# Female Students' Experiences Of Computer Technology In Single- Versus Mixed-Gender School Settings

Lee-Ann Burke

Elizabeth Murphy

Memorial University of Newfoundland

## Abstract

This study explores how female students compare learning computer technology in a single- versus a mixed- gender school setting. Twelve females participated, all of whom were enrolled in a grade 12 course in Communications' Technology. Data collection included a questionnaire, a semi-structured interview and focus groups. Participants described learning computer technology in the single-gender setting as more conducive to learning. In comparison, participants indicated that they felt they did not learn much about computer technology in the mixed-gender setting where they had negative perceptions of technology learning and use and felt conditions were not conducive to learning. Implications arising from this study include the need for educators, administrators and policymakers to be aware of classroom conditions that students feel are conducive to learning as well as conditions viewed as non-conducive to learning.

## Introduction

Claims of gender inequities in education overall (Orienstein, 1994; Sadker & Sadker, 1994), and particularly in math, science and technology (AAUW, 2000, 1991, 1998; Kelly, 1988), coupled with the growing trend of technology use, not only in education, but in the current and future workforce (AAUW, 1998; Robertson, 1998), indicate that females may need to be better prepared technologically, so as to compete with males in the new knowledge-based economy. A report by the American Association of University Woman (AAUW, 1998) concluded that, as technology is increasingly integrated into the education system, educators need to ensure that females gain ground and become more involved in technology fields in order for them to achieve economic independence in the industries of the 21st century.

However, according to some research, females are not gaining this crucial ground (e.g. AAUW, 1998, 2000; Huang, Ring, Toich & Torres, 1998; NCES, 2000; Neumann, 1991). Lichtman (1998) observed that the "…low number of woman who take…computer science, who choose computer science as a field of study and who are employed in technology related fields confirms that computer science is far and away a male dominated world" (p.2). Females make up only a small percentage of students in computer science and computer design courses (NCES, 2000). As well, females are less likely than males to say that they like and are good at technology, and are less likely than males to exhibit computer confidence and have a positive attitude about computers (AAUW, 1998).

In response to these gender equity issues in education, a small but growing number of advocates for single-gender education are emerging. Meg Milne-Moulton of the National Coalition of Girls' Schools claims that there is resurgence in single-sex education that has been spurred by both popular opinion and hard research that girls are shortchanged in coeducational classrooms (Lehmann-Haupt, 1997). A single-gender classroom can lead to higher self-esteem in females (Gillibrand et. al, 1999), and a single-gender setting may increase female participation, as well as females' interest in math and science (Streitmather, 1997; Warrington & Younger, 2001). Other research indicates that females perform better and feel better about themselves in a single-gender environment (Gillibrand et al. 1999; NCGS, 2000; Streitmatter, 1997; Warrington & Younger, 2001). Some findings indicate that females are at a disadvantage in a mixed-gender school (Orienstein, 1994; Sadker & Sadker, 1994), particularly when learning computer technology (AAUW, 1998, 2000; NCES, 2000; Nicholson et al. 1998; Sadker & Sadker, 1994; Singh, 1993).

The AAUW 2000 Report, *Tech Savvy: Educating girls in the new computer age,* notes that all future jobs including those in the arts, medicine, law, design, literature and the helping professions will involve technology. Because of this emphasis on technology in the workforce, females may, in many cases, need to be as competent as their male peers in using technology. Although, at present, it is unknown whether a single-gender education will promote this competency, it is viewed by some as an alternative to the "…marginalization… and domination of females in mixed-gender classrooms" (Gillibrand et al. 1999, p.361).

Knowledge of the experiences of females who have learned technology in both a mixed-gender and a single-gender school setting may shed light on the challenges and benefits of these two learning settings and help to determine which setting, if any, this group of females preferred. For this reason, there is a value in investigating females' experiences in learning technology in both settings. Building on the documented incidents of gender inequities in education, as well as research findings indicating positive outcomes from single-gender education, this paper reports on a case study focusing on one group of female students' experiences of learning technology in single-gender and mixed-gender school settings. The purpose of the study was to identify the students' experiences and perception of their experiences in the two settings.

Participants in the case study were 12 female students all attending the same single-gender high school. The group of students all came from four different mixed-gender junior high schools. At the time of participation in this study, all participants were enrolled in a grade 12 Communications Technology course. The study relied on questionnaires, semi-structured interviews and a focus group to gain insight into their experiences of learning technology in both single- and mixed- gender settings. The descriptions of their experiences were not limited to their use of computers in technology classes but also included their use of computers overall, in all aspects of their learning.

# Methods

The study was conducted at a girls-only public high school in a small town located in Nova Scotia, Canada. This all-girl school is the only all-girl public school of its kind in Nova Scotia. The school houses approximately 400 students. The majority of the females at this girls-only school have come from four mixed-gender junior high schools, thus this school offers these females their first experience of single-gender education. The 12 females who volunteered to participate in the study were selected from the 25 grade 12 students enrolled in a Communications Technology course at the school. The only prerequisites for participating

included past experience using computers in the classroom in junior high, as well as having attended a mixed-gender junior high school.

Data collection took place in the spring of 2003. Each of the three phases of research incorporated a different data collection technique and built on data collected from the previous phases. The questionnaire focused on the present educational experiences of students' learning technology and invited them to compare these experiences with those of their past computer learning. Information gathered in phase one was used to design the questions for the individual interviews in phase two. This phase consisted of a semi-structured individual interview conducted at the research site. It involved in-depth questioning and probing in relation to information provided in the phase one questionnaire. Participants were encouraged to elaborate on the responses given in their questionnaire. These interviews allowed the researcher to clarify any unknown responses and to probe responses more in-depth to obtain a better understanding of the participants' experiences and perspectives on the topic. As well, the interviews included member-checking which involved reviewing results of the questionnaire and allowing participants to clarify and elaborate.

The final phase included focus groups or group interviews The purpose of this group interview or focus group, was to allow students to express more than they might when one on one. As Glesne (1999) argues, interviewing more than one person at a time can prove very useful especially with children who often need company to be encouraged to talk. Each phase of data collection concentrated on students' experiences of learning computers in single-gender setting as compared to learning technology in a mixed-gender setting.

Preliminary analysis of the data was completed following each stage. This analysis served to inform the next stage of data collection which was the interview. Data resulting from all three data collection methods were subsequently combined for the purpose of analysis. Analysis involved identifying emerging themes from among the key statements using patterns in key statements and grouping them into categories.

# Presentation of the findings

Data analysis facilitated grouping the findings according to three categories as follows: attention; confidence and; learning. The findings are presented according to the categories. Abbreviations are used within quotes to refer to the school. Thus, instead of using the school name, the letters MG (mixed gender) or SG (single gender) are used.

The category *Attention* groups those statements made by participants that relate to teacher/student interactions and student/student interactions and to key statements such as: *Teachers have more time to explain stuff to you; teachers pay more attention; I got more personal attention;* and *Teacher pays more attention to the individual*.

Some participants commented that teachers paid more attention to them in the single-gender computer setting than did their teachers in the mixed-gender setting. One participant felt that this difference in teacher attention resulted in her learning more: "I find I learned a lot more here at a single-gender school for the reason that I find the teacher pays more attention to the individual student equally…" Similarly, another student indicated that she learned a lot more because she "…got more personal attention." One student tried to explain the difference in teacher attention between the two settings. She stated, "In [MG]…teachers had a view that males should be more involved in computers than females." This student went on to say, "Here girls are open to any course. I love computers here. In [MG] I couldn't do a simple

web page, cause I was not given help or opportunity." Some described having more opportunities in a single-gender setting. One student stated, "More focus is put on each student and bigger tasks aren't given to boys." Another remarked, "In a [SG] we have a bigger chance to do more because the boys in [MG] usually got to do the more 'complicated' roles."

Getting help when needed was viewed as a challenge in the mixed-gender setting but not in the single-gender one. One participant indicated that getting this help led her to be more patient, "I am more patient with waiting because I know I am eventually gonna [sic] get my turn. When before it wasn't like that. It was 'Hold on a second.' Then they'd go to another person, then another person and then maybe at the end of the day, I may actually get my answer." As well, several participants felt that peers were more helpful in the single-gender setting as one participant explained:

> It's just that people help you and stuff with it [technology]. If the teacher is not there you can ask your girlfriend next to you or something and yeah, they'll help you and show you from step 1 to step 10 but guys in [MG] are like "Whatever, I'm not doing that right now."

The category *Confidence* groups all statements related to security, self-esteem and self-confidence. Key statements and phrases included: *the fear of being wrong or made fun of; It's more of a comfortable environment; I'm not afraid for people here to know who I really am;* and *I'm more outgoing now and more confident.* Confidence was chosen as the category title because it best encompasses the key statements and spoke of the perceptions of self-esteem and security in the comparison of the two technology settings.

According to some participants' statements, many found a significant difference in their level of security in a single-gender technology setting as compared to a mixed-gender one. As one participant commented regarding the single-gender school, "It's more of a comfortable environment. We don't have to compete against guys and we're not afraid to speak up in classes because guys may think we are too smart or something." Another felt the fear of making mistakes was also alleviated in the single-gender setting:

> Now I can do what I want without having to worry about messing up my picture or what my image would look like. The boys might be like 'Oh you're stupid because you did that wrong.' Whereas here you can make a mistake and not have to worry about it.

Another participant indicated that she felt more secure learning in the single-gender technology setting as compared to the mixed-gender setting because of the difference between the reaction of males and that of females to student errors, "In class, if you get the answer wrong, guys are like, "Oh you're stupid" or whatever. Girls are like 'Good try!' they make you feel good about it." Similarly, some stated that girls feel more secure learning in the single-gender setting because, "No one picks on you here."

Because of the perception of security in the single-gender setting, some felt their participation level increased. One student describes her personal experience, "In [MG]…I never tried anything because of fear of being wrong or made fun of. Now I do so much more with computers and I'm not afraid to ask for help." Another commented that learning in the single-gender technology class was, "Definitely better. People aren't afraid to ask questions and people aren't afraid to get up and do projects." Security in choice of project topics also varied in the two settings for one student:

> What I like about [SG]… is that I am not concerned about the kinds of topics I pick to do my work because I don't think that the girls would pick on me for it where I think the guys [in MG] would.

Asking for help was another factor that some participants perceived as a difference between the two computer settings. One student commented, "Here you can ask classmates a question without being embarrassed." Fear of inadequacy prevented some from asking for help in a mixed-gender computer class, but this was not so in a single-gender class, as described by one participant: "There's more personal attention in a single-gender. It's more comfortable. Some girls feel they couldn't ask questions in a mixed-gender because they didn't want to sound stupid." Another stated that getting help when needed was less stressful in the single gender setting, "It's easier to cope. It's not stressful. If you need help there's [sic] tons of people to help you. You're not embarrassed to ask questions." Risk-taking was also described as differing in the two settings. In the following quotation, one student describes this difference in her risk-taking when learning computers in a single-gender setting as compared to a mixed-gender one:

> You can take more risks at something you like and are interested in [at SG], like making a PowerPoint presentation. In [MG], you'd only do certain things that were cool. You wouldn't feel free to do a project on what you're interested in because you'd be afraid it wasn't good enough or you wouldn't impress them or something.

Trying new things with computers was described as a form of risk-taking that existed in the single-gender setting more so than the mixed-gender one, and was attributed to making the participants feel more confident as revealed in the following quotation:

> [I am] A lot more confident at [SG]. My abilities increased a lot on computers. Now I can go to a program and actually check and find out what each button does. Whereas in [MG]…I would do what was said and I wouldn't venture outside of that bubble.

Another student shared her experience of being more of a risk-taker when learning in the single-gender technology setting:

> I am more of a risk-taker. We have a final project due for exam. I'll probably, maybe try something different like start a web page and work on a video too. Whereas…in [MG], if given an assignment like that, I would probably stick to something that was extremely easy that basically I could try to learn on my own.

Some commented that their confidence increased to some degree. Some felt it increased significantly: "In my [MG], I would not take any risks at all without talking to the teacher first. Now in a single-gender school, I have enough confidence in myself to take risks as I wish to." Others felt their confidence increased slightly: "I'm a little more confident. I never really had a problem with that sort of thing but it's easier here." A small number of participants felt their confidence and risk-taking stayed the same: "I wouldn't say I was less confident in myself, I was just less comfortable with my ability to use technology." The other stated, "I don't think it would make a difference [because] I'll try whether I'm at a mixed school or not."

The category, *Learning* groups all statements that relate to comparing new technology awareness, technological opportunities, and personal growth, in the two different technology settings. It includes key statements such as: I *learned more with technology here; I had more of a chance to use computers; my ability has increased;* and *more opportunities to try new things.*

Some participants were adamant in describing their growth in the area of learning to use computers in the single-gender setting as compared to the mixed gender one. Some of these perceptions included learning "a lot more here." "More able to do a lot now.", "Less people [so] I do better. It's more advanced here in technology. Never did much with technology at [MG]." and "Do a lot more now than in [MG]..." One student described her growth: "I never really even knew how to start a computer in junior high and now I can just basically do everything that we were taught. Now I can make a video when before I'd be like "What?" Another stated, "My average in technology is 90 and higher here and my average in technology there was 30, 30 to 50" And still another commented, "You learn more here. You want to do more. There's [sic] more options. It's more fun than [MG]."

One student described her experience: "I like the single-gender setting much better because I learned much more at [SG] than I ever would have at a co-ed school." Another felt that learning to use computers in the single-gender setting helped her go further: "If I had went [sic] to a mixed school, I probably wouldn't have taken computer courses. I probably wouldn't have went [sic] so far in computer studies." Some participants tried to explain why they felt they became more advanced in the single-gender computer setting. One such participant felt, "I found I learned more with technology here than any other school because the focus is not whether you're male or female but if you can do it." Another stated, "All girls is more comfortable."

Some participants found that they advanced in the single-gender technology setting due to being given a chance. One such student stated that the biggest difference between the two settings was, "Probably the chance females are given to show they are able to use technology." She went on to say, "I know a lot of females in this school who proved they are capable of using technology. Whereas in [MG]…they probably weren't even given the chance to prove that." One student stated, "My ability to use technology here as compared to my previous [MG] has become a lot stronger because there is more chances to use the technology available to us…we receive many more chances to use the technology." Another claimed, "Since I came to [SG], I had more of a chance to use computers in ways that interest me."

## Discussion of the Findings

The portrait that emerges from participants' descriptions of their experiences of learning technology in the single-gender setting is one which is conducive to learning technology. Participants described their experiences of learning technology in the single-gender technology setting as one in which they were able to learn more and in which they enjoyed using the technology.

Participants described how in the single-gender setting, their computer skills grew and they learned more about computers and became more capable of using the technology. Some confided that they surprised themselves with what they learned to do with technology and others described having fun using and learning about computers and remarked that this made them eager to learn more as well. Some perceived that the knowledge and skills gained in the single-gender setting were more advanced and their tasks more complex.

As they were given more opportunities to use computers in the single-gender class, participants also described being able to grow and learn more in the area of technology in the single-gender setting. Participants spoke of the increase of opportunities to use the computer in this setting as they had more chances to use different types of technology, more chances to

do things that interested them and more opportunities to try new things. Some commented that they were given more opportunities because they were trusted to use the computer in the single-gender setting. Others found that they were encouraged to use the technology in the single-gender setting and that they were given the opportunity to explore the technology independently. Some expressed the belief that these opportunities led them to take more risks and to be more creative and perceived that this in turn gave them more computer skills and more knowledge. As well, some remarked that this empowerment led to more opportunities for use of computers for the future as more doors were now opened for them. Others expressed satisfaction with what they perceived as an increase of opportunities to discover what it was that interested them and being given the skills to further these interests in the future.

In previous studies involving participants' experiences in single-gender settings, issues associated with learning were common. A study by Nicholson et al. (1998) on grade 1 students working in single- and mixed-gender groupings in a mixed-gender class found that single-gender groupings fostered a positive attitude towards technology. Participants in the Nicholson et al. study indicated that they had more positive experiences working with computers in the all-female groups than in the mixed-gender groups. Similarly, Elkjaer's (1992) study concluded that females learned more about technology when they moved into all-girl groups than they did when they were part of the whole class.

Lichtman (1998) found that an all-female computer club contributed to participants having a more positive attitude towards technology as well as increasing females' interest in technology and technology-related fields. Females in the study reported on in this paper indicated that they were able to do more interesting things with the technology and that they learned more with the technology and thus found technology more enjoyable than they had in the mixed-gender setting. When reviewing literature on single-gender education in general, Strietmatter's (1997) study on the attitudes of females in a girls-only algebra classes uncovered that this type of learning environment enhanced the females' ability to learn math. As well, Streitmatter's (1998) study of single- and mixed-gender physics classes determined that girls in the single-gender setting became more involved in collaborative learning than did the girls in the mixed-gender physics class. These findings are congruent with the perceptions of females in this study when they stated that they learned more and wanted to learn more in the single-gender setting.

Participants described learning more due to the technology being more advanced, and the tasks more complex. Others described learning more because of having more chances to use different types of technology, more chances to do things that interested them and more opportunities to try new things. Others described learning more because they were encouraged to use the technology and to try new things.

From participants' descriptions of their experiences, we can gain insight into the conditions that are favorable to learning to use computers. These conditions include individual attention and confidence. These conditions may have given rise to their perceptions of learning more in the single-gender setting. In terms of attention, participants expressed a degree of satisfaction with the amount of individual attention they received in this technology setting. They described getting help when it was needed and having their questions answered. In terms of teacher time, some described feeling that the teachers had time to answer their questions, time to help them, and time to pay attention to them. Also, these participants perceived that the single-gender setting was fair: they knew that the teachers were going to answer their questions and they were going to get their turn. As well, some perceived that they were encouraged more to use computers and that they were more connected to the teachers and to other students than in the mixed-gender setting. Some participants commented that the single-

gender setting offered them more opportunities, and more support and encouragement to use computers.

Streitmatter's (1998) study reported that girls indicated receiving more of the teachers' attention in the single-gender setting because no boys were present. As well, Elkjaer's (1992) study of mixed-gender learning found that when females broke off into smaller, all-girl groups, they received more help from the teacher and helped each other more as well. Elkjaer's findings are congruent with the perceptions of participants in the present study where participants commented that they received more help, not only from the teacher but also from their peers in the single-gender setting. Participants' indicated that when the teacher was unavailable, friends and peers were there to help.

In terms of confidence in the single-gender setting, participants described feeling more confident and thus more willing to participate in class. Some participants described how the absence of males from the setting affected their confidence and participation because they felt secure and free from criticism and the need to please males. Some indicated that in the single-gender setting, they could show who they really were and be their true selves. Others perceived themselves as more outgoing and more confident using computers in the single-gender setting. Still others remarked that they could take more risks with technology, explore new programs, choose topics that interest them and try more difficult things in a setting with no males present. Participants expressed feeling more confident in the single-gender setting, as they were not afraid to make mistakes because they did not fear being made fun of, or criticized like they perceived they were in the mixed-gender setting. This increased sense of security in the single-gender setting was attributed to some participants feeling more confident and more willing to participate in class and to take risks.

The AAUW (1998) study on single-gender education involved an extensive review of the research conducted on single-gender education. Although that study concluded that there was no evidence that single-gender education was better than mixed-gender, it did find that, in most cases, females' confidence and risk-taking increased in single-gender settings. This finding is congruent with the perceptions of participants in this study of increased confidence in the single-gender setting as compared to the mixed-gender setting.

In addition to findings related to confidence specifically in technology settings, the findings of this study are also congruent with those of research on female confidence in single-gender environments in general. Previous research conducted by Gillibrand et al. (1999), Streitmatter (1997), and Warrington and Younger (2000) identified differences in confidence and participation levels of females in mixed- and single-gender environments. One of the main findings of Gillibrand et al (1999) was that females in the single-gender learning setting had increased confidence and participation levels. As well, females in this study were found to be more willing to participate in discussions, seek help when it was needed and share ideas in the single-gender setting.

Similarly, Streitmatter's (1997) study found that girls in single-gender high school Algebra classes as compared to mixed-gender algebra classes, were more likely to ask questions and more likely to answer questions on the subject matter. A similar study by Warrington and Younger (2001) found females frequently expressed having more confidence in themselves in the single-gender setting. As well this research found that girls found it easier to contribute to oral discussions and to ask questions without being ridiculed in the single-gender setting. Finally, girls expressed caring more about their work, and feeling less inhibited in their single-gender classroom.

# Conclusions and implications

This study indicates that participants preferred learning computers in the single-gender setting where they perceived learning in a positive light and where they felt conditions were conducive to learning. Participants described receiving more attention and support as well as feeling more confident, that they had fewer distractions, and more control over their learning and over the technology. They indicated that these conditions generated more learning in the single-gender setting. In comparison, participants indicated that they did not learn much about computers in the mixed-gender setting, where they had negative perceptions of learning technology. Participants indicated feeling that conditions were not conducive to learning to use computers as they felt unsupported and ignored. As well, they expressed feeling that they had little confidence and security in the mixed-gender setting, where they felt distracted and dominated by males and therefore felt that they learned little about using computers in the mixed-gender setting.

The findings revealed that the single-gender experiences were more positive overall and for the majority of participants in relation to learning, confidence, attention, control, distractions and empowerment. However, participants' perceptions of their experiences in these two different settings are affected, we can assume, by all three characteristics and not only by gender composition. For example, the fact that the teachers appeared more attentive or that participants experienced greater confidence or were less distracted in the single-gender setting may result from the fact that one setting was a junior high school and the other (more positive one) a senior high school.

The two different sets of experiences may result as well from the fact that one set of experiences takes place in one school whereas the other takes place in another school. To focus more specifically on the single-gender versus mixed-gender characteristic would have required a research design that compared for example a single-gender high school with a mixed-gender high school or a single-gender junior high with a mixed-gender junior high school. However, this design would have resulted in a study of the experiences of two different sets of individuals. This study was interested in gaining insights into one group's experiences of the two different settings. These parameters of the design of the study therefore should be kept in mind as the findings are discussed.

We must also keep in mind that participants' descriptions of their experiences may be reflective of a general whole school experience and not only of a computer technology class. All questioning in the study aimed to focus on participants' comments in relation to use of computers specifically. However, we can assume that some of the statements made could relate to their experiences in general. This generalization of their experiences beyond using computer class is evident in such statements as the following: "It's a smaller school too, and female dominated. You can have a personal connection with the teacher." In addition, we must also keep in mind that no research observations took place and that the study reports on participants' interpretations of their experiences. Had observations been conducted or had males or teachers been interviewed as well, the findings related to females' experiences might have differed.

One of the more important implications arising from this study is the need for students, educators, administrators and policymakers to be cognizant and aware of classroom conditions that students view as positive and conducive to learning technology, as well as classroom conditions that students view as negative and non-conducive to learning to use computers  Educators need to be aware of their role, the perceptions of students and the knowledge and skills required to deliver technology in a gender-equitable fashion.  Finally, administrators and policymakers need to examine their mixed-gender computer environments

to determine if they effectively meet the needs of all students, both male and female. Administration may also need to offer educators more professional development opportunities to help them become more aware of issues related to gender and learning so as to help to improve the conditions of learning for females as well as to provide positive learning environments for all students.

In terms of the implications for research, it may be of value to conduct research into female students' perceptions of their learning to use computers in two *high* school settings and to compare these findings with those of this study as this study identified major differences in skills and knowledge gained in the single-gender high school setting compared to the mixed-gender junior high setting. Such research may determine how much of the results of the present study were influenced by the actual school setting, how much was influenced by changes in technological advancements over time, and how much was influenced by the maturity of the participants. Additional areas for future inquiry might include an examination of interventions that improve the conditions for females learning to use computers in mixed-gender settings.

# References

American Association of University Woman (AAUW). (2000). *Tech savvy: Educating girls in the new computer age:* Washington, D.C.

American Association of University Woman (AAUW). (1998). *Gender Gaps: Where schools still fail our children*. Washington, D.C.

American Association of University Woman (AAUW). (1991). *Shortchanging girls, shortchanging America*: Washington, D.C.

Elkjaer, B. (1992). Girls and information technology in Denmark: An account of a socially constructed problem. *Gender & Education*, 4(1-2), 25-40.

Gillibrand, E., Robinson, P., Brown, R., & Osborn, A. (1999). Girls' participation in physics in single sex classes in mixed sex schools in relation to confidence and achievement. *International Journal of science education*. 21 (4), 349-362.

Glesne, C. (1999). Becoming Qualitative Researchers: An Introduction. Ontario: Longman.

Huang, Ring, Toich & Torres. (1998). Gender Computing and Kids. Retrieved November 28, 2001 from: http://cse.stanford.edu/classes/cs201/Projects/gender-gap-in-education

Kelly. A. (1988). Gender differences in teacher-pupil interactions: a meta-analytic review. Research in Education, 39, 1-23.

Lehmann-Haupot, R. (1997). Girls School Seeks to Overcome Tech Gender Gap. Retrieved May 15, 2005 from: http://www.wired.com/news/culture/0,1284,7987,00.html

Lichtman, Judy. (December, 1998). The Cyber Sisters Club: using the Internet to bridge the technology gap with inner city girls. T H E Journal, 26 (5), 47.

National Council on Girls Schools (NCGS). (2000). Alumnae Survey. Retrieved January 7, 2002 from: http://www.ncgs.org/Pages/summary2.html

National Center for Educational Statistics (NCES). (2000). Trends in educational equity of girls and women. U.S Department of Education. Retrieved May 15, 2005 from: http://nces.ed.gov/pubs2000/2000030.pdf

Neumann, D. (1991). Technology and Equity. Retrieved November 27, 2001 from: http://www.ed.gov/databases/ERIC_Digests/ed339400.html

Nicholson, J., Gelpi, A., Young, S, & Sulzby, E. (1998). Influences of gender and open-ended software on first graders' collaborative composing activities on computers. Journal of Computing in Childhood Education, 9, 3-42.

Orienstein, P. (1994). SchoolGirls: Young women, self-esteem, and the confidence gap. New York: Doubleday.

Robertson, H. (1998). No more teachers, No more books: The commercialization of Canada's schools. Toronto: McClelland and Stewart.

Sadker, M., & Sadker, D. (1994). Failing at Fairness: How our schools cheat girls. New York: Simon & Schuster.

Singh, P. (1993). Institutional discourse and practice. A Case study of the social construction of technological competence in the primary classroom. British Journal of Sociology of Education, 1, 39-58

Streitmatter, J. (1997). An exploratory study of risk-taking and attitudes in a girls-only middle school math class, The Elementary School Journal, 98 (1), 15-26.

Streitmatter, J. (1998). Single-sex classes: Female physics students state their case. School Science and Mathematics, 98 (7), 369-374.

Warrington, M., & Younger, M. (2001). Single-sex classes and equal opportunities for girls and boys: perspectives through time from a mixed comprehensive school in England. Oxford Review of Education 27 (3), 339-356.