# The Influence of Gender on Attitudes, Perceptions, and Uses of Technology

**Connie D. Bain**
*Vestavia Hills City Schools, Alabama*

**Margaret L. Rice**
*The University of Alabama*

## Abstract

*This study investigates whether gender has an effect on students' attitudes toward, and their uses of, technology. Data were collected from 59 sixth grade students to examine their attitudes toward and uses of technology by means of The Computer Survey (TCS), computer logs, interviews, classroom observations, field notes, and student work. One of the major findings of the study was that gender differences in attitudes, perceptions, and uses of computers were not found to be significant. The results of this study indicate that gender does affect students' attitudes toward technology for the participants of this study. The majority of females do not perceive computers as being difficult for themselves, other females, or males. However, several males indicated they were better at using the computer than females.*

## INTRODUCTION

The prevalence of technology has increased at a phenomenal pace during the past 10 years and has become a large part of most of our lives. Rathbun and West (2003) report that 65% of children had access to a home computer in 2000, compared to 32% in 1993. This is almost a doubling of computers in seven years. With the continued growth and prevalence of technology, gender differences in the use of and attitudes toward technology as indicated by past studies, become even more important to understand (Bame, Dugger, deVries, & McBee, 1993; Boser, Palmer, & Daugherty, 1998; Comber, Colley, Hargreaves, & Dorn, 1997; Durndell, Glissov, & Siann, 1995; Nelson & Cooper, 1997; Teasdale & Lupart, 2001; Wolters, 1989). Of interest is whether gender differences still exist as they did in the past. The use of technology in future jobs makes it particularly important for both male and female students to develop skills that will help them become technology literate and prepare them to work in a technological society.

### Background Literature

Several researchers found that attitudes toward technology differ significantly between males and females, with males indicating greater interest and knowledge (Bame, Dugger, deVries, & McBee, 1993; Boser, Palmer, & Daugherty, 1998; Comber, Colley, Hargreaves, & Dorn, 1997; Durndell, Glissov, & Siann, 1995; Hale, 2002; Nelson & Cooper, 1997; Teasdale & Lupart, 2001; Wolters, 1989; Young, 2000). Other researchers found that female students perceive technology as more difficult and less interesting than male students (Boser, Palmer, & Daugherty, 1998; Krendl & Broihier, 1990; Teasdale & Lupart, 2001; Wolters, 1989).

According to Linn (1999), the difference in gender attitudes and uses can be traced back to the placement and use of computers in education, where they were mainly used in research and administrative offices by white males. Females were introduced to computers in word processing and secretarial classes, while males used computers in advanced math classes (Linn, 1999). Silverman and Pritchard's (1996) study supports this gender attitude difference. In their study, females' attitudes toward technology went from enjoyment of technology education and confidence in technological abilities at the beginning of the study, to negative attitudes by the end of the study that resulted from monopolization of equipment by males and the males making fun of the females. Sacks and Bellisimo (1993) found that female attitudes toward computers became more positive when they spent more time on computers.

Other studies showed differences in gender perceptions, where females viewed the computer as a tool, while males viewed the computer as more of a toy for fun (American Association of University Women Educational Foundation, 2000; Becker, Kottkamp, Mann, & Skakshaft, 1999). In this light, males generally spend more than half of their time playing games and females spend the majority of their computer time sending e-mails and working on assignments (Schofield, 1995; Teasdale & Lupart, 2001). Of interest is that the Kaiser Family Foundation (1999) did not find a difference in the amount of time spent on computers when computer games were removed from the equation.

Several studies examined differences in gender perspectives. The American Association of University Women Educational Foundation (AAUW, 2000) conducted a focus group with female participants in which the females insisted that they like computers—they just use them differently than males. This view of technology was reflected in another study conducted by Ray, Sormunen, and Harris (1999), who found that females had more positive attitudes regarding computers than males. Ray et al. found that females regarded technology as a way to increase productivity. However, when the AAUW focus group was asked to identify someone who is really good with computers, they described a man. Females appear to have developed a "we can, but I don't want to" philosophy toward technology (AAUW, 2000, p. 7). Females who are attracted to technology often have a friend or relative that encourages them to pursue their interest; this encouragement is an important factor for females who take nontraditional courses and are considered to be "path breakers" (Silverman & Pritchard, 1996).

Researchers have found that the technological environment at home directly impacts the gender differences (Bame et al., 1993; Boser et al., 1998; Heywood, 1998). For example, more males than females perceived their home as being more technological, and more males than females rated both parents' occupations as more technical (Bame et al.; Boser et al.). Males indicated a greater interest and knowledge of computers than females (Bame et al.; Boser et al.; Teasdale & Lupart, 2001; Wolters, 1989), which resulted in more time spent on the computer. According to Wolters, the technological environment of the home has a moderate influence on attitudes toward technology. While access to a computer does appear to affect attitudes, Boser et al. and Wolters found the

greatest impact on developing a positive attitude toward technology was playing with technological toys, such as LEGOs, Tinkertoys, and Erector Sets.

Several researchers examined the impact of instructional methods and curriculum content on students' attitudes toward technology (Boser et al., 1998; Krendl & Broihier, 1990; Teasdale & Lupart, 2001). Boser et al. and Krendl and Broihier found that students' perceptions of technology as being difficult did not change significantly after they had technology instruction. Female students perceived technology as less interesting and more difficult to use and understand than male students (Boser et al.; Krendl & Broihier, Teasdale & Lupart; Wolters). According to Wolters, technology instruction at school has the least impact on student attitudes. Even though computer use at school is more equitable, females are still less likely to enroll in computer science classes (American Association of University Women Educational Foundation, 2004a). This gender gap widens even more with advanced computer classes (American Association of University Women Educational Foundation, 2004b).

## PURPOSE

The main purpose of this study is to examine participants' attitudes toward and uses of technology based on gender, perceptions of computer use based on gender, and whether a relationship exists between using technical toys and participants' uses of technology based on gender.

### Null Hypotheses Guiding Quantitative Data Collection
- There will be no difference in attitudes toward technology between males and females.
- There will be no relationship between gender and perceptions of computer use.
- There will be no difference between computer enjoyment and technical toys.

### Research Questions Guiding Qualitative Data Collection
- Will students' attitudes toward technology and perceptions of technology use differ based on gender?
- What relevant ideas will emerge from the students involved in the study that will contribute to increasing the body of knowledge regarding the use of computers by students and computer use in the home environment?

## METHODOLOGY

This study utilized a mixed method approach by combining qualitative and quantitative research techniques (Onwuegbuzie & Collins, 2004). Mixed methods research provides an opportunity to corroborate findings across different approaches. Adding qualitative interviews and observations to quantitative data provides the researcher with the opportunity to understand the phenomenon from the participant perspective (Johnson & Onwuegbuzie, 2004; Merriam, 1998). The researcher is then able to build theory from observations obtained from the fieldwork (Merriam, 1998).

To gather quantitative data, participants were administered The Computer Survey (TCS) and the data were examined for differences in attitudes toward technology. Qualitative data included interviews, computer logs, classroom observations, field notes and student work, which were coded with keywords to identify and categorize reoccurring themes. Triangulation for the qualitative portion of the study was achieved through the collection and analysis of multiple forms of data. It is hoped that qualitative data will provide a richer picture of gender attitudes toward technology and maybe aid in beginning to answer one of the questions posed by the AAUW Educational Foundation Commission on Technology, Gender, and Teacher Education (AAUW, 2000): "What changes are needed in the computer culture to improve its image, repair its deficits, and make it more appealing to girls and women?" (p. iv). The commission reported that "In some important ways, the computer culture would do well to catch up with the girls. In other words, girls are pointing to important deficits in the technology and the culture in which it is embedded that need to be integrated into our general thinking about computers and education" (p. ix).

## Setting of the Study

This study took place in a neighborhood school located in a planned urban development community in central Alabama. The community continues to experience rapid growth as reflected in the school enrollment numbers, which have increased 297% since the school opened in August, 1999. The racial composition of the community and school is predominately white. This is an affluent community made up of many professionals and high-level managers of the business community. The neighborhood elementary school had 545 students enrolled in kindergarten through sixth grade. The school population consisted of 516 white students, 16 black students, 10 Asian students, and three Hispanic students. Sixty-one students were in the sixth grade class, 56 of these students were white, three were black, one was Asian, and one was Hispanic. Fifty nine of the sixth grade students participated in the study.

The sixth grade classrooms provide the students with a rich technology environment. Each classroom has five computers with high-speed Internet access. One computer in each classroom is connected to a television for whole class instruction. The teachers have access to an interactive Smart Board, a class set of AlphaSmarts, iPods, and a computer lab equipped with 25 eMacs. The science and technology classroom has a set of Palm Pilots and science probes to use for data collection, data analysis, and experiments. The data collected with the Palm Pilots are hot synced to a computer where data can be examined and printed for analysis. Students and teachers interact with technology on a daily basis.

## Assumptions and Limitations

A number of conditions were assumed for this study. It was assumed that students have had computers in their classrooms since they started school, that students have been taught the objectives in the *Alabama Course of Study: Technology Education* (Alabama Department of Education, 2002), that students will understand the survey questions and answer them honestly, and that students will be honest with documentation and when participating in the interviews.

Several limitations affect the generalizability of this study. Students were responsible for documenting the amount of time they spent on their home computer, their activities on the computer and the activity on which they spent the most time. This is considered a limitation because 11- and 12-year-old students recorded the documentation. Some students kept accurate records while others did not, and several students misplaced the logs. Due to these problems, data were used from one week instead of 12 weeks as planned. This study was conducted in a central Alabama neighborhood school located in a high socio economic area; therefore, the results are generalizable only to a similar population. The school system experienced technology problems that delayed most of the technology instruction until the second quarter. This delay reduced the amount of technology that was originally planned for integration in the science lessons and the number of observations of students interacting with technology.

## Participants

Fifty-nine sixth grade students volunteered to participate in this study. The study participants consisted of 29 boys and 30 girls who were 11 or 12 years old. The participants attend a predominately white neighborhood school; 56 of these students were white, three were black, one was Asian, and one was Hispanic.

## Instrumentation

The Computer Survey, adapted from the Computer Attitude Questionnaire (CAQ) and the Pupil's Attitudes Toward Technology (PATT-USA), was used in this study. The original PATT instrument was developed by Mar de Vries at Eindhoven Technology University in the Netherlands in 1984 (Becker & Maunsaiyat, 2002; Heywood, 1998). In 1987, Bame, Dugger Jr., and deVries adapted the PATT instrument for use in the United States (Heywood). The PATT-USA consists of 100 questions divided into three sections to obtain demographic information, assess students' attitudes toward technology, and assess students' concepts of technology. The CAQ is a 65-item Likert instrument for measuring students' computer attitudes in grades four through eight. The instrument was developed and validated by researchers associated with the Texas Center for Educational Technology. The CAQ was developed based on the work of scholars in several states and nations (Knezek & Miyashita, 1993).

The Computer Survey (TCS) was developed using statements from the PATT-USA and CAQ. A panel of experts reviewed and analyzed the TCS, which has 54 items divided into four sections to assess the technical home environment, computer uses, and attitudes toward computers. The first section has 26 four-point Likert-type self-report statements about computer interest, enjoyment, anxiety, and importance. All attitude subscales on the TCS were analyzed using Cronbach's alpha to determine the internal reliability. The alpha values ranged from .71 to .78, which are acceptable (Garson, 2005). Twelve items in the TCS subscales have negative wording and scores for these items were reversed. The second section contains nine, four-point Likert-type self-report statements regarding gender attitudes about computer use. The third section has 11 yes/no statements to obtain demographics and informa-

tion about the technological home environment. The fourth section contains eight free response items regarding computer use and technological equipment at home.

### Data Collection

The quantitative part of the study consisted of a pretest and posttest survey administered by the researcher. The pretest survey was administered the first week of school prior to any instruction. The posttest survey was administered during the last week of the fall semester. Additional quantitative data were obtained from computer logs where students documented the amount of time and the activities they completed on a home computer.

The qualitative part of the study consisted of eight free response items on The Computer Survey (TCS), field notes, classroom observations, and student work. Every week the researcher selected a different cooperative group to observe as they completed an activity. The Teacher Observation Checklist was used by the researcher to record observations of these groups. The target group was videotaped to allow the researcher to review how the students of the group interacted with each other and with technology as they worked. Each participant was given the Student Computer Use Documentation Record to document the time spent on their home computer and to identify the types of computer activities in which they participated. The students were asked to record their time and activities.

### Data Analysis

Quantitative data were analyzed using t-tests and chi-square to look for differences and relationships. Qualitative data were analyzed using recurring themes. One researcher reflectively coded each written observation, document, and free response survey item with keywords to identify and categorize reoccurring themes. The other researcher then compared the themes to the collected data to insure that the coding was appropriate.

## RESULTS

### Demographic Data

The sixth grade students indicated that they have technological home environments. They all have computers at home and 52% of the participants have their own personal computer. Sixty-two percent of the males have their own computer compared to 43% of the females. Females indicated they spend more of their computer time using an instant messenger or in chat rooms, while males indicated they spend more of their time playing games. Table 1 reports the demographic data for sixth grade participants.

### Computer Logs

The Student Computer Use Documentation Record provided data regarding the time and activities of home student computer use. Participants were requested to record their computer use for 12 weeks, but when several students did not, all students were then asked to keep a record of computer use for one week. Forty-seven students, 29 females compared to 18 males, turned in com-

#### Table 1: Demographic Data of Technological Home Environment

| Variable | Females | Males |
|---|---|---|
| | n(%) | n(%) |
| My parents have a computer at home that I use. | 29(98) | 29(100) |
| I have my own computer at home. | 13(43) | 18(62) |
| I use email at home. | 25(83) | 18(62) |
| I have my own web page. | 8(27) | 4(14) |
| I use an Instant Messenger. | 24(80) | 19(66) |
| I have a set of Tinkertoys, LEGO, and/or Erector Sets. | 11(37) | 17(59) |
| I like building things with Tinkertoys, LEGO, Erector Sets. | 12(40) | 16(55) |
| I spend most of my time on the computer (select one of the following): | | |
| Playing Games | 6(20) | 13(45) |
| Sending/Reading Email | 0(0) | 5(17) |
| Instant Messaging or in Chat Rooms | 16(53) | 11(38) |
| Doing Research or School Assignments | 9(30) | 7(24) |

puter records for one week of time spent on the computer. Females averaged 4.57 hours on the computer and males averaged 2.96 hours on the computer during the reported week.

### Gender Attitudes

To determine if attitudes toward technology differed between males and females, a comparison of the posttest group means was calculated for each subscale and an independent samples $t$-test was used to compare the means for each subscale with females and males. No significant difference was found in any of the subscales ($p > .05$), therefore, the null hypothesis was not rejected. Table 2 presents the group means, t-values and significance levels for each subscale for males and females.

#### Table 2: Student Attitudes

| Subscale | Gender | $n$ | Mean | Std. Dev. | $t$ | $df$ | Sig. |
|---|---|---|---|---|---|---|---|
| Computer Importance | Female | 30 | 22.8667 | 2.94470 | | | |
| | Male | 29 | 22.3448 | 3.47723 | -.623 | 57 | .536 |
| Computer Enjoyment | Female | 30 | 31.3667 | 2.61934 | | | |
| | Male | 29 | 29.7586 | 4.54859 | -1.671 | 57 | .100 |
| Computer Anxiety | Female | 30 | 28.1667 | 2.50631 | | | |
| | Male | 29 | 26.7586 | 3.97002 | -1.635 | 57 | .108 |
| Computer Interest | Female | 30 | 18.4000 | 3.00115 | | | |
| | Male | 29 | 20.0345 | 4.01322 | 1.776 | 57 | .081 |

### Gender and Computer Use

Chi-square analysis was used to determine if a significant relationship existed between gender and perceptions of computer use. No significant relationship was found between gender and perceptions of computer use ($p > .05$), therefore, the null hypothesis was not rejected. Table 3 presents the means, chi-square values and significance levels for males and females.

### Table 3: Gender Perceptions

| Subscale | Gender | n | Mean | Std. Dev. | Chi-Sq | df | Sig. |
|----------|--------|-----|---------|---------|--------|-----|------|
| Computer Use | Female | 30 | 30.5333 | 3.54997 | 7.400 | 10 | .687 |
| | Male | 29 | 30.0345 | 3.96847 | 7.310 | 12 | .836 |

**Computer Enjoyment and Technical Toys**

To determine if a significant difference existed between computer enjoyment and technical toys, a comparison of the posttest group means was calculated for the subscale computer enjoyment and an independent samples *t*-test was used to compare the means with students who have technical toys and who like to use technical toys. No significant difference was found between computer enjoyment and technical toys (p > .05), therefore, the null hypothesis was not rejected. Table 4 presents the group means, t-values, and significance levels for each subscale technical toys.

### Table 4: Computer Enjoyment

| Subscale | Yes/No | n | Mean | Std. Dev. | t | df | Sig. |
|----------|--------|-----|---------|---------|------|-----|------|
| Have Technical Toys | Yes | 28 | 22.8214 | 3.06780 | | | |
| | No | 31 | 22.4194 | 3.35434 | .479 | 57 | .634 |
| Like Using Technical Toys | Yes | 28 | 22.8571 | 3.17063 | | | |
| | No | 31 | 22.3871 | 3.26269 | .560 | 57 | .578 |

*Free Response TCS Items*

The first free response item asked for the age at which participants believe students should start learning about computers. The majority of female responses indicated an age of six, while males indicated an age of eight. Table 5 presents the age that females and males indicated that students should start learning about computers.

### Table 5: Age Students Should Start Learning about Computers

| Gender | Age | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|--------|-----|---|---|---|---|----|---|----|
| Females | | 2 | 5 | 8 | 5 | 3 | 5 | 1 |
| Males | | 2 | 5 | 2 | 4 | 12 | 2 | 2 |

For the second item, students indicated their time spent on computers per week. The estimated number of hours spent on computers per week is similar: females (3.55); males (3.5). The third item asked respondents to identify who used the computer more at home, their mother or father. More participants indicated that their fathers (n=31) use home computers more than their mothers (n=24). Four students were unsure. Fifteen females identified their fathers as using the computer more and 14 identified their mothers as using the computer more. Sixteen males identified their fathers as using the computer more and 10 identified their mothers as using the computer more.

The fourth and fifth items asked the respondents to indicate the types of activities for which their mothers and fathers use computers. All classes identi-

fied e-mail as the number one activity for which their mothers used computers (female = 21; male = 22). Other uses included work (female = 4; male = 4), research (female = 6, male = 3), and shopping (male = 4). All classes identified work as the number one activity for which their fathers used computers. Both genders identified work (females = 34; males = 20) and e-mail (females = 15; males =14) as the top two uses by their fathers. The sixth item asked what other types of computer-related equipment respondents have at home. The four most frequently listed types of computer-related equipment for each gender that students reported they have at home included printers (female = 6; male = 18), scanners (male = 16), laptop computers (female = 10; male = 5), digital cameras (females = 8; male = 4), and palm pilots (female = 5). The seventh items asked respondents what types of computer-related equipment they would like to have. The three most frequently listed types of computer-related equipment students would like to have were cell phones with cameras (female = 10), palm pilots (female = 5; male = 6), and digital cameras (male = 5).

The last item on the survey provided students with the opportunity to write any comments about computers. Females reported that they enjoyed working with computers and palm pilots. Comments included:

"I enjoy working with computers and Palm Pilots."

"I love working with technical stuff! It is so much fun! I have learned so much!"

"I love working with computers in school."

"I love working on the computer and find them fascinating."

"I think upper elementary should have laptops or Palm Pilots."

"I enjoy doing work on the computers because you learn more about technology."

Males indicated that they also enjoyed using computers:

"I love the computer and Palm Pilot activities."

"I think we should do as much as we can on the computers. I think the use of computers is a great way to teach kids."

"Computers are very fun and exciting to work with now that I have learned about them."

"They're great; I have a blast with them!"

### Teacher Observations

The teacher observation checklist was used to record observations of student interactions with each other and with technology as they completed science assignments using classroom technology. The students worked in cooperative groups to gather data using Palm Pilots and science probes, performed a hot sync with the computer, analyzed the data recorded, and added labels to their charts and graphs. A total of six evaluations were conducted. The target group for each evaluation was recorded, so the researcher could review the tape and make additional observations.

Several themes emerged from the data collected during the group observations. Male students tended to set up the equipment and troubleshoot technical problems, while the females tended to perform the hot sync and arrange the

data for analysis. Male students in general operated the equipment more independently and with little assistance from the teacher. Female students needed more assistance and guidance with equipment setup and troubleshooting. By the end of the study, females were more comfortable and worked more independently with equipment setup and troubleshooting.

## DISCUSSION

One of the major findings of the study was that gender differences in attitudes, perceptions, and uses of computers were not found to be significant. Findings were not consistent with past studies that did find significant gender differences in attitudes, perceptions, and uses of computers (Bame, Dugger, deVries, & McBee, 1993; Boser, Palmer, & Daugherty, 1998; Comber, Colley, Hargreaves, & Dorn, 1997; Durndell, Glissov, & Siann, 1995; Hale, 2002; Krendl & Broihier, 1990; Nelson & Cooper, 1997; Teasdale & Lupart, 2001; Wolters, 1989; Young, 2000). Even though significant differences were not found in the quantitative data analysis, qualitative analysis indicated differences in how females and males use the computer and the amount of time spent on the computer.

### Gender Differences in Technology

The results of this study indicate that gender does affect students' attitudes toward technology for the participants of this study. The majority of females do not perceive computers as being difficult for themselves, other females, or males. However, several males indicated they were better at using the computer than females, supporting the findings of Comber et al. (1997), Durndell et al. (1995), Nelson and Cooper (1997), and Young (2000), who found males were more inclined to gender biased views of technology. Evidence of gender bias was found in the comment of one male class student. Although he observes other female teachers and his female peers using the computer at school on a daily basis, he stated that "My teacher is one of the few girls I know that uses the computer."

Females spend more time on computers than males, contradicting findings by Bame et al. (1993), Boser et al. (1998), Teasdale and Lupart (2001), and Wolters (1989). Females spent an average of 64% more time on the computer than males. Females indicated they spent most of their time using an instant messenger or in a chat room, although they also play games, and they like doing their assignments on the computer. Males indicated they spent most of their time playing games, although they also use an instant messenger, and they too like doing their assignments on the computer. Activities engaged in the most by males and females supported the findings of Schofield (1995) and Teasdale and Lupart (2001).

The availability of technical toys, such as Tinkertoys, LEGOs, and Erector Sets, did not have an impact on this group of participants. Sixth-three percent reported they did not have technical toys, but none of these students found computers difficult or had a negative attitude toward computers. This contradicts the findings in earlier studies (Boser et al., 1993; Wolters, 1998) that stu-

dents with technical toys had a more positive attitude toward computers. This may be a result of the availability of new technical toys such as iPods, Gameboys, Palm Pilots, cell phones with cameras and Internet access, etc., which this group of participants was more likely to have.

All of the participants have technology at home, which affects student attitudes; this supports the findings of Bame et al. (1993), Boser et al. (1998), and Heywood (1998). The majority of participants identified their fathers as using home computers the most and were aware of their parents using computers for a variety of activities, especially e-mail and work. The participants were very comfortable using computers, which may be a result of several factors: home computers, observing their parents using computers, having had computers in their classrooms since they started school, using computers in classrooms and computer labs, and having teachers modeling computer use in the classroom.

This study indicates that for this group of participants, it appears that gender uses of computers are changing. Females are spending more time on computers than males. Even though the majority of females are using an instant messenger, they are also playing games. Males spend the majority of their time playing games, but they are also using an instant messenger.

## Technology Instruction

All of the participants indicated a positive attitude toward technology, enjoy using technology at home and school, and most are eager to learn how to use technology more. This was evident after the first lesson using Palm Pilots, which involved learning to write using graffiti—the handwriting the Palm recognizes—and beaming messages to another Palm. The students never seemed to get tired of sending simple messages to each other. The next morning two of the students came in with Palm Pilots that were no longer being used by their parents. A quick survey of the classes indicated that 12 students in the female class, 12 students in the male class, and 15 students in the mixed gender class had asked for Palms. Within a week, several students in each of the classes had a Palm.

## Implications

According to this study, females do show an interest in technology. This may be enhanced by educators providing more opportunities for females to use computers and having computer use modeled by female educators. Even though females are using the computer more than in the past, they do not have the same level of confidence as their male peers. Educators need to help females develop a greater sense of accomplishment in their computer skills.

Although females spent more time using an instant messenger and males spent more time playing games, the students enjoyed being able to use the computer to do assignments. Educators should examine their curriculum to determine where integrating computers will be beneficial for students. This option is available to more educators now that a greater number of schools and homes have computers (Rathbun & West, 2003). The evaluation of tools such as Palms, instant messengers and chat rooms for use in education are also rel-

evant as students enjoy using these tools and use them frequently. Educators should continue to provide and model technology within classrooms, and both male and female students need to see that females can be successful in the field of technology. Educators need to provide examples of technology role models for female and male students in an attempt to help students overcome gender biases that are evident in students today.

## RECOMMENDATIONS

Additional research might include longitudinal studies to determine the effect of age on gender differences in the attitudes, perceptions, and uses of technology; identifying ways to encourage more females to consider technological career fields; examining what has the greatest influence on increasing the confidence level of computer ability among females; examining the use of instant messengers and/or chat rooms for instructional purposes; and examining the influence of new technological toys, such as iPods, Palm Pilots, and Gameboys, on student attitudes, perceptions, and uses of technology.

### Contributors

Connie D. Bain is the technology coordinator at Vestavia Hills City Schools in Alabama. Her research interests include gender differences, classroom technology integration, and the use of instructional technology. (Address: Connie Bain, 1204 Montgomery Highway, Vestavia Hills, AL 35216; baincd@vestavia. k12.al.us)

Margaret L. Rice is an associate professor and program chair of Educational/ Instructional Technology at The University of Alabama. Her research interests include technology integration in K–12 schools, equity issues, and instructional and administrative technology. (Address: Margaret L. Rice, The University of Alabama, Box 870302, Tuscaloosa, AL, 35487; mrice@bamaed.ua.edu.)

### References

Alabama Department of Education. (2002). *Alabama course of study: Technology education.* (Bulletin 2002, No. 21). Montgomery, AL.

American Association of University Women Educational Foundation. (2000, April). *Tech-savvy educating girls in the new computer age*. Retrieved September 15, 2004, from http://www.aauw .org/member_center/publications/TechSavvy/ TechSavvy.pdf

American Association of University Women Educational Foundation. (2004a, March). *Single-sex education.* Retrieved January 5, 2005, from http://www.aauw. org/issue_advocacy/actionpages/ positionpapers/singlesex.cfm

American Association of University Women Educational Foundation. (2004b, March). *Under the microscope: a decade of gender equity projects in the sciences*. Washington, DC: American Association of University Women Educational Foundation.

Bame, A. E., Dugger, W. E. Jr., de Vries, M., & McBee, J. (1993). Pupils' attitudes toward technology–PATT-USA. *The Journal of Technology Studies, 19*(1), 40–48.

Becker, J., Kottkamp, R., Mann, D., & Skakshaft, C. (1999, March). *West Virginia story: Achievement gains from a statewide comprehensive instructional technology program*. Retrieved November 21, 2001, from http://www.mff.org/pubs/ME155.pdf

Becker, K. H., & Maunsaiyat, S. (2002). Thai students' attitudes and concepts of technology. *Journal of Technology Education*, *13*(2), 1–11.

Boser, R. A., Palmer, J. D., & Daugherty, M. K. (1998, Fall). Students' attitudes toward technology in selected technology education programs. *Journal of Technology Education, 10*(1), 4–18. Retrieved September 12, 2003, from http://scholar.lib.vt.edu/ejournals/JTE/

Comber, C., Colley, A., Hargreaves, D. J., & Dorn, L. (1997, Summer). The effects of age, gender, and computer experiences upon computer attitudes. *Education Research*, *39*(2), 123–133.

Durndell, A., Glissov, P., & Siann, G. (1995). Gender and computing: Persisting differences. *Educational Research*, *37*(3), 219–227.

Garson, G. D. Scales and standard measures. (2005). *PA 765 Statnotes: An online textbook.* Retrieved January 22, 2005, from http://www2.chass.ncsu.edu/garson/pa765/standard.htm

Hale, K. V. (2002). Gender differences in computer technology achievement. *Meridian A Middle School Computer Technologies Journal*. Retrieved June 22, 2004, from http://www.ncsu.edu/ meridian/sum2002/gender/

Heywood, J. (1998). *Pupils' attitudes to technology: A review of studies which have a bearing on the attitudes freshmen bring with them to engineering*. Paper presented at the meeting of the International Conference on Engineering Education, Rio de Janeiro. Retrieved October 25, 2004, from http://fie.engrng.pitt.edu/fie98/papers/1406.pdf

Johnson, R. B., & Onwuegbuzie, A. J. (2004). Mixed methods research: A research paradigm whose time has come. *Educational Researcher*, *33*(7), 14–26.

Kaiser Family Foundation. (1999, November). *Kids & media @ the new millennium*. Menlo Park, CA. Retrieved January 2, 2005, from http://www.kff.org/entmedia/1535-index.cfm

Knezek, G., & Miyashita, K. (1993). *Computer attitude questionnaire*. Texas Center for Educational Technology. Retrieved January 17, 2004, from http://www.tcet.unt.edu/research/ survey/caqdesc.htm

Krendl, K. A., & Broihier, M. (1990, May). *Student responses to computers: A longitudinal study*. Paper presented at the Annual Meeting of the International Communication Association, Chicago, IL.

Linn, E. (1999). Gender equity and computer technology. *Equity Coalition, 5,* 14–17.

Merriam, S. B. (1998). *Qualitative research and case study applications in education.* San Francisco, CA: Jossey-Bass.

Nelson, L. J., & Cooper, J. (1997). Gender differences in children's reactions to success and failure with computers. *Computers in Human Behavior*, *13*(2), 247–267.

Onwuegbuzie, A. J., & Collins, K. M. T. (2004). *Mixed methods sampling consideration and designs in social science research*. Paper presented at the Mid-South Educational Research Association, Gatlinburg, TN.

Rathbun, A. H., & West, J. (2003). *Young children's access to computers in the home and at school in 1999 and 2000.* (NCES Publication No. 2003-036). U.S. Department of Education, National Center for Education Statistics. Washington, DC: U.S. Government Printing Office.

Ray, C. M., Sormunen, C., & Harris, T. M. (1999). Men's and women's attitudes toward computer technology: A comparison. *Office Systems Research Journal*, *17*(1), 1–8.

Sacks, C. H., & Bellisimo, Y. (1993). Attitudes toward computers and computer use: The issue of gender. *Journal of Research on Computing in Education*, *26*(2), 256–269.

Schofield, J. W. (1995). *Computers and classroom culture*. New York: Cambridge University Press.

Silverman, S., & Pritchard, A. M. (1996). Building their future: girls and technology education in Connecticut. *Journal of Technology Education*, *7*(2), 41–54.

Teasdale, S., & Lupart, J. L. (2001). Gender differences in computer attitudes, skills, and perceived ability. Paper presented at the Canadian Society for Studies in Education, Quebec, Canada. Retrieved January 19, 2004, from http://www.geomatics.ucalgary.ca/cwse/CompAtt.pdf

Wolters, F. K. (1989). A PATT study among 10 to 12-year old students in the Netherlands. *Journal of Technology Education*, *1*(1). Retrieved February 15, 2004, from http://scholar.lib.vt.edu/ ejournals/JTE/v1n1/falco.jte-v1n1.html

Young, B. J. (2000). Gender differences in student attitudes toward computers. *Journal of Research on Computing in Education*, *33*(2), 204–216.