the classroom among high school students. The four major questions were as follows: (a) What were the perceived attitudes about using technology in the social studies high school classroom? (b) Did student attitudes change with prolonged computer usage? (c) Were there gender differences in attitudes towards computer and technology usage? (d) Was one gender more aggressive in computer-centered lessons?

Method

Participants

Sixty ninth grade students in an economics class, (23 females and 18 males, average age = 14.5 years) participated in this study conducted in an urban public magnet school where students must maintain a 3.0 overall grade point average. Students were selected from within the county to attend this school. The racial composition was composed of 47 percent Caucasian, 50 African American, and three percent other. Ten percent of students at this school received free or reduced lunches. Two intact groups of students were used for this study. Students were informed of the study and parent permission forms were obtained in accordance with the "Ethical Principals of Psychologists and Code of Conduct" (American Psychological Association, 1992). Students also submitted a technology permission form signed by parents and returned to the media center granting permission to use the Internet.

Instrumentation

Pretest and posttest surveys were administered to students to measure their attitudes toward technology, see appendix. Both surveys were identical and consisted of questions related to personal feelings and opinions about technology and computers. Students completed both

surveys anonymously and only gender was noted. Pretests were based on a Likert scale. Students answered a four for most likely and a one for least likely on how they felt towards that question. See Appendix. After completion of the semester unit, the students were administered the same technology attitude test. Student names were not recorded on this survey, but gender was indicated. The answers were coded as 4 for Strongly Agree, 3 for Agree, 2 for Sometimes Disagree, and 1 for Disagree. Questions three, five, six, and seven were stated in the reverse so the coding was reversed in the data entry which was done in an Excel spreadsheet.

In addition during each session in the technology lab, observations were noted in a journal by the teacher. Students behaviors in the media center were observed. During each session in the computer lab student behavior was observed and recorded in a journal. An observation inventory was used in each journal entry. The observation inventory noted if the students worked in same or mixed gender pairs, how many warnings were given to each group, warnings given to the class, incidents of arguing over the mouse, number of students who do not turn in the assignment, and the average class grade of the assignment. Gender dominance of the task, cooperative learning, and overall performance were recorded by gender in the teacher's journal. A daily reflection of each class was also noted in the journal. Positive attitudes noted were comfort level of using the computer, familiarity of the computer, and amount of usage of the computer. Data was collected throughout the semester. Observations were made and recorded concerning any gender aggressiveness and passiveness during mixed and same gender group activities.

Procedures and Materials

Economics curriculum was combined with computer-related lessons in accordance to the Quality Core Curriculum as outlined by the State of Georgia (Georgia Learning Connection, 2001). Over a period of a semester students completed assignments related to economics using the Investmart Investment program. This program is produced by Thinkquest 2001, it is an on line investment program which teaches students how to buy and sell stocks. Students also completed assignments using Microsoft Word, Excel, Inspiration, and Power Point. Students completed a spreadsheet using Excel, a flow chart using Inspiration, and a presentation using Power Point. Mixed-gender cooperative learning

groups were used to create a Power Point presentation and Internet Scavenger hunt unit. Students composed a pre and post resume listing their technology skills that an employer might be interested in. Students received a grade for all individual and group assignments. These programs are commonly used in college and are stressed by the state of Georgia In Technology program (Georgia Learning Connection, 2001).

Design and Data Analysis

A quasi-experimental one-group pretest-posttest design was used to measure attitudes before and after the teaching unit. Responses were compared using a nonparametric test of means. ANOVA was used to compare the responses by gender on both the pretest questions and the posttest questions. The alpha level of significance for each test was set at alpha = .05 using a one-tailed test. Behavior differences by gender were recorded in the journal observation inventory entries and conclusions and themes were drawn from these.

Results

The attitudes of the students towards the use of computers were very positive. Responses of Agree and Strongly Agree were combined into the percent of positive responses. See Figure 1. On the survey all students stated that they enjoyed playing games on the computer, ninety-five percent of students stated that using computers wasn't too complicated. Ninety three percent of the students surveyed stated that computers are necessary in daily activities and that they had access to a computer. A total of 41 students participated in the pretests and 29 in the posttests. Figure 1 was based on the pretest results. Twelve students did not complete the posttest surveys due to school attrition, school transfers, or withdraws due to academic deficiencies.

When pretest results and posttest results were compared using nonparametric tests of means (Wilcoxon Signed Ranks Test), there were no statistically significant differences. The means for six of the posttest questions did increase slightly. Question 10, " I would enjoy computers more if I had more training" improved the most.

The one way ANOVA used to compare each question on the pretests by gender revealed that there was a significant difference on question four, "I am very knowledgeable when using computers." $F(1,39) = 6.12$, $p = .01$ (one-tailed). The males scored higher $M = 3.28$, $S.D. = .89$, and the females scored $M = 2.61$, $S.D. = .92$. The posttest

scores were examined in the same way and at posttest there were no significant differences by gender. The mean on question four (I am knowledgeable) for females rose to M = 3.0, SD = .94. While the mean for the males was M = 3.39, SD = .698. However there were eight fewer males and four fewer females taking the posttest due to attrition. Some moved away or were disqualified academically to participate in classes at this magnet school. Overall males showed a slightly more positive attitude towards in technology use in both pretest and posttest surveys.

Qualitative data entered in the teacher's log was examined for other gender differences.Weekly journal entries indicated that both genders indicated a desire during class sessions for the increase in knowledge of new computer programs. As noted in several journal entries both genders often inquired when the class was going to learn a new program. Often students would hear of technology on the television such as using the Microsoft Power Point program to create web pages. Student attendance for both male and female students was higher on days when they were assigned to work in the computer lab. Students became more comfortable with technology, were less apprehensive toward computers, and were less concerned of the complications of using a computer. While male students indicate an overall higher level of comfort using the computers, female students demonstrated a higher level of aggression in the computer lab. For example, when students were assigned to work in mixed gender groups, female students were warned on an average of three times per session for discipline related problems. There were a higher number of incidents of female students that did not complete their assignments during the class period when working in mixed gender groups.

As noted in the journal, female students often demanded to control the mouse, sit at the navigation seat, and control usage of the computer when paired into mixed gender groups. Overall observations indicate that same gender group pairs worked the most cooperatively together, were more likely to finish assignments before the end of the period, less disruptions, and discipline problems than when paired into mixed gender groups. Over the length of the study students expressed the desire to use computers in the classroom. Students also felt that the use of computers in the classroom as perceived to make the learning process easier.

Discussion

Both genders indicated a higher degree of comfort using the computer both before and after the semester's work. Ninety three percent of students survey stated that they had access to a computer (see figure one). It is possible because this study was conducted at a magnet high school students were more likely to have access to computers. Students who attend this school must have a 3.0 average or above and must maintain an overall 3.0 average to stay at this school. Therefore, it might be possible that because of this academic requirement, students would be more receptive to technology. Research (e.g., Sexton, 1999) indicated that in a similar magnet school setting that students were more positive about using technology in the classroom than in a regular public school setting. In the same study students were also more likely to own a personal home computer than public school students. As students learned new programs they were excited to learn more programs. While more discipline problems were recorded in mixed gender groups, several of the students stated that they preferred to work in mixed gender groups but felt that they would accomplish more in same sex groups.

This study was important because it is for the benefit of the quality of education for the students. The findings of this study support the conclusion that use of computers for economics classes enriched student's quality of education, students learned new technology as well as retained information for longer periods of time. This unit also motivated students in the completion of assignments, and utilized extensive research from a variety of internet resources. Computer usage also created a variety of activities in the classroom and possibly discouraged passive learning. This motivated the students to complete the assignments. Initial expectations were that students would have less positive attitudes towards computers. Overall student attitudes were initially positive and improved over time. After completing a full semester unit combining computers in the classroom, it was discovered that students remained positive towards utilizing the computers.

Both genders displayed a positive attitude towards technology in the classroom. As anticipated, parents and administrators were supportive when integrating technology in the classroom. Adults realize the importance and necessity to combine computers with the curriculum since it is no longer an option.

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Table 1
Results of Pretest Survey

	All		Males		Females	
Question	M	SD	M	SD	M	SD
Computer five hours	3.44	.85	3	1.24	3.22	1.10
Comfortable and enjoy	3.72	.57	3.35	.88	3.54	0.77
Computer only when	3.44	.78	3.61	.65	3.525	0.77
*Very knowledgeable	3.28	.89	2.61	.98	2.945	0.99
Hand write term paper	3.67	.68	3.43	1.08	3.55	0.92
Computer too complicated	3.72	.57	3.65	.57	3.685	0.56
Not necessary	3.56	.70	3.56	.72	3.56	0.70
Access to computer	3.72	.82	3.74	.68	3.73	0.74
Enjoy playing games	3.67	.48	3.61	.49	3.64	0.48
Enjoy if had more training	3	1.02	3.13	1.01	3.065	1.01

*Note: $F(1,39) = 6.12$, $p = .02$ (two-tailed).

Table 2
Results of Posttest Survey

All		Males		Females	
M	SD	M	SD	M	SD
Computer five hours					
3.5	.618	2.95	1.02	3.13	.95
Comfortable and enjoy					
3.83	.383	3.52	0.81	3.67	.66

Computer only when					
3.61	.698	3.52	0.81	3.56	.78
Very knowledgeable					
3.39	.698	3.00	0.94	3.18	.85
Hand write term paper					
3.72	.752	3.80	0.67	3.77	.70
Computer too complicated					
3.78	.428	3.85	0.35	3.82	.38
Not necessary					
3.61	.698	3.71	0.46	3.67	.57
Access to computer					
3.94	.236	3.85	0.35	3.9	.30
Enjoy playing games					
3.61	.778	3.57	0.50	3.59	.63
Enjoy if had more training					
2.78	1.06	3.28	0.56	3.59	.63

Appendix

Technology Perception Inventory

Directions: Read each question carefully and circle the answer that you most strongly agree with.

1. I Use the computer over 5 hours per week.
Strongly Agree Agree Sometimes Disagree Disagree

2. I feel comfortable and enjoy using the computer.
Strongly Agree Agree Sometimes Disagree Disagree

3. I use the computer only when I have to.
Strongly Agree Agree Sometimes Disagree Disagree

4. I am very knowledgeable when it comes to using the computer.
Strongly Agree Agree Sometimes Disagree Disagree

5. I would prefer to hand write a term paper than type a term paper on the computer.
Strongly Agree Agree Sometimes Disagree Disagree

6. Using the computer is too complicated and time consuming.
Strongly Agree Agree Sometimes Disagree Disagree

7. It is not necessary to use a computer.
Strongly Agree Agree Sometimes Disagree Disagree

8. I have access to a computer.
Strongly Agree Agree Sometimes Disagree Disagree

9. I enjoy playing games on the computer.
Strongly Agree Agree Sometimes Disagree Disagree

10. I would enjoy using the computer if I had more training on how to use the different programs.
Strongly Agree Agree Sometimes Disagree Disagree