CROWDING OUT THE GIRLS:
ISSUES OF GENDER ACCESS IN THE USE OF COMPUTERS

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ISSUES OF GENDER ACCESS IN THE USE OF COMPUTERS

by

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Abstract

This ethnography investigated access to computers in one Grade 2 French immersion classroom based on gender. The action researcher employed student interviews and observation to describe computer access and attitudes of nineteen participants. Parent questionnaires investigated student access to home computers and parental involvement and attitudes towards computer education. Analysis of provincial, school district and school documents investigated the systemic response to the issue of gender equity in computer education. The results of the study indicate that gender is not recognized by parents and the majority of students as an issue in computer use in this classroom, and gender is not addressed at the school, school board or department administrative levels. However gender appears to affect computer access and use at home and at school in the behaviours and attitudes of students. In this classroom, interventions to ensure equal access to the computer are required. The small number of participants limits the generalizability of these findings. Further research in this area is required, and policy drafting, piloting and implementation at each administrative level is essential if the integration of computers is to benefit all students of the province of Newfoundland and Labrador.

Dedication

This thesis is dedicated to Daniel and Rosemary Maloney, whose belief in education will always inspire me, and to the memory of Mary Bridget O'Driscoll whose life was a story of strength.

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"...in a process of enlightenment, there can be only participants."

J. Habermas
1974
p. 40

Introduction to the Study

With the publication of provincial documents such as *Technology In Learning Environments* (1994) and *Living In a Technological Society* (1997), initiatives such as Human Resource Development grants to schools, and widespread access to the World-Wide-Web via Stem~Net, the schools of Newfoundland and Labrador are in the process of implementing full integration of computers in the curriculum. It is therefore topical that educators conduct research which informs the many dimensions of computer use by students, so that we understand the impact of computer use, utilize appropriate strategies and maximize resources in the classroom to enhance the learning of all of the children of this province. This case study is an investigation of the access, use and attitudes of students by gender in an attempt to understand better the effects of computer use in the primary classroom.

Personal Implications

Glesne and Peshkin (1992) advise: "...seek to make sense of personal stories and the ways in which they intersect" (p. 1). Their advice invites a critical reflection of my own gendered computing experience.

The technological innovations afforded me in attending an all-female high school in the mid-1980's were limited. Use of computers in this setting was reserved for a specific group, namely the "Work Experience" program of studies, which engaged those students who were preparing for secretarial and related positions immediately following high school. Students who enrolled in advanced courses had no contact with the keyboard

before graduating. At our brother school in the neighbouring community, my male counterparts in advanced studies were busily experimenting with programming and spreadsheet software, establishing computer clubs, and working towards technological literacy. Subsequently, my first official contact with computers was in the university setting, and was reminiscent of my previous experiences. The computer room in our single-sex university dormitory was frequently vacant, and the demands were limited to word-processing. On the other hand, the male residences organized schedules for their computer rooms to meet these students' diversified needs. My subsequent study periods completed at other universities yielded similar informal observations of computer laboratories; consistently, males would be more highly represented both in number and in variety of applications, rendering the computer lab a male domain.

In 1999, technology has seeped into the primary/elementary setting, and similarly preschools are boasting high-tech computer centers. As a teacher, I have witnessed in the last three years in my site the expansion of technology, from its original unimposing and mostly negligible presence, to the "wired school", with its state of the art laboratory and local area network providing classroom access to a library of software. Internet connections can be found in the resource center, the staff room, and all classrooms. In schools throughout the province and the entire country, the computer promises to revolutionize education. However one of the questions which must be posed is: for whom is this revolution taking place? If the observed divergence of patterns in my own gendered computing experience is indicative, the integration of computers in the curriculum may

result in the propagation of historical gender inequities in education.

Purpose of the study

The purpose of this study is to investigate access to technology in a primary classroom by gender, in an attempt to determine: (a) if access to and use of computers is gendered; (b) if the attitudes of students towards computer use differ by gender; (c) if the attitudes of parents towards computing are gendered, and if these attitudes influence children in their respective use of computers; and (d) if computer initiatives at administrative levels (ie., school, district, department hierarchy) address the issue of gender. As schools extend considerable resources to computing, it is critical to determine if gender differences exist in this domain. As a teacher of young children, I feel obligated to inform myself about the gender issues which may be developing in my technologically-enhanced classroom. In the spirit of action research, it is my ambitious aim to "...transform the present to produce a different future" (Carr and Kemmis, 1986, p. 183).

Statement of the problem

This thesis will investigate the following questions:

1. Are there gender differences in computer access?
2. Are there gender differences in attitudes towards computers?
3. Do parental attitudes toward the use of computers affect children's use and attitudes towards computers by gender?
4. How does the educational system promote gender equity in access and use of school computers?

Limitations of the study

The major limitation of this study is that it occurs in one Grade 2 classroom and is therefore limited to the population of this particular classroom. As such, the results may not be regarded in terms of generalizability to other populations. Additionally, the participants in this study are French immersion students, which may differentiate them from the general student population. Time and availability of computers were further limitations, namely one classroom computer and seven computers in the resource center.

Review of the Literature

"...our culture is defining computers as preeminently male machines."

Lockheed, M.E., 1985, p. 116

Three short decades ago, female pioneers made valuable contributions to the young computer industry: the world's first programmer was Augusta Ada Lovelace; Grace Hopper was instrumental in the development of the programming language COBOL, and 65% of computer programmers were women (Lockheed, 1985). However, a different reality is manifested today in the so-called Information Age, as reactionary writings of feminist theorists, coupled with accumulating research findings, submit that gender neutrality is no longer incidental in the world of computing. In *Questioning Technology*, T.V. Hill argued that a patriarchy now exists in technological society, which "...robs everyone of the fascinating complexity of experience and perspective which comes with attention to the wonderful diversity of people and cultures" (Zerzan and Carnes, 1991, Preface).

For the purpose of this study, the following themes will be presented in this review of the literature: (a) gendered patterns of computer use, (b) performance on tasks, (c) parental involvement and influences on patterns of computer use, (d) role model theory in computer education, (e) female misrepresentation in computer-related peripherals, and (f) interventions. Since this study investigates computer use in the primary classroom, the literature reviewed is limited to the primary/ elementary grades where possible; this is somewhat problematic in that primary education accounts for a small portion of the

research in this domain and a limited literature from which to draw.

Gendered patterns of computer use

Research suggests that gendered patterns towards the use of the computer are both attitudinal and behavioral, and are present early in life. Even after intervention, preschool boys reportedly hold more gender-stereotypical views than girls, tend to explore more freely without instruction, and engage more in 'trial and error' attempts to figure things out (Fletcher-Flinn and Suddendorf, 1996). Conversely, preschool girls tend to be somewhat inhibited in computer activities, and await instructional cues (Lancy & Hayes, 1988; Lancy et al., 1987). Despite female-friendly interventions at one site, the described behaviours were typical of both genders, and interventions served to intensify the stereotypic attitudes of the young male participants (Bernhard, 1992). Additionally, Huber and Scaglion (1995) noted that boys tend to monopolize not only the computer, but also the computer teacher, initiating more interactions with the computer specialist during class time.

In terms of non-structured usage of computers in school, gender differences are marked. In Kinnear's (1995) nine-month study of Grades 4 to 7, males tended to dominate the computer center when access was not controlled, particularly during out-of-class time such as recess or lunch. However, when access became controlled, some inequity still persisted, with at least some of the girls choosing traditional socialization activities during recess and lunch over their allotted computer time. A previous study of access and assignment reported that females do not take the initiative to reserve terminal space when

available (Schubert & Bakke, 1984).

The described male monopolization of computers at school is of particular concern because it can interfere with female participation, as Fisher (1984) reports: "...boys commonly would reach over to press keys on the computer when a girl was using it. I never saw a girl press keys when it was a boy's turn" (p. 25). Other qualifiers have been used to describe the male interaction with computers, including "enthusiastic" (Hawkins, 1985), "avid" (Fetler, 1985), and "inquisitive" (Elliot, 1993). These contrast with "reluctant" and "lack[ing] aggression" for females (Schubert & Bakke, 1984), who display a "lack of interest and drive" (Fisher, 1984). These attitudes result in avoidance tactics that ultimately "...deprive [female] students of personal and economic possibilities" (Brownell, 1992, p. 44). D'Amico (1995) also noticed that girls tended to adopt an orientation of "learned helplessness" in terms of the attributions which they make about their computer performance, often attributing good performance to luck, and poor to lack of ability.

As a logical extension of their positive attitudes towards computer use, males are more likely than females to select computer-related activities in their leisure time, either at home or school (Culley, 1988). Sanders (1984) claims that "...boys are usually the ones who are enthusiastic enough about computers to play with them after school..." (p. 31) Computer camps, for example, are largely attended by males, with female representation progressively decreasing as the difficulty level, grade and expenses increase (Hess and Miura, 1985; Fisher, 1984). Both studies found a trend of approximately three to one ratio

of boys to girls in computer camps. Additionally, computer games have been found to appeal more to the male population. Swadener and Jarrett (1986) indicated that 20% of the males in their sample of Grades 4 through 8 used the computer with much greater frequency than most respondents; the greatest difference of use was found in the extra-curricular use of computer games. A survey of Grade 7 students in Newfoundland indicated that almost twice as many males as females used the computer for games, while females significantly outnumbered males in word processing (Department of Education and Training, 1997).

It is important to note that computer games are linked to video games in the literature. Loftus and Loftus (1983) noted that experience with video games may serve as an initiation to computers, and girls' negative attitudes towards video games may actually delay their exposure to computers and thus their computer literacy. According to Wilder, Mackie, and Cooper (1985), "As early as kindergarten, boys and girls view video games as more appropriate to boys... Although the computer is seen more neutrally, there is a very slight tendency for children to see it as a more masculine than feminine item" (p. 220). Electronic games are more frequently the favorite pastime of boys, and both boys and girls consider that it is acceptable for boys to play these games frequently (Funk and Buchman, 1996; Newman, Cooper and Ruble, 1995). Boys are more likely than girls to have access to such games at home (Swadener & Jarrett, 1986). Further, males are more likely to be both the active participants and the spectators in video game arcades (Kiesler, Sproull and Eccles, 1985). Interestingly, Fisher (1984) reports: "...it may be worth noting that Pac-

Man is the only arcade game equally popular with females; it is a completion task, and doesn't involve rockets or blowing things up" (p. 24).

There also appears to be a connection between the curriculum areas of math and science, and the use of computers in school. Shashaani (1995) found that "math liking" was related to interest and confidence in computing. She also detected a positive relationship between the math stereotype and computer stereotype views; those who believed that math is a male domain also endorsed the idea that computing is more appropriate for males. Hawkins (1985) warned against the possible consequences of treating computers as a topic grouped as "science/math/technology", and advocated viewing computers as tools to counteract the traditional male dominance over these subject areas.

Evidence further suggests that the gender gap in computing is developmental; as a group, males become increasingly confident over time in their capabilities, while females become less frequent users and develop negative attitudes towards technology (Kirk, 1992; Hattie and Fitzgerald, 1987). By junior high and high school, computer use is regarded by students as a masculine activity (Collis, 1985). The gap widens towards post-secondary education (Shashaani, 1994; Hawkins, 1985) and beyond, as fewer females elect computer-related careers, and the female presence in the computing world becomes increasingly negligible (Frenkel, 1990). Not only do boys tend to "physically crowd girls out" (Siann, Macleod, Glissov, and Durndell, 1990, p. 189) when in front of a computer terminal, but the phenomenon actually extends itself as a metaphor for the effective

elimination of females as confident and competent users of technology. The promotion of equity is therefore of paramount importance if male and females are to enjoy the same opportunities beyond grade school. Newman et al. (1995) caution, "Reluctance to use computers and learn computer skills is rapidly becoming a major handicap to anyone wishing to perform effectively in anything but the most menial jobs" (p. 346).

Therefore, the literature suggests that a gender gap manifests itself early in educational computing and appears to widen in time in favor of males in terms of attitudes and behaviors. This gap is evidenced by access to the terminals in schools, performance on tasks, participation in extracurricular computer activities, and observations of male dominance over computers. Participation in video game culture, which is almost exclusively male, has been linked to computer use and may serve as an initiation to computer literacy. Interventions during structured and unstructured computer use have not always been successful and some have even intensified the stereotypic behaviors.

Performance on tasks

Significant performance differences have been documented between genders in computing; these range in their indicators of "performance", in that experimenters often differentiate between the rate and skill in completing a particular task. Bernhard's (1992) six-week study of preschool children used an informal evaluation tool for task completion. Despite equivalent preparation, the boys completed more tasks than did the girls. Alternately, in his study of Grade 3 children, Clariana (1990) used rate of completion as the dependent measure; his finding also favored male participants, noting that, "This may

relate to learning style and characteristics like risk-taking which tend to be enhanced by extensive association with Computer Based Instruction" (p. 89). Hawkins' (1985) year-long Logo study of elementary students concluded that there was a trend of boys performing considerably better than girls on all tasks and measures of programming expertise, with younger males outperforming older females. The girls in the study developed less facility with the programming software. Fetler's (1985) work in Grades 6 and 12 also favored males, noting that, "Boys in both grades displaced consistently higher levels of achievement in nearly all [computer] curriculum objectives surveyed" (p. 181). However, Hattie and Fitzgerald (1987) remarked the lack of empirical data to support the hypothesis that males and females differed on attitude and performance, and called for more research in order to comprehend the phenomenon.

In summary, there is a paucity of research at the preschool or primary/elementary levels on the performance of males and females in specific computer activities; studies that do exist, however, favor males in both rate of completion and skill in performing a particular task.

Parental involvement and influences on patterns of computer use

Parental involvement in schooling is significant in many forms, from helping with homework to school governance (Danyluk, 1996; Ho Sui-Chui and Willms, 1996; Etheridge, Hall and Etheridge, 1995; Becher, 1984). Hoover-Dempsey and Sandler (1995) describe parent involvement as "...a powerful enabling and enhancing variable in children's educational success...Its absence eliminates opportunities for the enhancement of

children's education; its presence creates those opportunities" (p. 319). Parental involvement has been linked to academic achievement and the development of a positive sense of efficacy in school-related tasks (Hoover-Dempsey and Sandler). For example, in their study of middle school students, Ho Sui-Chui and Willms found that parental involvement had positive effects on reading and math; these effects were not limited by parents' socioeconomic status. Griffith (1996) made a similar finding, in that consistent correlations of parental involvement to test performance of elementary students in forty-two schools were unaffected by school characteristics of the socioeconomic, racial, and ethnic composition of the student population. The ability of parental involvement to override the effects of socioeconomic status may differ in terms of computing, where ownership of computers is an important variable. Danyluk proposes that the use of technology and computers may confuse some parents and actually contribute to the decrease of parental participation at the high school level.

Parental involvement has implications for equitable computing in education; a significant contributor to students' attitudes and performance in computer-related activities, as determined by Shashaani (1994), is that of the family. She ranked the following variables in order of their effect on student interest, confidence, and attitudes towards computing: (a) positive encouragement from parents as the most powerful variable; (b) students' perceptions of their parents' attitudes/expectations as an especially strong effect on the female participants, and (c) socioeconomic status as the greatest effect on female participants from low socioeconomic backgrounds. Traditional gender roles

were more prevalent in families of low socioeconomic status, and tended to regenerate in the attitudes of female students from such families; females from strong socioeconomic backgrounds were greatly influenced by their parents' positive attitudes towards computer use. This tendency was less pronounced in the male subjects of Shashaani's research, whose interest and attitudes towards computing were not as strongly correlated with the attitudes and socioeconomic status of their respective families. Rocheleau's (1995) longitudinal study found similar results in defining variables to predict heavy computer usage, including (a) computer ownership; (b) parental interest in children using computers; (c) gender; (d) parental educational expectations, and (e) socioeconomic status. Further research shows that students actually rate their parents as the most influential people in their decisions about course enrollment (Shashaani, 1993; Eccles, Jacobs and Harold, 1990).

If "...the home is the first decisive step toward exposure" (Kirk, 1992, p. 30), then there are indications that exposure to computer use in the home is problematic. In two separate studies, parents were considered more supportive of their sons' learning in this area than that of their daughters (Lockheed and Frakt, 1984; Miura and Hess, 1983). Boys tend to have greater access and exposure to computers in the home than girls (Swadener and Jarrett, 1986; Fetler, 1985; Wilder et al., 1985; Fisher, 1984). Levin and Gordon (1989) argue that prior exposure to computers is a greater determinant of attitudes towards computers than gender.

When computers are present in the home, parental users are more likely to be male

than female, and males in general are more likely to use the home computers (Hattie and Fitzgerald, 1987). Swadener and Jarrett (1986) asserted that boys see males as more common home users than females. However, the same authors noted that two-thirds of the females who actually did have computers in the home had viable female role models.

According to Edwards (1984), the effects of parental involvement in educational computing are twofold: (a) a home computer allows children more hands-on time, and (b) parents using a computer at home provide positive role models for their children.

Parental involvement is therefore significant to academic and personal achievement, and more specifically to attitudes and performance in computer activities. This involvement is important regardless of socioeconomic, racial and ethnic characteristics of school populations. However, parental attitudes and socioeconomic status correlate more strongly with the attitudes of females towards computer use than those of males. Early exposure to computers is an important determinant of attitudes towards computers and may favor males in terms of access to home computers and parental support.

Role Models in Computer Education

The study of role models in computing is less conclusive than that of parental involvement. In one study, Lever, Sherrod, and Bransford (1989) made an unexpected finding, in that females improved their attitudes towards school and towards computer use during their project; the researchers suspected the change might be the effect of the female models, as both computer teachers were female. School teachers do play a crucial role in

their students' career choices (Eccles et al., 1990). Concerns regarding role models include an apparent lack of females in the field of computing (Culley, 1988). Fletcher-Flinn and Suddendorf (1996) observed that males accounted for nearly five times the number of female computer coordinators at the lower secondary school level in New Zealand, and called for the provision of more female role models to help bridge the gendered computer gap. These findings repute those of Stasz, Shavelson, and Stasz (1985), who determined in their Californian study that there were adequate teachers of both genders who were leaders in the microcomputer movement, and presented equally viable role models.

As early as 1984, interventions were in place in New York City schools to counteract the monopolization of computer activities by boys. These included proaction in terms of the provision of female role models as both teachers and guest speakers in the classroom (Alvarado, 1984). Fisher (1984) postulates that the success of the "Equals" project, which aimed to motivate girls to take more mathematics, may be a prototype for effectively stimulating female interest in computers. He advocates the selection of school wide "computer experts", who will be representative of the school population; he promotes the use of student "social leaders" as good role models for computing. Conversely, Sanders (1984) claims that female role models as computer teachers may not be enough to increase female participation in computing.

The literature suggests that role models in schools may affect student attitudes towards computers; however, more research is required to determine if there are adequate role models in terms of gender in educational computing, and if these role models in turn

affect student attitudes.

Female Misrepresentation in Computer-Related Peripherals

Investigation of female portrayal in computer-related peripherals such as textbooks, guides, software, magazines, and so forth is relevant in that biased portrayals may both reflect and perpetuate the status quo of inequity in computer use. Computer magazines have been found to represent females less often than males, and where females are represented, they are usually portrayed in stereotypic portrayals such as sex objects and clerical workers. In contrast, men are most often shown in positions of authority (Ware and Stuck, 1985). Likewise, in an analysis of representation of females in 23 textbooks which were used in K-12 settings, Brownell (1992) reported that, "...males accounted for 69% of the power figures, compared to an expected 49%, while females accounted for only 31% of the power figures, as compared to an expected 51%" (p. 48). Brownell's study used census projections as references, and although a female presence was strong in the textbooks overall, a consistent misrepresentation of the female as passive observer towards technology was evident. Kiesler (1985) observed that females were rarely represented on the covers of software games, and where representation was found, it was usually inappropriate.

In terms of the software itself, a male orientation is often detected in terms of violence, competition or aggression, and many primary characters are male (Fisher, 1984; Sanders, 1984). In fact, Sanders found that even when characters such as a turtle or "Dr. Factor" appear androgynous, children and teachers assume that they are male. In

analyzing the 17 most popular mathematics programs published from 1990-94, Chappell (1996) looked at three factors: gender, competition and violence. The mean percentages of female characters and voices in the software decreased with grade level, while the mean percentages for violence and competition against the program and against a peer increased across grade level. Chappell argued that an alternate format for software would be instrumental in shaping positive attitudes for girls towards computing. Similarly, Swadener & Jarrett (1986) contended that the computer-use gender discrepancy is actually a problem of software; they call for more games and content-area programs which are free of gender stereotyping. Fisher (1984) also found the general overall style of software was more attractive to boys, including such features as "...competition, aggressiveness, rapid, violent action; loud noises; etc." (p. 24). These features led some researchers to conclude that the designers of computer games actually target a male audience in their design (Colley, Hill, Hill and Jones, 1995; Huff and Cooper, 1987). Such gender bias in computer games, Shashaani (1994) claimed, causes computer technology to become an "alien culture for girls" (p. 363).

The suggested discrepancy in gender representation in computer-related peripherals therefore manifests itself in magazines, textbooks, and software, and is defined by passive female images compared to authoritative male images. This is particularly evident in terms of software and computer games, which appear to target a male audience with their stereotypic male characters, aggression and violence. Such representation may alienate girls from computer culture.

Interventions

In recognition of the challenges and limitations to the equitable integration of technology in classrooms, interventions have been proposed to counteract the observed trends. Bernhard (1992) advocates early intervention, as student attitudes tend to become less malleable over time. Perhaps the most obvious vehicle for change is awareness (Cottrell, 1992; Fisher, 1984; Edwards, 1984). Cottrell urges, "Listen to the stories of your colleagues and their friends, your children and their playmates" (p. 9). Knupfer (1997) concurs: "An informed society will be the catalyst to bring about continued social changes leading to gender equity" (p. 36).

Researchers such as Marrapodi (1984) call for "vigorous affirmative action" (p. 57) and a strong network of support in order to combat this issue. She makes numerous suggestions, which include integrating classroom practices like early computer integration, role model strategies, parent involvement strategies, resource reviewing and selection (e.g., use Logo, rather than traditional programming), media awareness activities, and extra-curricular considerations. An example of a proactive, systematic approach such as Marrapodi prescribes was the "Equals" project, which was successful in motivating girls to take more mathematics and may be a prototype for effectively stimulating female interest in computers (Fisher, 1984). Shashaani (1994) proposes similar campaigns, and suggests that educators organize workshops for parents to inform them of their critical role in the development of attitudes towards technology, and that educators lead parents to encourage their children's use of computers at school, as well as

outside of school if access is available. One such strategy which focused on the proactive partnership of parents is "Project Micro" (Edwards, 1984). In this program, a coordinator visits homes for the purpose of parent orientation, and a computer room is designated for parents at the school, in hopes of creating an informed, supportive parental community. Parental encouragement is a strong advantage in fostering self-efficacy in computing for both genders. Shashaani (1994) argues, "Parents should change their attitudes and expectations about their children and provide equal opportunities for their sons and daughters in respect to access and use of computers" (p. 363). Parent-teacher cooperation in encouraging female computer use is considered integral if intervention is to be successful.

Awareness activities have also been suggested to encourage students as advocates. These include students evaluating software, conducting surveys to determine preferences, and designing evaluation forms. Additionally, media education is considered valuable in critiquing software companies (Fisher, 1984).

Teachers have an important role to play in the effectual gender-free integration of computers. They can liaise with vendors and select task-oriented software which appeals to girls as well as boys. In some cases, computer classes demand a female quota of 50%, and students are allowed to select their own software, which improves female participation (Fisher, 1984). The direct teaching of strategies to overcome male dominance in computer lessons is also advocated (Culley, 1988). Bernhard (1992) recommends that gender neutral placement of the computer center in the classroom should be designated. Research

also suggests that teachers tend to allocate more of their time in the computer lab to the male students, and therefore should increase their contact with females (Huber and Scaglion, 1995).

Other proposed interventions involve the preferential use of school computers for girls. These include female computer clubs, girls' computer day in the classroom, specific hours set aside by the teacher for girls (Fisher, 1984), in-class computer time to favor girls (Bernhard, 1992), reserving the computer center for them one day of the week, prohibiting game-playing on computers at school (Lockheed and Frakt, 1984), same-sex peer groupings, and the provision of female role models (Elliot, 1993). Edwards (1984) further recommends setting affirmative goals for participation in co-educational computer clubs.

Software is integral in intervention strategies in terms of its design, its evaluation, and its use. According to Newman et al. (1995), "...software design might contribute to maintaining the gender gap...software could contribute towards severing the perceived link between computers and 'maleness' or could prevent the idea that computer use is a male activity from forming in the first place" (p. 347). Instead of designing with the male customer in mind, designers should represent females more often and more appropriately. Hawkins (1985) notes, "The careful design of software in the areas of math and science may enable girls to view these subjects as personally useful to them" (p. 179).

In determining appropriate software, critical examination of equal female representation in images and language is paramount. Careful reviewing aids in avoiding

male-oriented software (Lockheed and Frakt, 1984).

Once an appropriate collection has been established in a school, further actions may enhance the students' use of the software. Nathan and Baron (1995) advise that when given the opportunity to make an independent selection of their software, children are more motivated to learn and to explore. It is important that programs and computers be seen as classroom tools for achieving a variety of goals (Hawkins, 1985). Fisher (1984) suggests using graphic programming software, such as *Logo* or *Pilot*, as opposed to *Basic*, as the former programs are more appealing to girls because they are graphic. He also indicates that changing the focus from mathematical programming to drawing is helpful: "...emphasize applications, rather than simply illustrating programming commands...The goal is not to make the computer more accessible and attractive to girls than to boys, but to ensure that this marvelous tool is available to all students in school" (p. 26).

A final item which recurs in the proposed interventions is experience, which is shown to have a positive impact on students' attitudes towards computing (Clarke, 1990). Increasing exposure time to a particular task can help improve performance (D'Amico, 1995). However, research suggests that it is not experience or exposure alone, but the diversity of computer experiences which is key (Jones and Clarke, 1995; Newman et al., 1995; Wiburg, 1994). This requires using the computer across the curriculum in a variety of contexts, including creative and artistic applications, as well as mathematical and language-oriented tasks. Jones and Clarke recommend a computer curriculum for girls

which comprehends a broad range of computer activities, rather than skill development.

Not all studies of gendered computing experiences concede that a gap exists among children. Elliot's (1993) examination of four-year-olds' computerized play indicates similar learning outcomes for both genders. Forsyth and Lancy (1989) acknowledge no gender differences in attitudes or achievement in fourth and fifth graders resulting from a learning experience with a particular software program. Nathan and Baron (1995) contend that male and female fourth graders did not differ in their software preferences. Shade (1994), however, had previously argued the existence of gender preferences for software: "...girls responded more positively to the more developmentally appropriate software, whereas boys were more excited about the low-level, more competitive drill software" (p. 203). Hattie and Fitzgerald (1987) detected no differences in primary children's attitudes towards or usage of computers; however they did concede that a developmental gap was present, in that as students progressed through secondary schools, the differences became more noticeable. Kirk (1992) claims that computer technology did not create gender differences:

> Before computers were introduced in schools, gender inequalities *already existed*, particularly in traditional curriculum areas. Schools can have only minimal influence on any change in gender differences, because they perpetuate some of the biases of the past and reflect the attitudes of the society they serve. (p.30)

Hattie and Fitzgerald (1987) remark on limited empirical data to support the hypothesis that males and females differed on attitude and performance, and call for more research in order to comprehend the phenomenon.

According to the research, interventions for equitable computer use should take place early in a child's education; awareness activities and proactive measures are proposed for teachers, parents and students. Affirmative action in favor of female computer use is advocated, and computer experiences should be diversified. Finally, stakeholders should critically examine software and demand quality, gender-neutral computer resources.

Summary

In sum, the literature suggests that a gender gap exists in educational computing, which manifests itself in early childhood experiences and appears to widen with age in favor of males. This gap is evidenced by access to the terminals in schools, performance on tasks, participation in extracurricular computer activities, and observations of male dominance over computers. Encouragement from parents and other role models may play a pivotal role in the eradication of these patterns. Software considerations are also advocated since magazines, software packaging and the software itself often depict a male orientation. The use of certain interventions may narrow the described gap, including such actions as organizing female-only computer groups, utilizing graphic-based software, recruiting parental involvement, and using the computer as a tool across the curriculum. There have also been challenges to the existence of a gender difference in computing; these detractors imply that the problem has been exaggerated.

Theoretical Framework and Methodology

Theoretical Framework

Two general theories guide this study; the first applies to the research on gender in computer education, namely that gender inconsistencies in attitudes and aptitudes in computer education are determined by the environment and not by inherent dispositions. This is conventionally accepted in this research domain, as Shashaani (1994) indicates: "Most researchers involved in this area agree that the basis of gender differences in computer attitudes is essentially social and cultural and not related to inner ability" (p. 444). In this context, it is argued that if an acceptance of females as computer-capable is fostered both at home and at school, then the anti-feminine trends discussed will be offset long before negative stereotypes can be established.

The second guiding theory arises from the general research on parental involvement in education, which states that parental involvement is significant in all forms, from tutelage at home to school governance (Danyluk, 1996; Ho Sui-Chu and Willms, 1996; Etheridge, Hall and Etheridge, 1995; Hoover-Dempsey and Sandler, 1995; Becher, 1984). In particular, Shashaani's (1994) findings indicate that parental attitudes are a determining factor in the shaping of student attitudes towards computer use; parents who are positive role models and provide encouragement to their children in computing are more likely to have children who display positive attitudes towards computers.

Methodology

This research employs an ethnographic case study approach. Spradley (1979)

defines ethnography as " ...learning from people" (p. 3), as opposed to studying them. Case study allows for the construction and interpretation of the "lived experience" (Glesne and Peshkin, p. 19) of the participants, while "...immersion in the field..." (ibid., p. 10) fosters thorough exploration of the dynamics at work during computer use. The data collected in this study therefore depict the reality of the experiences of a particular group of students, as determined by their own words and actions. "Thick description" (Geertz, 1973) forms the core of this research, and is achieved through student interviews, observation, and parent surveys. The use of multiple instrumentation, and the inclusion of secondary data in the forms of document analysis and dialogue with relevant officials, establishes internal rigor and trustworthiness of results. In the spirit of action research, it aims mainly to generate knowledge about the research site, but can also act as an example to other schools. In addition, it may serve to educate other teachers, administrators, parents and students about the importance of gender equity in computing.

Ethnography implicates presence in the lives of others. As the constructivist nature of such evolutionary inquiry implies, the researcher is an important instrument of the research. This qualitative investigation is set at the site where the researcher is presently teaching, and therefore proceeds from an "emic" perspective (Glesne and Peshkin, p. 7).The selection of this site is not deemed a liability; rather, the researcher's understanding of the context is considered a valuable contribution to data analysis. To Polanyi (1962), such action research "...transcends the disjunction between subjective and objective" (p. 300).

This practitioner research does not presume absolute objectivity in the researcher role, but submits to Kincheloe's (1991) philosophy:

> Teachers...will never approach the act of inquiry without an agenda - they will be prejudiced because they live and work in the schools. These prejudices are not an impediment...they are part of the relevant understandings teachers have acquired from their experience. In conjunction with their classroom inquiry, these understandings can lead to more sophisticated reflection and reflective action. (p. 102)

Such a perspective can allow a holistic view of this research without jeopardizing the trustworthiness and rigor established through triangulation techniques.

As the teacher/researcher, I am therefore the chief instrument of this qualitative inquiry. My studies have enabled me to use recent trends and practices in integrating computers in the curriculum, including careful software evaluation and other integration issues. I have also completed various technical training, including keyboarding and web publishing, and with the school learning resource teacher I have presented at a national conference in 1997 on the use of computers in the classroom. As a teacher, I make a consistent effort to infuse computers in the Grade 2 curriculum, so that the computer becomes a tool in meeting learner outcomes. This ethnography proposes a better understanding of the attitudes and practices of computer use in one particular classroom, in which the researcher is a participant observer of radical technological development.

Sources of Data

This study employed mainly qualitative research methods but was also informed by the use of a quantitative parent survey. This research was conducted as an ethnography,

often referred to as a case study. Since the study is focused on an in-depth analysis of gendered computer experience in my classroom, the number of participants was limited to that particular group. Primary data include student interviews and parent questionnaires, supplemented by a research journal, which includes field notes and structured and unstructured observations of students. Secondary data include documents, communication with provincial department and school district officials, and minutes of computer committee meetings at the school where I conducted the study.

Sources of Qualitative Data

There was an interview with each of the 19 students (See Appendix A). The instrument was piloted with four 7-year-olds before implementation. The interview with each student was limited to 10 minutes in duration, and was scheduled at a time convenient to the student, without loss of instructional time (often previous to school time or during lunch hour). It was conducted in a quiet room, with few distractions, and was normally audio taped (one child requested no audio taping) and was subsequently transcribed. Students were instructed to respond "Pass" if they wished to refrain from answering any particular question. All responses were voluntary. The interview was divided into three sections: (a) knowledge about computing, (b) attitudes towards and use of computer at home, and (c) attitudes towards and use of computer at school. It investigated such issues as the attitudes towards use of computers by gender and perceptions of parents' attitudes/expectations towards computer use. Responses were subsequently organized using The Ethnograph, to identify themes, trends and

classifications in gendered computer use.

In addition to acting as a qualitative instrument, the student interview was initially coded and analyzed in a quantitative format; however, it was the students' explanation or commentary regarding their responses which provided the most useful information, and therefore the quantitative analysis is not presented here. In fact, the quantitative results alone often misrepresented the student response, such that simple "yes" or "no" codes did not depict the lived reality of the child; by contextualization, a more authentic description of that reality is achieved.

Qualitative inquiry further involved informal observation of students' use of and interactions with software and with fellow computer users, in order to determine if gender differences existed. These took place in both structured and unstructured environments. During structured computer events in the school resource center, participants were engaged in computer activities such as using a particular piece of software or scanning specified web sites for information. A checklist was used (See Appendix B) to determine if patterns were emerging. Five structured computer events were observed. Unstructured computer time involved use of the classroom computer during recess or lunch hours. Gender composition of those observing, as well as commentary and actions of participants were noted.

My research journal included field notes as well as reflection on practice, which provided an ongoing meta-analysis of the research as well as a check of researcher subjectivity. Participation in computer committee meetings of the school was also

documented, and minutes evidenced members' priorities.

Secondary data involve an examination of provincially published documents, such as *Technology In Learning Environments* (1994) and *Living in a Technological Society* (1997). This examination attends to policies and interventions based on the issue of gender in computer use to determine if female participation is promoted. Additionally, school district and provincial department representatives were contacted to determine if computer use policy had been drafted for schools. These secondary data determine if the educational hierarchy systemically promotes gender equity in terms of computer access and use.

Sources of Quantitative Data

One instrument which incorporates some quantitative elements in this study is a parent questionnaire (See Appendix C). This measure provided further evidence of the lived reality of the Grade 2 child and the data contextualized by qualitative components. The questionnaire was created in context of the research questions and was approximately three pages in length. A pilot of the survey helped clarify instructions and render the tool more user friendly. The instrument determined computer presence in the home and use by family members, and explored parent expectations or participation in their child's computer education. It further investigated such attitudes as importance of computer use compared to other subject areas, and parental consideration of differences in gender towards computer use.

Each child was given the questionnaire to deliver to parents on a Monday afternoon to ensure that the most parents would see the insert in their child's homework

for that evening. Parents were given one week to complete the questionnaire. The questionnaires were numbered so as to correlate the parents with their respective children. In order to ensure participant anonymity, returned questionnaires were placed in a box so that a particular student could not be associated with a questionnaire. The percentage of participation was 85%, which was considered satisfactory for the small number of children involved in the study (N=20). SPSS was utilized in the statistical analysis of this data.

In summary, qualitative tools including interview, observation and document analysis are utilized in this case study. A further component, the parent questionnaire, includes both qualitative and quantitative elements.

Setting

Ecole Bonaventure is a Kindergarten to Grade 5 French immersion urban school. As the only fully French Immersion primary/elementary school in the city, its population is approximately 350 students. As a "district" school, its intake consists of students from all over the city and its environs.

The 30-year-old facility houses a gymnasium/auditorium with stage, two music rooms, a bilingual resource center, a mini computer laboratory, a science/art room, parent volunteer room, and daycare, some of which are made available by converting unused classroom space. There is a well-appointed playground, equipped with see-saws, slides, monkey bars, and tennis/basketball court. In 1998, landscaping was completed in front of the school, which renders the facility inviting and visually pleasing. Although it is situated in an inter-urban area, the school is fairly secluded, and as such, it falls victim to vandalism

on a regular basis. For example, recent improvements including basketball nets, shrubs, and flags were all stolen from the property in separate incidents. Perhaps the most obvious drawback to the physical plant of the facility is that it is not wheelchair accessible; although it is accessible on the main floor, there is no elevator or lift to allow access to the upper floor.

Within the school, specialized programs offer both enrichment and special assistance to those students who require such services. The enrichment program is organized by the district, with candidates selected on a basis of standardized tests, coupled with informal teacher assessments. A small number of successful students attend an alternate school one day per week during Grades 5 - 7, while another group meets one day per cycle in the school with a teacher representative from the alternate school. Special education follows the procedures set out by the Department of Education, and usually results in individualized or small-group assistance for those who demonstrate tendencies of learning difficulties. Often, these students are capable of coping with the immersion program after the implementation of classroom adaptations; however in some cases students transfer to the English program and therefore to a new school. Finally, the strings program is also organized by the district; this is a "pull out" program, in that students attend strings class while regular classes are ongoing. This program acts as one type of on-site enrichment for these students.

Extracurricular activities organized at the school include chess (open to students from Grades 2 to 5), cross-country running, and newspaper (committee determined by

teacher selection among Grade 5 students). Other services are offered to the school population by outside agencies. The German club is organized by several native German speakers, who give lessons one day per week after school hours, and the choir has been organized by music students from a neighbouring high school, who practise with the members at lunch hour. Also, a drama troupe meets weekly under the direction of an instructor from the community. Finally, as previously indicated, there is a daycare on-site, which is run by the YMCA, and consists of an after-school program, and morning and afternoon sessions to complement the half-day schedules of kindergarten students.

Bussing is not provided at the school; transportation is the responsibility of parents. As well, there is no school lunch program on site. Such programs are usually based on need as determined by socioeconomic status; the school population is fairly affluent, with the majority of students coming from middle to upper income families. Most parents hold post-secondary education, and many are highly skilled professionals. For example, 76% of the case study participants have parents with post-secondary education.

As a French immersion school, the first language of virtually all students is English. A few transient French families have enrolled their children, and some anglophone parents have some knowledge of French. Otherwise, students receive their only contact with French while at school. One effort to remedy this lack of exposure is a yearly trip to St. Pierre, organized for the Grade 5 students at the end of the school year.

Parental presence in the school is strong. The Home and School Association elects on a yearly basis an executive whose members chair the subsequent monthly meetings to

discuss relevant issues, fundraising, etc., and also to welcome guest speakers. Parent volunteers aid in various capacities in the school on a daily basis, including administrative duties in the resource center and in the school office during lunch hour, as well as the preparation of curriculum resources; the parent volunteer room is the center of many of these activities. The newly organized school council was formed in 1998 with a number of parents presenting themselves as candidates.

The faculty of 20 is predominantly female, with one male teacher. Two teachers are francophone, with the remainder either raised with French as their second language, or have studied in immersion programs themselves as adults. The staff is organized into a variety of self-selected committees, which include computer, chess, school council, fundraising, and social committees. Annual activities at the school include an elementary science fair, a Grade 5 statistics fair, English and French book fairs, a spring bazaar, science/technology week, and education week. As well, spirit day is usually held during the month of February, and sports day in May/June.

With regards to computers, the committee has been involved in a variety of projects, including participation in "GrassRoots" Internet projects in conjunction with STEM~Net, the provincial educational network. A local area network has been installed this year, which allows extended use of classroom units through the file server, which is administered through the resource center. Each student has a "logon" name and password to use the system. E-mail accounts have also been created for all students and teachers on the server; however these are still not used by the student body. There has been much

debate by committee members as to how the computers may be better distributed throughout the school; at present, each class has one computer and most have a printer. Some class computers are Internet-ready. This year, four students from a local technical college completed the compulsory placement component of their program at our school, which was beneficial in maintaining the technology and improving technical capabilities of staff members. For the past two years, one of two annual professional development days has been devoted to computer applications. Technological expansion at this site has been very aggressive in the past two years, as computer literacy has become a priority with teachers and administrators of Ecole Bonaventure.

Sample

In the spirit of action research, the researcher's class was selected as the sample for this study. This Grade 2 class consisted of 11 females and 8 males. All students attended Grade 1 in the previous year, with two students transferring in from other schools to Grade 2. Four of the students (three female, one male) were receiving extra help in language arts from the special education teacher. Two of these students (both female) had been previously diagnosed as showing tendencies of learning disabilities; the male student was an individual case, in that he had transferred from another school, and was experiencing great academic and social challenges at Ecole Bonaventure. The family backgrounds of this group were fairly heterogeneous, with seventeen students coming from traditional two-parent families, the majority of which were two-income units. All students had had a computer in their classroom the previous year, and had participated in

several software and Internet-related activities. The students appeared enthusiastic about using the computer and engaging in computer-related activities.

The classroom computer was equipped with a variety of software, including math, French, art, and geography-related packages, as well as a word processor. It was linked to a network which was administered from the resource center, through which compact disc software could be accessed.

Time Frame

The submission of the proposal for this research was dated October, 1997, and approval was received the following month. Permission was subsequently sought and received from the school administration and school board, which was followed by informed consent of parents and student participants. The actual on-site research, which included survey distribution and collection, individual interviews, observations, and journal writing spanned a four-month period, from January to April, 1998.

Presentation and Analysis of the Data

Several tools inform this research. These include: (a) journal (consisting of unstructured and structured observations); (b) student interview; (c) parent questionnaire; and (d) document analysis and correspondence (including school, school board, and government policy initiatives). Collectively, these methods constitute a verification procedure in that findings from one procedure support those of one or more of the remaining research tools.

The data presentation and analysis which follow are structured by the guiding theories of this research, namely (a) that gender differences in computing attitudes and practices of students are determined by the environment and not by inherent dispositions, and (b) that parental attitudes are a determining factor in the shaping of student attitudes towards computer use. The data analysis identifies patterns which implicate these guiding theories in response to the following research questions: (a) Are there gender differences in computer use? (b) Are there gender differences in attitudes towards computers? (c) Do parental attitudes toward the use of computers affect children's use and attitudes towards computers by gender? (d) How does the educational system promote gender equity in the access and use of computers?

Journal

Introduction

The journal was used by the researcher to log observations of computer use during structured and unstructured classroom time, as well as to monitor and check the

researcher's subjectivity. Structured classroom time included computer classes at the resource center, while unstructured time was outside regular class time.

In the classroom, the twenty students were normally seated in heterogeneous groups of four at small tables. In one corner, the math center offered Lego blocks, math manipulatives, etc. In the opposite corner, the reading center included a comfortable seating area and shelves stocked with French storybooks. The computer was set up on the opposite side of the room near the teacher's desk, and was not in close proximity to any other center; the positioning of the computer in a gender neutral area was therefore provided, as recommended in the literature (Bernhard, 1992). There were two chairs at the computer table, and ample room for onlookers.

The classroom computer had a wide variety of software from which to choose. These included word processing (*Student Writing Center, Student Publishing Network, Microsoft Works)*, mathematics (*MathBlaster, Math Wizard, Exploring Pattern Blocks, Exploring Base Ten, Animated Math, MathVille, Counters and Sums, 1-2-3 Ordonne-moi, J'ai des sous, Quelle heure est-il?, Frises et modèles)*, publication (*Print Artist, Print Shop)*, geography *(Carmen Sandiego, PC Globe, X- Country Canada)*, spatial orientation *(R- Alpha, Orientation Spatiale)*, spelling (*Ballons Magiques)*, grammar (*La chasse au Trésor)*, science (*Operation Frog)*, various topic specific software (*Designasaurus*), and several games (*Word Rescue, Chess, Orbits)* which exhibit varying curricular value. The computer was connected to a server in the resource center, so that students had to log on in order to access the local area network.

For initial unstructured observations, students were permitted to use the computer on a first-come, first-served basis. There were no specific regulations given, such that patterns of use might not be inhibited. The times when the classroom computer would be available in this way were 8:25 am - 8:50 am (period before class), 10:30 am - 10:45 am (recess), and 12:25 pm - 12:55 pm (lunch hour). There were also computer activities during class time which represent the structured observations. The results of these observations over a period of five weeks are organized according to varying themes which emerged from the use of the computer in the classroom.

Unstructured Observation

Theme I: Competition for access to the computer.

During the first week, certain patterns did begin to emerge among these Grade 2 students in terms of access which, once established, prevailed throughout the observation period. Student access to the computer was not controlled, but delegated on a first-come, first-served basis. As a result, there was a competition among some students to get to the computer center first and claim the computer for that time slot. As in Kinnear's (1995) study of Grades 4 to 7, male students became more frequent users of the computer because they were more likely to claim it and demand access to it. Five male students in particular were more eager than their classmates to rush to the computer during their free time, as evidenced by their daily use; or if the computer was not available they would ask to reserve it for the next recess or lunch period. For a time, this limited female participation at the computer center. However, towards the end of the first week, two

female participants requested to use the computer at lunch hour, and their request for a "reservation" was granted. The following journal entry describes their use of the computer:

> Two females using the computer. They choose *Word Rescue*. Three males and two females look on. Several times, the males make comments regarding the procedure in the game. On two occasions, a male reaches over the female's shoulder to press a button, showing where to navigate. The males remain at the computer even after the teacher has twice asked the group to be seated to resume class.

As the pattern of more regular use for males continued at the computer center, several females of the class became more vocal about their desire to use the computer more often, and conflict began to develop among two groups of students who were both interested in using the computer in their free time (one group of two males, one group of three females). The practice of free access to the computer was therefore halted at the end of a two week block, in favor of designated access or "turns" for each computer slot. This became necessary as the group of five male students became daily users of the computer, while their classmates either looked on or participated in alternate activities. The majority of students welcomed the new system of predesignated computer use for free time. A list of students' names was posted, and students were told that it was their time to use the computer. For the remaining three weeks, access to the computer was predetermined, which eliminated the need for competition or reservations.

Theme II: Predominant software.

Ninety percent of the time throughout the observation period, the same software

was utilized in unstructured classroom computer use: *Word Rescue*. This program is similar to a *Nintendo* game, in that a small character (male) manoeuvers through a maze composed of a number of levels or "worlds" in order to achieve the highest level . The character is confronted by various opponents or "Nasties", against whom he may or may not be equipped with some defensive "slime". It is the character's duty to collect letters throughout each maze in order to create a word. The game does exhibit some educational value, since it reinforces conventions of spelling. On most occasions this was the game of choice, and so the topic of how far each student had traveled in terms of levels quickly became a subject of discussion in the classroom. Many students were competing to reach the highest level first - in particular, the five male individuals who had become the most frequent users. The use of the classroom computer became synonymous with playing *Word Rescue*, even though there were many other programs from which to choose, as outlined above. This was true for both male and female users.

The second most popular program was *Paint*, in which the students experimented with creating pictures or designs using colors, shapes, and tools. However, this program was used approximately 8% of the time that the computer was in use. It was also equally popular with male and female users. The third program which maintained a presence was *Print Shop*, in which students experimented with graphics and layout to create greeting cards. This was used exclusively by females, and was used approximately 2% of the time.

Theme III: Computer experts in the classroom.

Six students emerged as knowledgeable users of the computers, as evidenced by

the number of times that students approached them for assistance during unstructured computer time. Five of these were male, and were the same users that dominated the computer from the onset of the observation period. Their knowledge of the classroom computer was influenced by their obvious interest in using it. As a result, even when "turns" were delegated, these students would regularly gather at the computer to observe the players of the day, and on the performance of the user. It also became obvious that one particular female was very knowledgeable in computer use; she did not use it more than others at school, but had a computer at home that she used regularly. She was often asked for help regarding such processes as saving or exiting.

Theme IV: Male and female spectator patterns.

Males were more inclined to be spectators while other students played; the females would also observe but always for a shorter period of a few minutes, and they would then proceed to other activities in the classroom, such as low-organized games. In general, the females were frequent spectators but they did not tend to become involved in the game or make comments regarding how it should be played. Males did exhibit these behaviors, and watched players for extended periods, often for the entire fifteen minutes of recess time. Especially during the first two weeks, male spectators were regularly observed to reach over the female users' shoulders and press a key in order to help the females navigate.

Theme V: Designated access versus student selective access.

Once observed patterns of dominance by one group of children were established, the intervention of "taking turns" was introduced with the expectation that access would

be equalized. The majority of students did engage in more computer time as a result of this redistribution. However, a small number of students did not benefit from this re-allocation, since they preferred to participate in alternate activities during their free time, and chose to skip their computer turn. There were two such students, both of whom were female. On one occasion, one of the female students asked, "Do I *have* to use the computer if it is my turn?" Therefore, despite interventions to improve their access, the attitudes of some females towards computers in this particular group became an issue which actually undermined their access. These findings are similar to those of Kinnear's (1995) 9-month study of Grades 4 to 7, in which males tended to dominate the computer center when access was not controlled, particularly during out-of-class time such as recess or lunch; however, even when access became controlled, at least some of the girls chose traditional socialization activities during recess and lunch over their allotted computer time.

Structured Observation

There were five one-hour sessions of observation during structured class time in the resource center. Each hour was further sub-divided into three 20-minute observation periods. The number of computers was limited to seven. Therefore, each student was observed at a computer on five occasions for a period of 20 minutes per session. All students participated in the computer activity, which was organized such that those who were not being observed would complete an alternate activity. Based on the trends discussed in the literature, a checklist of possible behaviors (see Appendix B) was designed to target and tally student interactions with each other and with the computer.

Each computer experience was open-ended with student-selected software. This practice coincides with Nathan and Baron's (1995) finding that when students select their own software, they are more motivated to learn and to explore. The software available included all programs present on the classroom computer, with the exception of *Word Rescue*. This program was eliminated to allow for further exploration of the available software. Several themes emerged as a result of these observations, as outlined below.

Theme I: Request for assistance.

Both male and female students were capable of working independently at the computer for extended periods of time without asking for assistance (eg., 5 - 10 minutes). However, when assistance was sought, it differed in frequency by gender. During all five structured observation periods, female incidence of requesting teacher assistance outnumbered males by at least 3:2, but was usually greater; on two occasions, female requests were more than double those made by male students.

Students also sought the assistance of peers when they encountered difficulty with a particular program. Females requested the assistance of their classmates slightly more often than males. One interesting trend was that students did not tend to request the assistance of those who had been established as the class "experts"; rather, they approached peer users of their gender.

Theme II: Dominance versus assistance.

When their assistance was solicited, all students generally reacted by instructing verbally or by pointing to an icon on the computer screen to aid their classmate. However,

on several occasions, the assistance provided exhibited an element of dominance over the computer, such that the helper would take control of the keyboard or of the mouse. When such an observation was logged, it was twice as likely to be a male student. On one occasion, a male student shut down the computer of a female student, because she had been "stuck" in a particular program.

Theme III: Selection of software.

In the initial two observation sessions, there was a difference in the computer programs selected by the males and females: males selected *MathBlaster* more often than any other program, while the females selected *Exploring Pattern Blocks*. The former is a game-oriented program in which a cosmonaut experiments with numbers to create accurate equations, with the ultimate goal of taking a space voyage. The latter is an open-ended activity in which students create patterns using geometrically different blocks. A difference in program selection was not evident after the first two observation sessions, as students of both genders explored a wide variety of software.

Theme IV: Change of program.

Students changed programs fairly often, as they enjoyed experimenting with the available software. The number of times that students did change programs did not differ in terms of gender.

Theme V: Unwillingness to exit.

When their computer time of 20 minutes had expired, males remained at the computer three times more often than females, and had to be prompted to exit in order that the next user might begin his/her session.

Theme VI: Seating plan.

Males and females tended to sit in gendered groupings at the computers, and would discuss their programs with those of the same gender. During two observation periods, the seating was altered in order to observe any differences. There was much less discussion noted when students were directed to sit next to a member of the opposite sex.

Summary

Observations logged in the journal revealed certain patterns of computer use in structured and unstructured computer sessions. During unstructured computer time, participation was largely limited to male students until interventions of predesignated access were introduced. Guaranteed access did not guarantee use, as some female students decided to opt out of their computer time. Computer experts emerged in the classroom, comprised of five males and one female. Male students were more likely to observe the players for long periods of time. Game software dominated use.

Structured time was characterized by exploration by males and females of a variety of software. Students tended to sit in gendered groupings in the mini-lab, which yielded more discussion among the computer users than when males and females were intermingled. Females tended to request assistance of their teacher and their classmates more often than males. When males students assisted fellow users, assistance was often characterized by taking control of the keyboard. Finally, upon closure of the structured session, males were often unwilling to exit their program, which required prompting.

Student Interview

The student interview consisted of sixteen questions which were subdivided into three sections, namely: (a) knowledge about computing, (b) attitudes towards and use of the computer at home, and (c) attitudes towards and use of computers at school. The number of students interviewed was 19 with a ratio of 8 males to 11 females. Of these 19 students, 6 males and 8 females had computers at home. Data are organized into each of the three subsections below.

Section A: Knowledge About Computing

To establish the students' understanding of the computer and generate data regarding the children's background experience with computers, the following two questions were posed:

1. What is a computer?

With the exception of one female student who stated "Pass", it was obvious that the students had had some computer experience and were able to articulate a definition of the computer. Two students (one male and one female) likened the computer to a TV, and many students described the computer as a machine, for example:

> Margie: It's like a T.V. with all the buttons on it and you can play games on it.
>
> Ana: A machine that helps you write down stuff, like information and all that.
>
> Jill: It's a machine that sometimes people use.
>
> Mike: It is a machine that you can do things on and learn from and you can print from it.

Joey: It's something that you use for birthday cards and stuff.

Gregory: It's a thing that we play and work on.

Four male respondents verbalized more varied uses for the computer than their male counterparts and the females in general. These boys used varied descriptors, as the following examples demonstrate:

> Peter: A computer is a machine that can do lots of things like colour. It has something called the Internet. You can put CD Roms in it. It has something called a printer and a keyboard. It's all man-made.
>
> Andy: It's like a TV and you can go on the Internet on it. It goes through the phone wire. You can also play games on it.
>
> Donald: It's an electronic thing that has programs and discs and CD's. You can put things on it and save things, you can go on the Internet, and sometimes you can get games on it.
>
> Barry: It's a machine. It has a brain like us and a computer has a hard drive.

One female student offered multiple descriptors of the computer, stating that it was "...something that you use to find out things and play with and write messages to people". Otherwise, most of the female responses were quite succinct, such as the following:

Abbey: It's an electronic thing.

Jackie: It's a little machine that you play games on.

Michelle: It's a machine you type things on.

Rachel: A thing you can play games on and stuff.

A slight discrepancy is noted between genders on this question, as four males and one female saw the computer as multi-dimensional (ie., provided three or more descriptors).

2. What can a computer do?

As in the previous question, one female elected to pass. The responses to this question were varied, but the most popular answer of both males and females, four and seven respondents respectively, was that the computer can be used to play games. This was also true in Question 1, where five girls and one boy suggested this use. The literature indicates a possible detrimental gender gap in envisioning a game context for the computer, as this particular use of the computer may be less appealing to girls (Culley, 1988; Swadener and Jarrett, 1986; Department of Education, 1996; Loftus and Loftus, 1983; Wilder et al., 1985; Funk and Buchman, 1996; Newman et al., 1995). If students in this study perceive of the computer as game machinery, that perception may lower female interest in computer use and thereby possibly reduce access to girls.

Other responses to the uses of the computer have been rated in order of decreasing frequency by gender as follows:

Table 1

Use of computer in decreasing frequency by gender

Male uses	Female uses
games	games
internet	write
write/work	internet
e-mail	research
virus check	printing
	draw/work/e-mail

Maloney, 1999

These responses were similar. Potential computer utilization in terms of the first three uses is almost identical between genders, and a broad spectrum of computer use is described by both groups, as illustrated below:

> Donald: You can put things on it and you can play games on it. You can go on the Internet. You can get viruses, and you have a virus check. You can put in new discs.

> Margie: It can give you information. You can look something up on a CD Rom or the Internet. You can play games and draw.

Summary: Section A.

All 19 students interviewed demonstrate an understanding of what a computer is. Their varied responses demonstrate a wide background of exposure to computers by both genders. Previous experience of the computer for these children at home and at school has been predominantly game playing was repeatedly associated with computer use and even seemed to be equated with the computer itself by some respondents. This association may be a detriment to the promotion of female computer use.

Section B: Attitudes Towards and Use of Computer at Home

Questions 4 to 9 determine computer presence and use in the home. Parental influence on computer use is also explored.

3. Do you have a computer at home?

Fourteen of the students have access to a computer at home, which represents 74% of the respondents. Of the five who indicated that there was no computer in the home, three were female and two were male. For respondents who have computers at home, there are eight females and six males. These ratios are consistent with the ratios of

males to females in the class, and therefore there would appear to be no difference in presence of computer in the home for gender.

4. Do you use the computer at home? For what kinds of things?

All 14 students who have computers in the home indicated that they have access to the computer. Six of these students were male. All of them named "playing games" as the activity for which they use their home computer most often, with one boy each mentioning making birthday cards and going on the internet. For the 8 females, game playing was also popular; however this was not as unanimous as for their male counterparts, as the girls named other activities, such as painting pictures (4 students), typing (3 students), making cards (1), and exploring interactive CD's of favorite musical groups (1). Some of these preferred pastimes of the female respondents would appear related to the creation of a final product, such as a letter or a picture, while the males are more likely to engage in game playing. The females interviewed may think of the computer as game-related, but when they themselves use computers, they engage in activities that are not necessarily game-related.

5. Who uses the computer most at home?

Respondents named various family members who are the most frequent computer users in the home, as shown in Table 2. Of the 14 students who have computers in the home, there were 7 each of male and female principal users indicated. Of the 6 males, 4 observed frequent male users in the home, including brothers (2), fathers (1), or themselves (1). The remaining 2 indicated that their mothers were the principal computer users. Among female respondents, 2 believed mothers to be the principal users, 2 named

their sisters, 1 mentioned herself, and the 3 remaining females indicated that their fathers were the prominent computer users in the home.

Table 2

Principal computer users as determined by Grade 2 students

Sex of respondent	Male principal user	Female principal user
male (n=6)	4	2
female (n=8)	3	5
Total	7	7

Maloney, 1999

In responding to this question, two females made similar comments about their mothers' computer patterns:

> Abbey: Mom doesn't know how to work it.
>
> Ana: My dad uses it the most. He even uses Mom's computer a lot, too!

The mothers who were deemed to be the principal users were using the word processing capabilities of the computer. However, the fathers were engaged in more diverse activities, including exploring the Internet, making cards, and playing games, while the brothers named were playing games or using the computer as a research tool. This appears to represent a divergence of patterns in the sample group of how the computers are used by male and female principal users in the home.

6. Do you have any electronic games at home?

Electronic games may represent an initiation to computer use, and therefore are relevant in targeting male/female patterns of use (Loftus and Loftus, 1983; Wilder et al.,

1985). All but 2 of the interviewees, both female, had some sort of electronic game at home, as shown in Table 3.

Table 3

Electronic games by gender

Electronic Game	Male (n = 8)	Female (n = 11)
Pocket Pet	2	9
Game Boy	3	1
Game System (eg., Nintendo, Sega, etc.)	3	1
Dear Diary	0	2
GeoSafari	1	0
Total Games	9	13

Maloney, 1999

In this particular group, the most popular electronic game was the "Pocket Pet", which belonged almost exclusively to females. For the males, *Nintendo* or *Game Boys* were more popular than other types. For several females *Nintendo* is also present in the home; however actual ownership of the game is qualified, as follows:

> Rachel: I have a *Nintendo*. Well, it's my brother's. I have a *GigaPet*.
>
> Abbey: My brother has a *Nintendo*. I have a *GigaPet*. A *Dear Diary*. I have a CD player...well, my brother does.
>
> Ana: I got painting *Nintendo*, and flies that you got to beat them up, and I got hockey. They're all my brother's. And I got this thing with the sword...I never played it...and it got bombs. Well, he gave me the painting one for keeps because he doesn't really like it...I play them sometimes. I have a sea creature. It's like a *Tamagotchi*.

During the interview process, ownership of an electronic game was an issue expressed only by females with reference to older brothers. The commonality in each of these particular cases is that games tend to be gender specific, in that *Nintendo* is owned by a male sibling, while the *PocketPet* is female domain.

7. Is using the computer important for you?

This question was indicative of students' attitudes towards computer use and responses showed a marked difference in terms of gender. Of the 11 females, 4 stated "Yes", while the remaining 7 replied negatively. For the males, all 8 found the computer to be important to some degree; 6 of them thought that it was very important, and 3 males qualified their responses with considerations for the future:

> Donald: Yes. When you're grown up, you need more use of the computer, sometimes for e-mail, sometimes for sending letters, sometimes for copying things onto the computer.
>
> Peter: Yes, it's important for me to learn how to use the computer because it can come in handy someday. It's a very neat thing to have and people are very lucky to have computers.
>
> Barry: Yes, because when you grow up you might need to use a computer for your work.

Female responses were more tentative. One female stated that it was a "little bit" important to learn to use the computer, because "...I might press a button and break it." A second reiterated this idea, responding that it would be important to learn to use the computer if you have one at home, "...so that you know how to use it." One female stated that it is "sort of" important, so that "...you won't be bored all the time". The attitudes among these male and female students appear to differ in terms of the importance of the

computer in their lives.

8. Is using the computer important to people you know?

This question was posed in order to describe how students were being encouraged to become computer literate, and to determine whether this encouragement and role modeling were consequently evident in the child's computer use. Thirteen students could name someone to whom the computer was important, 4 responded "No", and 2 responded "I don't know". In terms of gender, this translated to only one negative male response, and five female responses of "No" (three) or "I don't know" (two). This indicates that although there may be strong computer models present in the lives of many of the students, over one quarter of the class is unable to name a computer role model, and this group is almost wholly female; it may be that strong role models are not necessarily present for these female students.

9. To whom is it important?

This question attempted to identify the gender of role models of computer use mentioned in the previous question. Of the 13 students who could name individuals to whom computer literacy was important, 6 were female and 7 were male. For females, all but one named at least one female role model in computing, either a grandmother, a mother, a friend or a sister. The remaining female named her brother. For males, one named a female user (mother), and two named males only (father or friend). However, the 4 remaining males named both male and female users, usually both parents. Therefore, for those students who could identify role models in computing, there were strong numbers of male and female representation.

Summary: Use of computer at home.

Access to a home computer is available in 14 of the 19 homes. Use is characterized as game playing for male students; it is more varied among females. An equal distribution of males and females defines the principal users of the computer in the home. Patterns of use among principal users differ by gender; females reportedly utilize word processing while males engage in more varied activities. Seventeen students have electronic games, with game preferences noted by gender. Computer use is less important to the female participants than the males. Thirteen students identified strong male and female role models for whom computer use would be considered important; 6 students could name no such individuals. Five of these 6 individuals were female, indicating a possible lack of role models for the females in this study.

Section C: Attitudes towards and use of computer at school

10. Do you use the computer at school? When?

All respondents indicated that they used the computer in school, and recalled both structured (eg., resource center or learning center in classroom) and unstructured (eg., recess time or lunch time) activities by name, such as typing a poem or searching for information on the Internet on birds. One female described the context of her computer use in the classroom as follows:

> Ana: I use it when it's my turn. I didn't use it any other time because Jake and Donald were always on it. And Peter and Gregory and Andy. They were always on the computer and they never let girls use it. They said girls are not allowed to use the computers. Every time, they were on it before anyone else could get on it. Now everyone can have a turn because Madame said, and they won't always be on it anymore.

A male student considered the same situation:

> Peter: Before we had turns, we all used to gather up at the computer and I used to play sometimes. And now my turn, I always play, but some people like Audrey don't really want to. Me and Jake and Gregory (him especially) and Andy used to play a lot before. And Ana and Sally, but they didn't play that many times.

Another female student mentioned that on some occasions she chooses to pass her turn on to a classmate, preferring instead to play with her friends. Therefore, while some conditions made it necessary for the teacher/researcher to intervene in order to equalize access, some students actually declined access to the computer despite safeguards to ensure that access.

11.Do you like using the computer at school?

All students responded that they enjoy using the computer in the classroom and in the resource center.

12. What kinds of things do you like doing on the computer at school?

This question prompted a great variety of answers. All 11 females indicated that games were part of what they enjoyed about the computer. For the males, 5 indicated their satisfaction with playing games, while 3 talked about work, especially research. Other categories mentioned included typing (3 females) and the Internet (1 female).

13. Are you good at using the computer?

Interpretations for " being good at" using the computer varied among respondents. Males all responded positively to this question, and qualified their responses with various achievements they have made or skills they can demonstrate, as follows:

> Jerry: I know how to get different pictures on the computer and

I know how to get in to where the pictures are.

Donald: I know how to put on a virus checker. I know how to go on the Internet, different parts of it too. I know how to get into different things on the computer.

Three males in particular identified their "rank" in their families with regards to computer use:

Peter: I was the first one in the house to shut the computer down by keyboard.

Gregory: I was the first one in my family to know a little bit about computers. I know a little bit more than my sister and my mom. But Dad's a "fix-it" and he knows everything about computers and I only know a little bit.

Barry: I'm the second best person who knows about using the computer. My dad knows the most and I know the second most.

It would appear that a patriarchal use of computers resounds in two of these messages, in which the father is the family computer expert.

For the female participants, 8 responses indicated that they were good at using the computer. The remaining 3 females were less enthusiastic; 2 females responded "Sort of" and one responded "I don't know". When suggesting reasons for why they deemed themselves good computer users, like the male respondents they indicated a variety of skills:

Audrey: In typing I type it in, and my friend however many seconds it takes her, it takes me like two minutes before.

Margie: Because my Dad showed me how to get into the computer and what's the password.

Ana: I don't really make a lot of mistakes. If I wanted that and it came small, I know how to fix it and all that.

Jill: Because most of the time I go downstairs and Mom says how do you get out and I just get out.

Jackie: Because I share.

Other than the first response above, the female's understanding of what it means to be good at using the computer (ie., sharing, fast typing or operating the computer) may differ from that of the boys (what I can make the computer do, or how good I am compared to other family members) . The responses of the females are consistent with those of the males in that mothers are sometimes depicted as knowing less about computers than fathers.

14. Is everyone in the class good at using the computer?

Eleven students indicated that everyone in the class was good at computers. However, one of those specified that their classmates were only good at some things, and another indicated that everyone is good at the game of *Word Rescue*. Four students (3 females, 1 male) thought that everyone in our class is not necessarily good at using the computer, and three responded "I don't know" (1 male, 2 females) Therefore, 5 females, as opposed to only 2 males, had reservations about the level of computer skills of some classmates compared to others.

15. Are boys and girls both good at using the computer?

Most students felt that males and females were both good at using the computer. However, there were several who felt that males were superior, including 2 males and 1 female. The female qualified her answer in comparing herself with her brother. The 2 male responses were as follows:

Peter: I think boys may be better. My uncle is probably better at using the computer than my Mom.

Barry: Most of my friends think that boys are better at using the computer than girls.

16. Do boys and girls like using the computer?

Fifteen students (6 boys, 9 girls) felt that boys and girls enjoy equally the use of the computer. The statement that boys like using the computer better than girls was made by 4 participants, 2 boys and 2 girls. Three of these observations drew on previous experience of the children:

Ana: I think that the boys like it more because they were always on the computer and everyone wanted a turn. But, Ally and a lot of girls said "I don't want to use it. I'm going to play something else - I want to cancel." She wanted to play that cat game.

Rosie: I think that the boys like it more than the girls because they play it more.

Peter: I think that the boys maybe like the computer more when they have the right games. I think that there are certain games that would attract boys more than girls, like *Jazz Jack Rabbit*. There isn't a lot of girls' stuff in it and this little bunny rabbit goes around with a bazooka shooting turtles.

Barry: I think boys like computers better. I don't know why.

Summary: Attitudes towards and use of computers at school.

Students expressed enjoyment in using the computer at school in both structured and unstructured situations. Previous journal entries, coupled with several student responses evidence that during unstructured time, some males would take over the computer. When measures to eliminate such behavior were implemented, some female students declined their right to the computer. Male students are unanimously confident

about their own computer skills; however, females were less certain. Some students (5 females, 2 males) had reservations about their classmates being "good at" using the computer. A small number of students (2 females, 1 male) indicated that the males are better at using the computer than the females in the class, and several students (2 male, 2 female) indicated that males actually like using the computer better.

Summary: Student Interview

Students in this study enjoy using the computer at home and at school and demonstrate varying levels of confidence in their computer skills by gender. Electronic game use differs by gender among the student participants. Perceived importance of computer use is divergent; males view the computer as necessary in their lives while some females do not. This may be affected by the lack of strong role models for some of the students. Male and female role models of computer use are present in many homes; however, patterns of use appear to differ among these users by gender, since males use the home computer more frequently and more diversely. A minority of students believes that males are more skilled in computer use, and derive more satisfaction from it than the female students.

Parent questionnaire

Eighty-nine per cent of the parent questionnaires were returned (17/19). Respondents represent a slight majority male parent population, defined by the parent who uses the computer most, as stipulated in the questionnaire. Ten fathers and 7 mothers participated. This relates indirectly to the student population of 10 females to 7 males. Of the 2 students whose parents did not return the questionnaire, 1 was male, 1 was female.

Not all questionnaires were completed in full, and some questions required computer access at home; where N is less than 17, it has been noted. The questionnaire was subdivided into three sections, as follows: (a) Section A provided a general profile of the respondent and the household, (b) Section B described how a computer is utilized in the home, and (c) Section C determined parental attitudes and involvement regarding computers and electronic games. Each questionnaire item is presented individually, and analysis of emergent patterns and themes are identified. Responses are assessed along gender lines.

Section A

Section A of the questionnaire was to be completed by all respondents. The parent participants indicated whether a computer was present in the home and the number of hours which parents used the computer at home and at work. Of the 17 questionnaires completed, 4 indicated that there was no computer in the home; 13 of the homes were equipped with computers. Of these 13 parents, 4 of the 8 males indicated 6 or more hours of home computer use per week; only 1 female checked the same category of hours. At work, the number of regular computer users increased to 15, and 5 of the 7 females used the computer 6 or more hours per week, while 4 of the 8 men utilized the computer the same number of hours. This indicates that both males and females use the computer frequently in their work, but the males are more frequent users in the home. Of the 4 homes which did not have computers, 3 of the Grade 2 students were female and one was male.

Section B

Section B describes how the families who have computers at home use them. N = 13, as 4 respondents have indicated no computer presence in the home, and 2 questionnaires were not returned.

Question B1: In the following table, please rate in order of importance (1 being least important, 6 being most important) your reasons for purchasing a computer.

This question was completed by only 8 of the 13 respondents. Of the 8 respondents, 6 considered "child's education" to be the most important factor in purchasing a home computer, and the 2 remaining respondents indicated that parent work was the most important factor, with child's education being the second consideration. Therefore, for the parents who did respond, their child's education was a primordial factor in the purchase of the home computer; as all of these assigned a 5 or 6 weighting to that reason. This indicates a strong interest in children's computer use by their parents.

Question B2: Who is the principal user of the home computer?

Twenty-five per cent of the respondents named Dad, 10% named Mom, and 30% indicated that a child was the principal user. (The gender of the principal user is addressed in Question B3.)

Question B3: Please estimate the number of hours that the principal user uses the computer per week: 1-5; 6-10; 11-15; 15+.

The respective responses for each category were 23.1%, 23.1%, 46.2%, 7.7%. These figures indicate the number of hours which the home computer is in use by the principal user. If a cross tabulation of the gender of the principal user and the number of

hours is run, the following table results:

Table 4

Cross tabulation of gender of principal user by hours

Sex	1-5 hours	6-10 hours	11 - 15 hours	16+ hours
Male	2	3	4	1
Female	1		2	

Maloney, 1999

Therefore, the number of male principal users in the 13 homes is 10, whereas there are only 3 homes where the principal user is female. The male principal users are also using the home computer for a substantial number of hours per week, such that students would see a male using the home computer more often and for extended periods of time.

Question B4: If the principal user is a child, please indicate age and sex of child below.

When the principal user was a child, (7/13 responses), the child was older than the Grade 2 child in 5 of the 7 cases, and in 1 case the child was younger; in 1 case, the child principal user was the Grade 2 child. Of the children who were named by their parents as principal users of the home computer, 6 out of 7 were male.

Question B5: Please indicate how the principal user uses the home computer, using the rating system of 1 (least usual) to 6 (most usual). Categories: games (non-educational); communication (e-mail, Internet, WWW, Newsgroups); word processing/typing; work-related; education (educational software); other.

The spread in this data was quite large; the greatest frequency was 4 principal users using the computer most for keyboarding, with 3 using it for communication (as

defined above), and 2 principal users each avail of the computer as an educational tool and for work purposes.

Question B6: If you have more than one child, please indicate the gender and the frequency of computer use of each child, in hours per week.

Ten participants responded. Eight of the students have at least one elder sibling, 7 of whom are male. Six students also have younger siblings, 4 of whom are male. The mean number of hours for older brothers (N = 7) is 7.0 hours. Two of the students have older sisters, who use the computer for 2 and 3 hours each. Of the younger siblings, 2 are sisters who use the computer for 10 and 7 hours each, while the 4 younger brothers use the home computer for 0, 2, 2, and 15+ respectively. Of the students who have siblings, 6 of them use the computer either the most of the children in the family, or at least as often as a brother/sister. Of the five Grade 2 students who are using the computer less than a sibling, 4 are female.

Question B7: Please list the software titles which are used by your Grade 2 child, in order of frequency.

The assortment of programs listed have been classified by the researcher into the following categories: (a) games, (b) word processing/card making, (c) encyclopedia, (d) educational games (eg., Magic School Bus), and (e) other. Educational games were defined as those games which had a direct link to a curriculum area (eg., *Monker's Math*), or were explorations of a particular concept (eg., *Magic School Bus Water Cycle*). The general category of games includes such games as chess or *Wish Bone*, which may be related to skill development and do exhibit some educational value, but were not

considered predominantly educational in nature. The two most popular categories were the first two, (games and word processing/cardmaking) with 10 responses each. The next two categories, educational games and encyclopedia, were both indicated a number of 8 times. However, the category which was listed most often as the most used type of software was educational games, including *Magic School Bus*, *Monker's Math* and *Living Books*, with 6 parents indicating that such software is most frequently used by their child. Non-educational games were indicated a total of 10 times by 7 parents, with a ratio of 5 males to 2 females playing them. Gender-stereotyped software was not predominant, except for the presence of *Barbie* and *Lego Island*, which were used by a female and male respectively.

Question B8: Have you ever taught your Grade 2 child any of the formal computer skills below?

N = 13. The following table represents no marked differences between males and females and how parents instruct them on the home computer:

Table 5

Computer skills taught by parent to Grade 2 student

Skill	Male student (n=7)	Female student (n=6)
Keyboarding skills/Typing	4	2
Dos commands	0	0
Windows basic commands (eg., opening/closing a program, saving a document)	6	6
Basic computer knowledge (turning on/off, inserting/removing/storing a disk, etc.)	7	6
Other	0	1 (Internet)

Maloney, 1999

Question B9: If you have both male and female children, do you as a parent see any difference in their use of the computer?

N = 7. Four parents indicated "No", three indicated yes. All 3 parents added comments to their affirmative response, as follows:

> Yes. The boy would rather play non-educational games on the computer, whereas the girls would rather make cards and play math games.

> Yes. But I believe it is because of their age difference, not sex.

> Yes. Females use more for entertainment. Male more as a research tool.

These responses indicate that a small number of parents do observe differences in the way their male and female children use the computer.

Section C

This section was to be completed by all participants and included the following 8 questions.

Question C1: Does your child own any electronic/computerized games (eg., Nintendo, Sega, Speak and Spell, GigaPet, Tamagotchi, etc.)?

All 17 respondents indicated "Yes". Eight students have a version of *Nintendo*, including 5 females and 3 males. Three students have *Sega*, all 3 are female. One female student has *Speak and Spell*. Six students have *GigaPets*, 5 of whom are female. There are 5 *Tamagotchis*, 3 belonging to females and 2 to males. Three *Nanos* all belong to females. Seven students have a mini-computer of some sort (eg., *V-tech*), 5 females and 2 males. One male and 1 female each have the *Geo-Safari* computerized game. Two females own *Cyberbabies*. Three students own *Game Boys*, 2 of whom are male. There is, however, some question of ownership of such games, which was discussed further in the interview discussion (ie., many parents are naming games actually owned by brothers and sisters of the Grade 2 students). The following table presents the discrepancy between the responses given by students in the interview, and the responses of their parents.

Table 6

Electronic games by gender

	Interview (child)		Questionnaire (parent)	
Electronic Game	Male	Female	Male	Female
Pocket Pet	2	9	3	13
Game Boy	3	1	-	-
Game System (eg., Nintendo, Sega, etc.)	3	1	3	8
Dear Diary	0	2	0	2
GeoSafari	1	0	1	1

Maloney, 1999

The information from the children and their parents is not consistent in this instance. On several occasions, female students indicated the presence of certain electronic games in their homes; however these students did not actually have access to those games as they belonged to a sibling. This may account for some of the discrepancies in the above data.

Question C2. Do you feel that these are valuable games?

N = 16. Ten parents responded "Yes". Comments included the following:

Table 7

Parental comments re computerized games

Comments re male students	Comments re female students
Teaches team work; they figure things out.	The *Sega* and Electronic pets I could do without but the kids love them. The two laptops are educational and we have fun playing them together.
Because they are educational and non-violent.	She can succeed with them, then learns from them in a comfortable setting.
Improves hand-eye coordination; improves reasoning/thinking skills; he enjoys them and they are fun!	Notebook is like a laptop computer and gives exposure to a computer keyboard and commands. The rest are just games.
some; we do not have *Nintendo, Sega*, etc; We are trying to resist the pressure to purchase these!	Make interesting learning tools, keeps the child's interest and helps them to learn on their own, to a certain degree.
a form of entertainment. Good for hand-eye coordination.	Has taught her spelling, add, subtract, completes the sentence, words that sound alike.
	Too simple.
	They have some value but can lead to too much physical inactivity.
	They do not teach the child anything. (*Gigapet*)

Maloney, 1999

Question C3: If there was a computer club offered as an extra-curricular activity (eg. during lunch) at your child's school, please circle below the phrase which best describes how you would approach such a club with your Grade 2 child.

Table 8 presents parental reactions to this question:

Table 8

Parental reaction vis-à-vis computer club

Response	Male	Female	Total
I would not influence my child's decision.	2	0	2
I would discuss the benefits of such a club and let him/her decide.	3	9	12
I would discuss the benefits and expect my child to attend.	2	1	3
Total	7	10	17

Maloney, 1999

This question was posed in order to gauge parents' interest in their child's computer experience. The majority of parents indicate their belief in the importance of computer experiences for their children (15/17), and a slight majority (12/17) would allow students to decide for themselves if they wish to participate.

Question C4: Has your child ever enrolled in a computer class outside of school (eg., computer camp)?

Four respondents indicated "Yes"; all 4 students were male. This indicates a similar trend as suggested by the literature regarding computer camps, in that males are more likely to be registered (Hess and Miura, 1985; Fisher, 1984). This is particularly noteworthy since the 4 males who have participated in computer camps are among the same students who became the classroom computer "experts". This suggests that the computer camp experience may have been of benefit to these students, and that if females are not attending perhaps they should be encouraged to do so.

Question C5: If yes, would you consider such a camp again?

All 4 parents indicated "Yes". Therefore, both students and parents evidence the importance of positive computer experiences, and the impact that those experiences can have on children's knowledge of computers.

Question C6: Please estimate the number of hours that you spend per week completing the following structured activities with your Grade 2 child: completing homework; using the home computer; participating in athletic activities; participating in cultural activities; other.

Data are presented in the following table:

Table 9

Average hours of weekly parent-child activities

Gender	homework	computer	athletics	cultural	other
male	4.6	2.2	1.3	2.3	1
female	3.3	1.2	2	2.7	0.7

Maloney, 1999

This question was posed in order to determine how parental time with children is spent in organized activities. If compared by gender, parents of male students in the class spend an average of one hour more per week with their children on computer activities than the parents of female students.

Question C7: If you are able to volunteer at school, please comment on the nature of your involvement (eg., field trip supervision, attendance at Home and School Meetings, etc.).

Seven parents indicated that they were involved in the school, including attending

Home and School meetings, volunteering for field trips and in the library, etc. Two of these were parents of male students, and the remaining 5 were those of females. This indicates a small number of parents who are actively involved with the school, and the majority of parents involved have daughters in the class.

Question C8: Please indicate the importance you place on the following areas for your Grade 2 child. (Circle 1 = Little importance, to 4 = Great importance): reading; writing; music; computer activities; mathematics; physical education; science; other.

Table 10

Activity rating of parent by gender of student

	Activity rating of parent by gender of student								
	1		2		3		4		Total
Activity	M	F	M	F	M	F	M	F	
Reading							7	10	17
Writing						4	7	6	17
Music		1		1	2	5	5	3	17
Computer			2	1		3	5	6	17
Math				1		3	7	6	17
Phys. Ed.			1		1	8	5	2	17
Science				1	2	3	5	6	17
Other						3	2		5
Total	0	1	3	4	5	29	43	39	

Maloney, 1999

In comparing the importance of these curriculum areas, all 17 respondents considered reading to be very important. In writing, 13 considered it to be very important,

while 4 considered it to be important. Music was considered of little importance by 1 respondent, and of less importance by 1 respondent. The others responded either more important (7/17) or very important (8/17). Computing was rated "2 " by 3 participants (2 parents of males, 1 parent of a female); it was rated "3 " by 3 respondents (all 3 parents of daughters), and considered "4" (very important) by the remaining 13 respondents (65%). Math was rated of 2, 3, and 4 in importance by 1, 3, and 13 respondents respectively. Physical Education was rated from 2-4 in importance by 1, 9 and 7 respondents respectively. Science had the same ratings, 2-4, with 1, 5 and 11 respondents respectively.

Summary

Children's education and parent's work impacted on the purchase of home computers. The 13 home computers in this study are used by fathers more often than mothers, even though both sets of parents use the computer extensively at work. The principal user of the computer in 10 of these homes is male; students would observe males using the home computer more often and for extended periods. Only one Grade 2 student was deemed principal user of the home computer; this student was male. Principal users utilize the home computer for a variety of purposes. The Grade 2 students use a variety of software in the home; males play non-educational games more often than females.

Preferences for electronic games differed by gender. Parental comments were largely in favour of such games, citing hand-eye coordination and reasoning as possible developmental benefits. However, 4 parents (3 daughters, 1 son) were less enthusiastic about such games.

A majority of parents displayed positive attitudes towards computer education. If extracurricular computer opportunities were offered at school, 15 parents would discuss the benefits of such an experience with their children. The majority of parents would let their children decide on enrollment; however 2 sons and 1 daughter would be expected to attend. Only 4 males had participated in computer camp previously. The experience was likely a positive one, since these 4 students were among the "class experts" who emerged during the study. Parents of these 4 males indicated their satisfaction with these camps and would register their sons a second time if such a camp were available.

In evaluating importance of subject areas, parents of 5 males and 6 females rated computer activities as 4 ("most important"). Two parents of male students assigned a rating of 2 (less important) to computer use. For the remaining females, there was one rating of 2, and three ratings of 3.

The parents in this study are involved in their children's education. Seven parents noted strong involvement in the school. Five of these had daughters in the class. This involvement was not linked to computer education, but represents educational support in the home and a willingness to become involved. In terms of computer education, parents teach the male and female students computer skills including Windows commands and basic computer knowledge. Parents of males spend an average of 1 hour more per week in computer activities with their children than parents of females. Three parents observed differences in their sons and daughters' computer use.

Document Analysis and Correspondence

Three administrative levels are responsible for policy implementation: (a) school, (b) district, and (c) provincial Department of Education. Each level is treated separately below, and any comments made by contacted officials are noted.

School Policy

The school at which this study was conducted has a computer committee composed of the principal and assistant principal, resource teacher, and two classroom teachers each of whom is computer literate. The committee does not meet on a regular basis, but rather schedules meetings as deemed necessary. This homogeneously female group has been preoccupied for the past 2 years with the installation and maintenance of the local area network. Because of the magnitude of equipping the school with such a network, meetings have generally been technical discussions of computer components, requirements, associated costs and maintenance considerations. This has often necessitated the exclusion of theoretical reflection of how the computers are to be used in the classrooms. The school continues to experience technical problems regularly within its network; the committee is responsible for resolving these, yet in general its technical competencies are weak. In an effort to remedy this, several members have completed courses in network maintenance, yet technical expertise from outside the school is often required. On three occasions, students from a local post-secondary institution have completed work placements to aid in this area.

One professional development day for computer use was held previous to this case study. The agenda included sessions on particular software (*Toolbook*, *Winschool*,

KidNet, network access, and the Internet) which were facilitated by members of the computer committee in an effort to improve the computer literacy of colleagues and thereby maximize use of the classroom computers.

For the duration of this study, two students from a local post-secondary institution were completing their work placement at the school, and were involved with technical maintenance of the local area network. This gave the committee the freedom to discuss more theoretical issues, such as effective integration of the computer, and the usage of applications in the school. The computer committee met three times during the period of the study. The first meeting included technical discussions of such issues as sound card, scanner and printer acquisitions, and various peripherals. For the next two meetings, however, members were engaged in preparations for an on-site professional development day, to be held on March 27th, 1998. The committee decided to prioritize its inservice options, so that the following sessions were offered to teachers: (a) software available in the school, (b) the library database, and (c) a computer skills continuum to specify computer expectations for each grade level. Committee members facilitated the sessions. Specific issues of computer use, such as gender, were not considered at this time; rather, a general plan of what skills to be introduced and/or mastered at each grade level was developed.

To date the school does not have a policy for the equitable use of computers by gender in the classroom. Two staff meetings did involve discussions regarding an Acceptable Use Policy for the Internet, since each classroom was on-line, and there had been two reports of inappropriate use. The intervention selected was the installation of

KidNet on the elementary computers, such that site access was designated by classroom teachers. Several teachers voiced disapproval of this strategy, since it greatly limited Internet searches and minimized student responsibility. Another issue which was raised involved keyboarding instruction for students who do not have computers in the home. This discussion was preliminary, with suitable software a concern. Otherwise, no policies have been drafted regarding acceptable computer use, although the skills continuum is expected to contribute to more effective use of computers among grade levels, as it will outline computer skills for each grade level.

District Policy

In the last year, school boards in the province have amalgamated, which has created certain administrative challenges in policy implementation. When contacted, the district official responsible for science and technology reflected this reality, and indicated that no policy regarding the issue of gender in access to computers was in place at the district. Further, he suspected that no ground work had been done at this level to address the issue. He expressed interest in this research, and invited me to become involved in drafting a policy at the district once the study was completed.

Department of Education Policy

After contacting the Technology Education Consultant of the Department of Education, it was determined that there was no provincial policy to date on the issue of gender in integrating computers in the curriculum. As the consultant noted in discussing the department's varied publications, "...none of these documents address specifically the computer integration issue mentioned. *TTLE* addresses the broad issues...but does not

address them other than to indicate the level of responsibility and strategies for dealing with them." He did indicate that the Department was in the process of drafting a new document to include general computer integration outcomes, exemplars, strategies, sample resource needs, sample professional development needs, to be available in the next school year. The following publications of the Department of Education have determined the path of computer integration in the province: (a) *Learning to Learn* (1991), (b) *K - 12 Education System Strategic Information Technology Plan* (1992), (c) *Technology in Learning Environments* (1994), (d) *Student Learning Outcomes - Primary/Elementary Education* (1994), and (e) *A Curriculum Framework for Technology Education: Living in a Technological Society* (1997). Each document is analyzed below in chronological order in terms of the information presented and the treatment of the issue of gender in computer education.

Learning to Learn.

This document was published in 1991. It represents the Department of Education's expectations regarding learning strategies related to the paradigm of resource based learning. This document is included here because it includes certain guidelines regarding computer use, media literacy, and evaluation of resources.

Learning to Learn does recognize the importance of gender as a characteristic of the learner, as it lists gender as a factor which enables teachers to focus on learner needs (p. 8). It does not, however, expand on the issue of gender beyond its inclusion in this list, and therefore presents no guidance for teachers or administrators in approaching gender differences in context of resource-based learning. The other attributes noted include

"...interests, age and maturity, attitude, family history, intellectual ability, psychomotor development... socio-economic/cultural background." Each quality implicates sensibilities on the part of the teacher, yet listing an issue such as gender to the exclusion of guidelines is deemed superficial. The document also acknowledges computer software as a potential curriculum resource (p. 11), however in suggesting criteria for selection and acquisition of resources, gender is omitted. One criterion, "...treatment of various points of view," may be interpreted as the representation of all groups in resources, however this is the subjective interpretation of one individual.

In *Learning to Learn*, the roles of the Department of Education, the districts and the schools with regards to collections and evaluation of resources are defined. The Department of Education sees its role as the development of minimum standards in this area; the important role of developing policy is delegated to the school boards, who are expected to provide "leadership and expertise". It is the responsibility of the schools to ensure policy implementation.

K - 12 Education System Strategic Information Technology Plan.

This document is not curriculum related. It states that the issue of use of technology in the classroom was the responsibility of the "Computers Across the Curriculum" working group, and the IT planning team which prepared this document did have representation in that working group. The *K-12 Education System Strategic Information Technology Plan* does identify the need for a plan in the use of computers in the curriculum; however, its focus is the infrastructure of information technology in the Newfoundland and Labrador educational system, and how the technological framework

may be effectively maximized to meet the strategic needs of organization within the Department of Education. For example, one major objective was "...to determine what standards, application systems and data resources are required in meeting the organization's information needs" (p. 2.1). Therefore, it represents policy of the Department of Education towards the use of computers in schools in terms of school administration.

Technology in Learning Environments.

The *Technology in Learning Environments*, or *TILE* document, was written to provide a "synchronization of vision and a coordination of leadership" (p. 12) in responding to what it describes as the "redefined educational needs" in the technologically transformed K-12 educational system. It represents the Department of Education's overall plan for technological integration in the curriculum, and expands on general theory to include specific strategies and projects. These are categorized as follows: (a) policy changes, (b) educational support strategies, (c) professional development strategies, (d) enabling technologies strategy, (e) technology integration strategies, (f) curriculum management strategies, and (g) curriculum technology infrastructure strategies. The time line indicated for the transition phase of 1995 - 2000 is relevant to this case study, as implementation of these policies should be ongoing. More specifically, this document delineates the significant trends and policies which the department wishes to undertake in technology education, and promotes the integration of technology as aiding in the creation of a self-reliant citizenry capable of exploiting these "tools of change" for its own betterment.

Tile is gender-neutral in language and imagery, in that it refers to students as "users" or "students", and its graphics include both genders. It does address gender as an issue in several specific ways. One curriculum management strategy is stated as a plan to "...monitor equity of technology across subjects, gender and grade levels" (p. A-20). It calls for a longitudinal study of the impact of integration on students. Additionally, *Tile* projects that educators should monitor ethical and social issues as they arise, but does not postulate on specific issues of concern. It further outlines specific duties of technology facilitators to "...monitor equity of technology integration across gender lines, grade levels, and subject areas" (p. A-31). Finally, *Tile* does mention of one study in which a difference in computer use based on gender may have been indicated, stating: "...using a game format reduced math anxiety for high achieving females" (Rowe, 1986).

While the researchers of *Tile* have acknowledged the issue of gender as one of importance and have committed resources to its careful monitoring, these strategies are considered reactive in nature, in that they do not present a comprehensive plan of what educators should do if, once monitored, gender does become an issue of concern; proactive measures, such as more specific research information and interventions would have suitably rectified this problem and enabled educators to foresee and even preclude access difficulties based on gender.

Student Learning Outcomes - Primary/Elementary Education.

This document addresses the issue of accountability in education, and specifies the goals and objectives to be met in the form of learning outcomes. It justifies the Department of Education's development of outcomes following the recommendations of

such documents as *Our Children, Our Future (1992)* and *Adjusting the Course* (Parts I and II), in which the department was called upon to set specific standards and expectations. It therefore defines the knowledge, skills and attitudes resulting from learning at the end of grades three and five.

In the context of this study, the Science and Technology section does not implicate the issue of gender, but delineates such outcomes as "...understand that many of the objects associated with Science and Technology are being used to improve lives". It does not ensure against gender inequity, nor does it recognize it as a concern in the classroom.

A Curriculum Framework for Technology Education: Living in a Technological Society.

This document is meant to define technology education and to provide an overview of the program for all grade levels in the province. However, it is not a curriculum guide to implementation; it contains keystage outcomes (for Grades 3, 6, 9 and 12) for technology education, as well as stipulations of resource and facility requirements, implementation strategies, and information for course design. These components are contextualized by theory and models of implementation such as design and problem solving.

Perhaps the most obvious criticism of this document in terms of equity is the selection of two male students as the cover photo. It is notable that the students involved were award winners in a national competition and consequently competed internationally with their project; nonetheless, it is unfortunate that female students were not equally represented, as such imagery may contribute to gender gaps in science and technology

(Ware and Stuck, 1985). An additional criticism is that of the thirteen committee members, one was female; two other females were mentioned as consultants. The document is nonetheless generic in language.

Living in a Technological Society does investigate the gender issue in technology education in the section "Course/Class Management" under the Organizational Issues heading, as follows:

> Students need to understand that technological activity is gender neutral. Issues of male and female roles and capabilities are societal constraints. An approach which fosters gender equality is essential. Some approaches and some problem situations may favor boys more than girls, or girls more than boys, in terms of students' predispositions and interests. (p. 60)

The document goes on to provide the following possibilities for intervention:

> Teachers should structure the learning experience to appeal to the interests of boys and girls. Practical activities, emphasis on who uses technology and in what ways, demonstration of the relevance of technology to the student's life, and providing instruction which acknowledges the differences in boys and girls are important elements of a program designed to promote personal interest in technology. (p. 60)

In comparison to the previous documents, this statement greatly elaborates on the issue of gender in computing, and presents teachers with some very basic information. Additionally, its recommendations for interventions are worthwhile. However, it does tend to minimize the problem by treating it in a succinct paragraph and offering only four simple interventions, when a more comprehensive discussion of the gender gap would better serve the female students in their technology education.

It is important to note that this document is said to have "evolved from an earlier

draft framework for technology education, *Technology Education: Living in a Technological Society"* (1994) (p. ii), in which much stronger language had been used to describe the gender gap in technology education. It treated the issue in several areas, including a description of the technology education student:

> ...There is a danger that sex stereotyping and technology elitism may stream some students into design, some into certain information technology courses, and others into integrated technology courses. Students should be encouraged to work in non-traditional technology areas. (p. 4)

Further, in its rationale for technology education, it presents the gender gap:

> There is evidence to suggest that the industrial model for education in technology does nothing to develop an understanding about technology, encourage positive attitudes towards technology, or to reduce the gender gap in technology based industries. (Prime, 1992). Canadian students show significant gender differences between girls and boys responses to questions on science and technology (IST, Canada, 1992). Boys were more open and optimistic, girls associated the subjects with 'boring'. Girls focus more on environmental and societal concerns while boys were more eclectic. Girls considered careers in the arts while boys wanted careers in sports, science or technology. The study concluded that 'it is important that girls be made to realize the importance of knowledge of all {areas}. (p. 7)

This document was not implemented, and when the final version was published in 1997 under a new title, the above comments had been eliminated. Had these and other study results been included in the final document, the issue of gender in technology education may have been given more consideration by readers. Ideally, these results would have been complemented by further interventions. At the least, the most recent document from the department does make an attempt to educate teachers on the issue.

Summary

The three administrative levels offer no official policies for the equitable access to computers by gender. Some preliminary drafting has been discussed, and officials at all levels express interest in the issue of gender in computer integration. A recent draft document did address the issue of gender, however the section was edited out of the final document. Therefore, a systemic response to the issue of gender in computer education is not present in the administration of education in Newfoundland and Labrador.

Data Analysis

Each research question is treated separately below.

1. Are there gender differences in computer access?

The study explored both controlled and uncontrolled access to the classroom computer. During uncontrolled access, students were given free access to one computer in the classroom on a first-come, first-served basis during unstructured classroom time. This philosophy of free access resulted in very limited access for most students, as one particular group of students appeared to claim the computer center. This group was made up of five male students, who did not overtly disallow other students to use the computer. However, their aggressive competition for access denied the access of others in the class, both male and female. During interviews one female student claimed that these boys did state that computers were not for girls. Although access was not pre-determined by the teacher/researcher, the culture of the classroom and the dynamics of the students became factors which implicated the inequitable access of some males over the remaining males and females in the group. Therefore, in terms of this study, access to the computer during

unstructured time was gendered, since male students were far more likely to demand computer use than the females of the class.

When access was controlled in the classroom, other behaviours undermined equity. Equitable access to the computer center increased overall with the designated redistribution of computer time (ie., a schedule of computer "turns" was created and followed). However, for 2 female students reserved access did not indicate an increase in access to the computer, as their interest in using the class computer was weak, such that they would decline access when offered. In the resource center, there were no incidents of declined use, nor of competition, as access was controlled at all times, and the context was structured classroom time; there was no alternative to the computer activity. Therefore, access to the computer in the classroom was more equitable when interventions were in place to enable use by both genders; otherwise, there was a risk of gendered access and marked inequities of use.

Data collected from students' homes indicated that there was no difference in computer presence in the home by gender. Of the 14 students whose home was equipped with a computer, all students indicated that they had access to the home computer and used it regularly. However, parental indications of the numbers of hours students spent in computer activity at home suggest discrepancies between the genders; all but 1 male used the home computer for at least 6 hours per week, and usually more than 10 hours, while all but 1 female user spent 4 or less hours per week in computer activity. Therefore, self-selected access to the computer is gendered for this particular group both at home and at school, as indicated by parental and teacher indications of the number of hours students

spent engaged in computer activities.

As outlined by the guiding theories of this research in Chapter One, it is generally accepted in this research domain that anatomical differences between genders is not an accepted factor in accounting for the discrepancy in computer use. Nonetheless, gender is impacting on home and school computer access in this particular group. Further investigation of the attitudinal differences may be useful in determining why this is so.

2. Are there gender differences in attitudes towards computers?

One of the general theories guiding this research is the convention that gender inconsistencies in computer education are determined by the environment and not by inherent dispositions (Shashaani, 1994). If intrinsic differences are discounted, factors which differ by gender may be isolated in order to investigate the discrepancies in students' home and school access to the computer. One such factor is attitudes towards computer use. All students indicated positive attitudes towards computers when interviewed, claiming that they liked using computers at school. However, this information is further qualified by data from Question 7, "Is using the computer important for you?" Responses to this question differed markedly by gender. Of the 11 female students, only 4 indicated that using the computer was important; the remaining 7 responded negatively. Of the 4 female students who claimed it was important to them, the reasoning employed was somewhat passive and unenthusiastic, emphasizing the importance of the function of a computer rather than the impact that the technology can have on their lives (eg., "...because I might press a button and break it"). Conversely, all 8 male participants believed that computer knowledge was important, and 3 of these respondents talked about

the important role that computers may play in their adult lives. If the results of Question 7 are juxtaposed with researcher observations regarding computer use by females versus computer use by males in the classroom, these findings are further verified, since female students were more likely to decline use and male students more likely to demand it in unstructured contexts. This behaviour would indicate a lower attribution of importance to the computer by females. These collective findings postulate that for this case study, gender is affecting the attitude of students towards computer use, specifically the perceived importance attributed to use of the computer. The difference in access to computers between the male and female students may be accounted for by the fact that the female participants do not value the computer as important in their lives; the males do. It is therefore contended that student perception of the importance of computer use is an important variable in determining access to computers for the nineteen participants of this study. Given these relationships, two bivariate hypotheses are identifiable: (a) that gender affects the perceived importance of computer use, and (b) that both of these variables (gender and perceived importance of computer use) affect the frequency of computer use.

3. How do parental attitudes toward the use of computers affect children's use and attitudes towards computers by gender?

Positive encouragement from parents is an important factor affecting student interest, attitudes, and confidence towards computers, and students' perceptions of their parents' attitudes and expectations have been noted as particularly important in shaping female attitudes towards computing (Shashaani, 1994). Given that male and female participants of this study differ in attitudes and self-selected access towards the computer

both at home and at school, it is important to examine the parental attitudes towards computer use and to explore potential trends. The parents of these students are involved parents. They would discuss the benefits of a hypothetical computer club with their children regardless of gender, and they are regular users of computers at work themselves. The students in this group did not differ by gender on computer presence in the home. However, the parent questionnaire indicated a possible lack of positive messages to females in terms of computing which may be contributing to diminished female interest in computer use at school and at home, as well as a perceived lack of importance of computers. Firstly, a significant number of males (5 out of 8) had participated in a computer camp outside school, whereas none of the females had experienced such exposure. Secondly, parents spent an average of 1 hour more per week with male children on computer activities. Thirdly, in 10 of the 13 computer-equipped homes, males represented the principal users. Therefore, computing role models for females are not necessarily present in many of these students' homes. This may reinforce gender associations for both groups. When interviewed, 7 of the 11 females indicated that computer use was not important to them; it was important to all of the 8 male participants. As well, 5 females compared to only 1 male could not name an individual to whom the computer was important. The under-utilization of the computer in the home by females, coupled with a lack of experiences to provide exposure to computers outside school do not formulate positive messages to the female students. The concern is not negative parental attitudes towards computer use; however, parental attitudes do not appear overtly positive in promoting female computer use. It is overt promotion of female

computer use which is required if females are to become avid computer users.

4. How does the educational system promote gender equity in the access and use of computers?

Reports of the computer committee at the research site, document analysis and communication with representatives of the educational system inform the examination of policy in promoting gender equity in computer use and access.

At the research site, members of the computer committee achieved the installation of a local area network, and were normally involved in the technical maintenance of the network. These duties did not allow for the theoretical discussion and reflection necessary to address such issues as equity of access to the classroom computer. Attempts to balance the technical and theoretical aspects of computer integration included two on-site professional development days, during which presenters introduced software, the library database, and the continuum of skills to be developed for the school. The staff did discuss acceptable use of the Internet and the introduction of keyboarding skills; otherwise, issues of integration, such as equitable gender access, were not highlighted by the committee or other staff members.

This study examined five publications of the Department of Education to determine the official policy of equitable access and use of computers in the educational system in Newfoundland. These included (a) *Learning to Learn* (1991), (b) *K - 12 Education System Strategic Information Technology Plan* (1992), (c) *Technology in Learning Environments* (1994), (d) *Student Learning Outcomes - Primary/Elementary Education* (1994), and (e) *A Curriculum Framework for Technology Education: Living in*

a Technological Society (1997). None of these documents adequately address the issue of gender. *Learning to Learn* makes reference to the fact that gender may be a factor in determining learner needs; *Technology in Learning Environments* suggests close monitoring of equity of technology integration and cites one study of math anxiety in females. The most recent document, *Living in a Technological* Society, does highlight the importance of gender equality in technological activity and provides a short list of possible interventions; however, this treatment of the issue is considered inadequate in that educators require proactive interventions to prevent patterns of inequitable use, and specific examples of inequities to monitor.

Further investigation of policy involved dialogue with Department of Education and district representatives, who verified the lack of policy at their respective administrative levels.

Therefore, the three administrative levels of department, district and school offer no official policies for the equitable access to computers by gender. Some preliminary drafting has been discussed, and officials at all levels expressed interest in the issue of gender in computer integration. However, a systemic response to the issue of gender in computer education is not present at this time in the administration of education in Newfoundland and Labrador.

Summary and Recommendations

This case study investigated the use and attitudes towards technology by gender in one Grade 2 French immersion classroom, in order to determine: (a) if access to and use of computers is gendered; (b) if the attitudes of students towards computer use differ by gender; (c) if the attitudes of parents towards computing are gendered, and if these attitudes influence children in their respective use of computers; and (d) if computer initiatives at administrative levels (ie., school, district, department hierarchy) address the issue of gender. As a result, the study responds to the following questions:

1. Are there gender differences in computer access?
2. Are there gender differences in attitudes towards computers?
3. Do parental attitudes toward the use of computers affect children's use and attitudes towards computers by gender?
4. How does the educational system promote gender equity in access and use of computers?

Nineteen student participants consisted of 8 males and 11 females; there were 17 parent participants. Fourteen of the families' homes were equipped with computers. Instrumentation consisted of qualitative and quantitative measures, including: (a) journal, (b) student interview, (c) parent questionnaire, and (d) document analysis and correspondence. The use of multiple instruments provided a measure of internal validity.

The major limitation of this study was that it occurred in one Grade 2 classroom and was therefore limited to the population of that particular classroom. As such, the results may not be regarded in terms of generalizability to other populations. Additionally,

the participants in this study were French immersion students, which may differentiate them from the general student population. Technology was also a limitation, as one classroom computer and seven computers in the resource center were often in demand.

Since this study concentrated on primary education, the literature review pertained to primary/elementary education. This was somewhat problematic in that the research in this domain is expansive in secondary and post-secondary contexts, but limited in early education. The review of the literature indicated that gender differences have been noted in terms of (a) patterns of computer use, (b) performance on tasks, (c) parental involvement and influences on patterns of computer use, (d) role models in computer education, and (e) female representation in computer-related peripherals. The literature indicated numerous strategies and projects which have been suggested or implemented to counteract the gendered patterns of computer use.

Summary of Conclusions:

The results suggest the following conclusions:

1. Access to computers: Males and females differed in access to computers both at home and at school. Interventions of predesignated access did not counteract the dominant male participation during unstructured computer time. Some females exercised their right to "opt out" of their computer time.

2. Attitudes towards computers: Students enjoyed using the computer at home and at school and demonstrated varying levels of confidence in their computer skills. Perceived importance of computer use was divergent; males viewed the computer as necessary in their lives while many females did not. A minority of students

believed that males were more skilled in computer use, and derived more satisfaction from using it than the female students. Females tended to request teacher and classmate assistance more often than males. Male assistance of fellow users was often characterized by taking control of the keyboard. Males were often unwilling to leave the computer center.

3. Parental attitudes affect children's use and attitudes towards computers by gender: The parents in this study were involved in their children's education and a majority displayed positive attitudes towards computer education. Parents of males spent an average of 1 hour more per week in computer activities with their children than parents of females. Parents of 4 male students had previously arranged for their sons to attend computer camps. Patterns of use by male and female role models of computer use in the home differed by gender. These factors were believed to intervene in attitudinal and behavioural differences among children.

4. Computer experts: Five males and 1 female emerged as computer experts in the classroom.

5. Dominant software: Non-educational game software, which was typically self-selected, dominated use during unstructured computer time.

6. Electronic game use: Use of electronic games differed by gender among the student participants. Parents were largely in favour of such games, citing hand-eye coordination and reasoning as possible developmental benefits.

7. Computer camp : Four males and no females had participated in computer

camp. These 4 male students were among the "class experts" who emerged during the study.

8. Reasons for home computer purchase: Children's education and parent's work impacted on the purchase of home computers.

9. Administrative policies: The three levels of the administrative hierarchy, namely the school, the district, and the provincial Department of Education promote the integration of computers in the curriculum; however, they do not address the issue of gender in computer education. Published policies for computer integration exist at the departmental level only. These policies are not strategic in terms of gender but evidence the evolution of computer use in the province's classrooms, represent policies for computer use in the classroom setting, and outline student learning outcomes for computer education. Representatives of all three administrative levels expressed their interest in the development of policies to promote equitable computer use by gender.

Discussion

This action research, which grew out of the gendered computing experience of the researcher, aims to "...transform the present to produce a different future" (Carr and Kemmis, 1986, p. 183).

Reflection on the effects that this research has had on the teacher/researcher invokes a particular responsibility to the teaching environment. As a researcher, I was engaged by the discovery that no policy addressed the issue of gender in the educational system of Newfoundland and Labrador. Government initiatives such as Stem~NET,

School Net, Computers for Schools, and others typify recent trends towards supplying computer access to students in provincial schools. The literature review and the data collected both evidenced the need for a systemic response to the issue of gender in computer education.

It is important to note that the data analysis revealed certain limitations of the quantitative instrumentation used in this research, and evidenced the importance of the qualitative orientation in informing this study. In addition to acting as a qualitative instrument, the student interview was initially coded and analyzed in a quantitative format. A numerical assignment of 1 and 2 for Yes and No respectively represented students' responses. There was a marked deviation between the profile of the class which was provided by using this method, and the subsequent qualitative analysis in that the students' explanation or commentary regarding their "Yes / No" responses provided the most useful information. Therefore the quantitative analysis was presented only in that context. In fact, the quantitative results alone often misrepresented the student response, such that simple "Yes" or "No" answers were not deemed of great value; by contextualization, a more authentic description of the lived reality of the child was achieved. For example, in asking the students "Is using the computer important for you?" four of the eleven females indicated that it was important to them. However, their reasons for responding positively included such responses as " ...[because] I might press a button and break it," which in turn defined the child's interpretation of the "importance" of computer use in their lives. Therefore, it is submitted that quantitative inquiry may not be suitable for research with very young children on social issues as represented in this study.

Recommendations:

As an informed action researcher, it is my responsibility to contribute to a transformation of the present situation, to initiate discussion on this issue and to agitate for more research. As noted in the literature, perhaps the most obvious vehicle for change is awareness (Cottrell, 1992; Fisher, 1984; Edwards, 1984). The preceding study further clarifies this notion. Knupfer's (1997) assumption that, "An informed society will be the catalyst to bring about continued social changes leading to gender equity..." (p. 36) therefore provides the basis for an action plan which aims to inform educational stakeholders, as follows:

1) classroom level: promotion of the importance of female computing, such that both student and parental awareness of the issue is achieved;

2) school level: organization of a female computer club and education of administrators and colleagues;

3) district and departmental levels: dialogue with respective officials to advocate the importance of policy directives.

This dissemination of information is further discussed below.

Student Awareness.

1. Proactive strategies are required to promote female use of computers. Suggestions include a female-only computer club in each school, so that social interaction and computer use are achieved. Additionally, female-friendly initiatives such as female only computer days should be considered.

2. Awareness activities, such as student evaluation of software in terms of gender

inequities, should be ongoing to create a critical consciousness of the issue.

3. The use of non-educational computer games in schools should be strictly limited to those games that appeal to both genders. Game playing should not be emphasized; rather, a large variety of computer applications should be explored by all students in structured computer time. Specific activities, such as "Site of the week" on the Internet, a particular entry on the Encyclopedia, or regular journal writing on the computer, provide varied exposure.

4. Interventions to ensure equitable access should be in place in classrooms; computers should not be available on a first-come, first-served basis but should be delegated to students.

5. Whenever possible, teachers should attempt to provide positive female role models of computer use (eg., guest speakers, field trips, etc.).

Educator Awareness

1. Professional development is recommended for teachers in the provincial education system on the importance of the gender issue in computer education. This would include considerations of computer placement in the classroom, selection of software, and the promotion of female computing and parental support.

2. Communication through such mediums as *The Bulletin*, the professional magazine of the Newfoundland and Labrador Teachers' Association, and organization of fellow teachers to inform educators of the issue of gender in computer education.

Parent Awareness

Parent encouragement is paramount to motivation in computer education for young children. To ascertain that support is available for parents to become role models of computer use to their children, the following strategies are recommended:

1. An information package should be drafted by the Department of Education to inform parents of the importance of encouraging their children, especially girls, to use the computer. This package or pamphlet should be distributed to parents by schools at the beginning of each school year.

2. Lunch hour, after school, or evening computer courses should be offered to parents as an incentive to become computer literate; in turn, these parents will act as role models who champion the importance of computer use for their children.

3. The organization of parent drop-in computer centers at schools would allow parents hands-on computer experience and encourage them to use the computer in their daily lives.

4. An invitation should be extended to computer literate parents to visit the school during student computer times and share in computing experiences with their children, especially females.

Continued Research

The paucity of research in the area of computer use in the primary/elementary grades must be addressed. Specifically, the following are areas of consideration:

1. Research into educational software should be undertaken, in order to determine

gender appropriate resources.

2. Large-scale studies of gender in computer use in the primary/elementary grades is required.

3. Large-scale studies of computer use within families would enrich this domain in terms of student use and role models in the home.

4. Comparative studies of provincial documentation to determine policies of computer integration in the primary/elementary grades would be useful in drafting policy for Newfoundland and Labrador.

Policy Drafting/Implementation

1. Awareness campaigns and research would ideally culminate in the publication of policy by all three administrative levels. This process would include the formulation of policy, field testing, and implementation. The policy should address responsibilities of all three levels of administration, and should include resource criteria, strategies for teachers, parents and students towards the effective elimination of the gender gap in computing.

2. Adaptation of provincial Student Learning Outcomes is recommended to account for student awareness of the importance of females as computer users, and secondly to ensure student evaluation of gender bias in software and electronic games.

Conclusion

The trend of technology in the classroom opens many doors; however, it is not devoid of inherent problems. This study demonstrates that in one classroom, computer use

was gendered, with male students effectively "crowding out the girls" (Siann et al., 1990, p. 189). Further research in this rapidly evolving domain is an essential component to the informed, systematic use of computers in education. The resulting equitable use of technology will benefit all stakeholders in the educational system of Newfoundland and Labrador.

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Appendix A
Student Interview Questions

Student Interview

Researcher: I am going to ask you a few simple questions about using the computer. If there is a question that you would rather not answer, just say "pass".

I. Knowledge about computing:

1. What is a computer?

2. What can a computer do?

II. Attitudes towards and use of computer:

A. At home:

3. Do you use the computer at home? When? For what kinds of things?

4. Who uses the computer most at home? For what kinds of things?

5. Do you have any electronic games at home? (Prompt if necessary: Sega, Nintendo, or Speak and Spell?)

6. Do you think that it is important for you to learn to use the computer? How do you know this? Is it important to people you know? Who? How do you know it is important to them?

B. At school:

7. Do you use the computer at school? (Yes) - When do you use it?

8. Do you like using the computer?

9. What kinds of things do you like doing on the computer?

10. Are you good at using the computer? How do you know?

11. Is everyone in your class good at using the computer?

12. Do both boys and girls like using the computer? Why do you think so? Are they both good at it?

Appendix B
Observation Checklist

Date of observation:_____ Duration:_____

Location:_____ Structured/Non-structured:_____

Behaviour observed	Tally
1. Male working independently at computer.	
2. Female working independently at computer.	
3. Male seeking out help from teacher.	
4. Female seeking out help from teacher.	
5. Male seeking help from male peer.	
6. Male seeking out help from female peer.	
7. Female seeking out help from male peer.	
8. Female seeking out help from female peer.	
9. Male dominance at computer over female.	
10. Female dominance at computer over male.	
11.Male exploring freely without instruction.	
12. Female exploring freely without instruction.	
13. Male request to begin an alternate activity.	
14. Female request to begin an alternate activity.	
15. Male request to not participate in computer activity.	
16. Female request to not participate in computer activity.	
17. Male remains at computer following allotted time.	
18. Female remains at computer following allotted time.	
19. Male groups formed around computer.	
20. Female groups formed around computer.	
21. Heterogeneous groups formed around computer.	

Appendix C
Parent Questionnaire

Please note: This questionnaire is confidential and should take you approximately 10-15 minutes. Please do not identify yourself. The information from this survey will be disposed of following completion of my project. If you have a computer at home, then it would be appreciated if the parent who uses the computer most would complete this questionnaire.

Part A - *All participants*

1. Please indicate your sex: M F

2. Please estimate the number of hours per week that you use a computer below (circle):

AT HOME	*AT WORK*
36164	36164
36320	36320
11+	11+
Not applicable	Not applicable

2. Number of children in your household: _____

4. Is your Grade 2 child (please circle): male? female ?

5. Is there a computer available for children's use in your home (please circle)?

Yes No

If you answered *Yes* to item 5, please complete Part B. If *No*, please go to part C.)

Part B - *If you have a computer for child use at home*

1. In the following table, please rate in order of importance (1 being least important, 6 being most important) your reasons for purchasing a computer. *(Please use a different number for each reason.)*

REASON	RATING (1- 6)
Parent work	☐
Child's education	☐
Parent's continuing education	☐
Communication (eg., e-mail)	☐
WWW/Internet	☐
Entertainment	☐
Other (Please specify): _____	☐

2. Who is the principal user of the home computer? *(Please circle)*

Mom Dad A child/children

3. Please estimate the number of hours that the principal user uses the computer per week:

1 - 5 6 - 10 11 - 15 15+

4. If the principal user is a child, please indicate age and sex of child below:

__ __years Male Female

5. Please indicate below how the principal user uses the home computer, using the rating system of 1 (least usual) to 6 (most usual): *(Please use a different number for each rating)*

Use of computer	Rating 1-6 1= least 6= most
Games (non-educational)	
Communication (e-mail, Internet, WWW, Newsgroups)	
Word Processing/ Typing	
Work-related	
Education (Educational software)	
Other (Please specify) _____	

6. If you have more than one child, please indicate their sex and the frequency of computer use by each child, in the following table:

Child birth order	Age	Sex	Computer use (in hours per week)
Child 1			
Child 2			
Child 3			
Child 4			

7. Please list the software titles which are used by your Grade 2 child, in order of frequency, below:

Most frequent: _____

Next frequent: _____

Less frequent: _____

Least frequent: _____

8. **Have you ever taught/introduced your child in Grade 2 any of the formal computer skills below? (Please check appropriate column to indicate yes or no.)**

SKILL	Yes	No
Keyboarding skills/Typing		
Dos commands		
Windows basic commands (eg., opening/closing a program, saving a document)		
Basic computer knowledge (eg., turning on/off, inserting/removing/storing a disk, etc.)		
Other:_____		

9. **If you have both male and female children, do you as a parent see any difference in their use of the computer?** ☐ **Yes** ☐ **No**

If yes, please explain.

_____

_____

_____

Part C -*To be completed by all participants*

1. **Does your child own any electronic/computerized games (eg., Nintendo, Sega, Speak and Spell, GigaPet, Tamagotchi, etc.).?** ☐ **Yes** ☐ **No**

If yes, please name them.

_____

2. **Do you feel that these are valuable games?** ☐ **Yes** ☐ **No**

Why?

_____

3. If there was a computer club offered as an extra-curricular activity (eg., during lunch) at your child's school, please circle below the phrase which best describes how you would approach such a club with your Grade 2 child:

   a. I would not influence my child's decision.

   b. I would discuss the benefits of such a club with my child and let him/her decide.

   c. I would discuss the benefits and expect my child to attend.

4. Has your child ever enrolled in a computer class outside of school (eg., computer camp)?

   ☐Yes ☐ No

5. If yes, would you consider such a class again?

   ☐Yes ☐ No

   Please comment.

   _____

   _____

   _____

6. Please estimate the number of hours that you spend per week completing the following structured activities with your Grade 2 child:

Activity	Estimated hours						
Completing homework	0	1	2	3	4	5	5+
Using the home computer	0	1	2	3	4	5	5+
Participating in athletic activities (eg. swimming, soccer, etc.)	0	1	2	3	4	5	5+
Participating in cultural activities (eg., dance classes, music classes, etc.)	0	1	2	3	4	5	5+
Other:_____	0	1	2	3	4	5	5+

7. If you are able to volunteer at school, please comment on the nature of your involvement (eg., field trip supervision, attendance at Home and School Meetings, etc.):

_____

_____

8. Please indicate the importance you place on the following areas for your Grade 2 child (1=Little importance, 4=Great importance):

Activity	RATING			
	Less important			More important
Reading	1	2	3	4
Writing	1	2	3	4
Music	1	2	3	4
Computer Activities	1	2	3	4
Mathematics	1	2	3	4
Physical Education	1	2	3	4
Science	1	2	3	4
Other	1	2	3	4

YOUR TIME IN COMPLETING THIS QUESTIONNAIRE IS GREATLY APPRECIATED.

Appendix D
Letter of Consent to Parents

Dear Parents,

As some of you may already be aware, I am currently a graduate student at Memorial University of Newfoundland. The issue which I will be investigating for my thesis research is the use of computers in the Primary Classroom. I am working under the supervision of Dr. Alice Collins in the Faculty of Education.

I would appreciate permission to conduct a ten -minute interview with your child. I am also requesting permission to audiotape the interview, which will be conducted by me outside our classroom time. **I am also requesting that you complete a questionnaire which I will be sending home in a few weeks**. Additionally, I will be observing the class during our computer time, and recording my observations. I expect the data collection for this project to be completed by the end of this school term (April 9, 1998).

Your participation is voluntary and may be withdrawn at any time. Parents and children may refrain from answering any of the questions. All information gathered in this study is **strictly confidential** and at no time will individuals be identified in the final report. All data and surveys will be disposed of following the completion of this study. This study has received the approval of the Faculty of Education's Ethics Review Committee. The results of my research will be made available to you upon completion at your request.

If you are in agreement with having your child participate in this study, please sign the attached form. If you also agree to have my ten-minute interview with your child audio taped, please sign the second permission form, which is being provided in accordance with regulations of the Avalon East School Board. Please return one copy of each form in your child's homework bag. The second copy is being supplied for your own records. If you have any questions or concerns, please do not hesitate to contact me at school, 579-4131. If at any time you wish to speak to a resource person not associated with the study, please contact Dr. Linda Phillips, Associate Dean of Graduate Studies and Research, Faculty of Education, at 737-3402. I would appreciate it if you could please return this sheet to me by Friday, February 6, 1998.

Thank you for your consideration of this request.

Yours sincerely,
Tina Maloney

Permission Form A

I, _____hereby (please tick below)

___ give permission

___do not give permission

for my child to take part in a study on computers in the classroom. I understand that participation is entirely voluntary and that my child and/or I can withdraw permission at any time. All information is strictly confidential and no individual will be identified.

Date:_____

Parent/Guardian signature:_____

Permission Form B

I, _____ hereby (please tick below)

___ give permission

___ do not give permission

to audiotape the interview which will be conducted in the study of computers in the classroom.

Date:_____

Parent/Guardian signature:_____

Appendix E
Communications with District and School Officials

To: Martha Sanger, Avalon East School Board

From: Tina Maloney, Graduate Student, Memorial University of Newfoundland

Re: Research Proposal

Ms. Sanger,

I have recently submitted my thesis proposal to conduct research in my classroom as part of my graduate program at Memorial. My proposal has been reviewed and accepted by the Ethics Committee, and now I am seeking your approval to proceed.

I am a Grade 2 teacher École Bonaventure. My area of research is Gender Issues in Access to Computers. I hope to conduct a case study in my Grade 2 classroom, which would involve observation, interviews outside class time, and parent questionnaires regarding student use of computers. I believe that such action research situated in our own classrooms is a valuable tool in education today, and that the sociological implications of computer integration is an area which educators need to understand in all levels of education.

I would be happy to provide whatever documentation you may require in responding to this request. I may be reached at the following numbers: 579-4131 (w), or 579-7522 (h), or on e-mail at: tmmalone@calvin.stemnet.nf.ca.

Many thanks for your consideration of this request.

Tina Maloney

January 6, 1998

Dear Ms. Sanger,

Please find attached my application for permission to conduct research at Ecole Bonaventure in my Grade 2 French immersion classroom, as discussed in our telephone conversation late last term.

I have attached copies of my proposed instruments for data collection, as well as a copy of my explanatory letter to parents, and my submission to the Ethics Committee regarding the dual role of researcher and teacher which I will hold in the proposed research. I have also provided copies to Ms. , Principal of Ecole Bonaventure.

If you have any questions, or require any further information, please contact me at 579-7522 (h), or at 579-4131 (w).

Thank you for consideration of this request,
Tina M. Maloney

AVALON EAST SCHOOL BOARD

APPLICATION FOR PERMISSION TO CONDUCT RESEARCH
(To be completed prior to consideration of request by Board)

Title of Study: _____

Name of Researcher/Applicant: _____

Address: _____

Postal Code: _____ Telephone No: _____

Status/Position of Applicant: _____

Name/Title/Address of available Consultant (Referee?) Regarding this research project

(e.g. Director of Agency, Student's Supervisor, etc.): _____

_____

Purpose of Study: _____

_____

Description of Methodology: _____

_____

_____

Specific data-gathering instruments to be used (please attach): _____

_____

When is study to take place: Starting: _____

Completion: _____

Number of Students/Subjects required: _____

Ages: _____ Grade Levels: _____

Estimate of time required of each student/subject: _____

Estimate of time required of school personnel, e.g. class teacher: _____

Do you propose use of present instruction time? _____

If not, when is study to be carried out? _____

_____

Is access to school records required? _____

If so, state nature of information required? _____

_____

_____

Describe measures proposed to ensure

1) Confidentiality of responses: _____

_____

2) Anonymity of respondents (mandatory if students): _____

_____

Please state the nature of any possible risk(s) which might accrue to participants. _____

_____

_____

Please state the nature of any benefit(s) which might accrue to the participants (school/students) in this study. _____

_____

By what date may the Board expect to have access to results/conclusions of this study (if desired)? _____

PLEASE NOTE: **Before any research involving students is initiated, parental consent must be obtained.**

Appendix F
Ethical Procedures

Memorial
University of Newfoundland

Faculty of Education

November 19, 1997

Dear Tina,

After reviewing your proposal, the Ethics Review Committee would like to point out that your proposal raises an issue that is always of concern -- that of the dual-role relationship. This means that you are assuming two roles, that of researcher and that of teacher. While dual-role relationships may be permitted in some cases, we feel that the onus is upon the researcher to demonstrate an awareness of the ethical considerations involved and possible means of providing assurances of voluntariness of consent. Therefore we would like to ask you to provide a letter describing the ethical dilemna as you understand it, and how you would be addressing the situation.

On a minor note, please forward copies of the interview questions and questionnaires for parents, as well as written consent from the principal.

If you have any questions, please feel free to contact me. We look forward to your resubmission.

Sincerely,

T. Seifert
Ethics Review Committee

cc: Dr. Collins

St. John's, Newfoundland, Canada A1B 3X8 • Tel.: (709) 737-8588 • Fax: (709) 737-8637

January 6, 1998

Dear Members of Ethics Review Committee,

Thank you for your letter of November 19, 1997. Please be assured of my appreciation of your concerns in reviewing my thesis proposal, as I feel it is most important that the rights of my students/participants be safeguarded, and that my own awareness of dual responsibility be heightened before my research is undertaken.

As a strong believer in action research, I wish to conduct a study in my own classroom which I feel will reveal valuable information in my proposed area of research, namely the issue of gender in computer use in the primary classroom. As the principal researcher and the teacher of my class, I am charged with a dual role, which I am aware can be an ambiguous one if not approached responsibly, with systematic interventions to safeguard the rights of the participants. In consideration of this, the following interventions are proposed:

1. A group discussion will be initiated before the study begins, which will explain to students that I would like to learn how they use computers, and how they feel about them. I will explain that I am doing this for my "homework", and that it does not impact on our classroom activities.
2. During the discussion, I will impress upon the children the difference between their school work and their interview/survey with me as a researcher, stressing the importance of the voluntary nature of the computer questions I will be asking them. If they do not wish to respond

to any question during the interview, they will be told to use the word "Pass", and the decision to pass a particular question is an individual one which will not be questioned by me.

3. The time of the interview will be at students' discretion.
4. Students do not have to write their names on anything associated with the study, ie., questionnaire, survey, parent questionnaire.
5. I will not identify participants in any discussion, written or otherwise, during the analysis of my data, or after, and once I complete my writing, all of their responses will be destroyed, in convention with confidentiality practices.
6. Students will be asked to attach their questionnaires to those of their parents, and insert the information into a box. This box will not be opened until all forms are returned. In this way, I will not be handed any written responses, an action which could identify a particular participant. I will be unable to identify the written responses as those of a particular parent or student.

I feel that by guarding the anonymity of responses as much as possible, and by ensuring that my participants are *informed* participants, I am not abusing the power which I hold in this classroom as the teacher, and am respecting the guidelines as defined by the University.

Additionally, I should like to discuss the ethical considerations which I maintain as a teacher, as outlined by the professional association, the Newfoundland and Labrador

Teachers' Association. The student-teacher relationship is stipulated as follows:

> (i) A teacher's first professional responsibility is to the enhancement of the quality of education provided to the pupils in his/her charge.
>
> (ii) A teacher regards as confidential, and does not divulge, other than to appropriate persons, any information of a personal or domestic nature concerning either pupils or their homes.
>
> (iii) A teacher keeps teaching as objective as possible in discussing with the class the controversial matters whether political, religious or racial...
>
> (vi) A teacher accepts that the intellectual, moral, physical and social welfare of his/her pupils is the chief aim and end of education.
>
> (vii) A teacher recognizes that a privileged relationship exists between the teacher and his/her pupils and shall never exploit this relationship...

I am committed to and bound by each of these stipulations.

Finally, I would like to emphasize that I feel there are many benefits to conducting research in one's own classroom, as the data are contextualized and relevant to the researcher. As the NLTA *Code of Ethics* further states, "A teacher makes a constant and consistent effort to improve professionally." By conducting the proposed research and applying my interest in this specialized area to my own situation, I hope to grow as a teacher, and also hope to better understand and teach the young computer users with whom I am learning.

I thank you for the guidance which you have provided in this matter.

Appendix G
Letters of Permission

To: Dr. T.E. Seifert, Faculty of Education Ethics Committee
From: Principal, Ecole
Date: January 20, 1998
Subject: Permission for Research Project

This is to confirm that I am familiar with the content of Tina Maloney's research project and hereby grant her permission to carry out her research at Ecole

I understand that Tina has also contacted Central Office of the Avalon East School Board to obtain the required consent from that office.

Avalon East School Board

Suite 601, Atlantic Place
215 Water Street
St. John's, Newfoundland
A1C 6C9
World Wide Web Site: http://www.aesb.k12.nf.ca
Telephone: 709-758-2372 **Facsimile:** 709-758-2706

February 2, 1998

Ms. Tina Maloney
4 Quebec Street
St. John's, Nf.
A1A 2S3

Dear Ms. Maloney:

Permission is granted for you to conduct research at Ecole on "Issues of Gender Access in the Use of Computers: A Case Study of a Primary French Immersion Classroom". Permission is granted with the understanding that confidentiality of all parents and students who participate in the study is protected; that written permission is obtained for students to be involved in your research; and that participation is voluntary. As indicated to you by telephone, if your decide to tape record student responses, a separate written permission is required before students can participate. You should refer to the record keeping policy of the former R.C. School Board for St. John's to assist you.

I wish you success in your research.

Sincerely,

Martha Sanger
Research Co-ordinator

c.c.
Principal, Ecole

Memorial
University of Newfoundland

Faculty of Education

January 27, 1998

Dear Tina,

After reviewing your submission, I am satisfied you have addressed the issues raised by the Ethics Review Committee. We wish you all the best in your research.

Sincerely,

T. Seifert
Ethics Review Committee

cc: Dr. Collins

St. John's, Newfoundland, Canada A1B 3X8 • Tel.: (709) 737-8588 • Fax: (709) 737-8637 • Telex: 016-4101