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GENDER INEQUALITIES IN COMPUTER EDUCATION AND EMPLOYMENT

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ABSTRACT

Gender Inequalities in Computer Education and Employment

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This study, which was generated from preliminary interviews and observations at the kindergarten and CEGEP educational level, addresses the problem of gender differentiation in computer education, and opportunity and participation in higher status employment positions in the technological, occupational structure.

The study draws on sociological (social structural) theory, biological theory, psychological theory, and theories of the nature of woman, as well as an interpretation of symbolic interactionist socialization theory to explain this social phenomenon. These theories were not specifically designed to address the relatively new problem: women, education, and computers. Rather, they were "bent" in pursuit of an explanation.

The premise is that the symbolic interactionist perspective is an analytical framework which provides a dynamic view of the phenomenon.

ACKNOWLEDGEMENTS

For my daughter

Amanda Rachel Goff

"To love her is a liberal education."
                    ---Steele

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CHAPTER 1

INTRODUCTION

This study is the result of a short observation period at the kindergarten level that graphically illustrated the essentially ungendered use of the computer at this early stage in the school career. The kindergarten observation stands in vivid contrast to seven years' teaching experience with female CEGEP students in the Office Systems Technology program that shows virtually one hundred percent female enrolment in low-level word processing and data entry courses.

The purpose of this study is not to prove that sex inequalities in computer education and employment exist. There is sufficient documented evidence in the academic literature, both qualitative and quantitative, to confidently assert that women are under-represented in high-level computer occupations and over-represented in low-level computer occupations. In terms of salary, it is a matter of record that women's salaries are not equal to the salaries of men in the same occupational positions (England and McCreary 1987; Maris,

1987; Linn and Hyde 1989).

In the educational realm, observed and documented classroom dynamics have been shown in many studies to discriminate against female students in the technologies and sciences (Wolpe, 1978). Statistics reveal the uneven balance in choice of career programs, with males opting for high-level computer programming courses and females opting for low-level data entry and word processing courses. In addition, current "anti-female" practices and prejudices in the computer classroom and the technological workplace will only enter into the periphery of our discussion. Other studies have documented these infelicities in detail (Harding 1986; Weiler 1988; Deem 1978; Deem 1980; Wright 1987; Rothschild 1983, Belenky et al. 1986).

The focus, then, is an exploration of the theoretical bases that underlie the notion of woman as computer second-class citizen, and the location of this notion within the various schools of thought that have influenced society's perception of women. How, in other words, do theorists explain why women's computer behaviour seems to be different from men's?

The intent is to explore the relationship of the feminine stereotype to the life experiences of women and the

processes involved in constructing an identity in our rapidly changing society. The main focus is the relationship between stereotyped feminine roles and traits, and actual behaviour. Ultimately, the study is rooted in the conviction that technology and women are not necessarily incompatible; and that, despite social pressures, it is possible (although it may not be easy) for women to succeed in the computer world as it now exists.

Chapter 2 presents the commonly-held belief, supported by the importance accorded this topic in the popular media, that women are "computer misfits". The tenacity with which this belief is held is contrasted with observations gleaned from an exploratory study at Northview Elementary School kindergarten, during which no overt gender inequalities in computer use were observed.

Although the kindergarten data seemed to contradict the popular belief in gender differences in computer use and success, experiential and empirical data acquired during a seven year involvement with computer students at the CEGEP level confirm a factual basis for the popular belief in gender inequities. Both kindergarten and CEGEP observations are summarized in Chapter 2, with the research instrument and

additional data included in Appendix A.

As noted above, this study was undertaken in order to understand the explanations offered by a variety of theoretical perspectives for what seems to be the increasing gender inequalities in computer education as the school career progresses. Chapter 3 presents the first of these theoretical perspectives: a social structural explanation and interpretation of gender inequalities in computer education and employment. This theory, if applied to gender inequalities, describes the impact of the workplace on the educational system and points to the use of the computer as a tool of the dominant culture. Women are seen to be excluded from high-level computer occupations and directed into low-level deskilled office positions. Social structural theories are incomplete, however, because they do not address the specific mechanisms by which individuals are induced to behave in certain ways by the social structures; nor do they offer an explanation of the success of a number of women in computer positions at the highest levels of the occupational hierarchy.

The mechanisms of social control suggested by various theories of gender differentiation (biological, social learning and behaviourism, and cognitive-development) are presented and critiqued in Chapter 4. Biological theories have

historically supported the restriction of female roles to that of wife and mother; consequently, the computer is seen as inappropriate and incompatible with women's interests and abilities. Psychological theories of gender socialization posit that women cannot achieve in high-level computer occupations because they are handicapped by their early socialization experiences. Ultimately, these theories are limited because they fail to explain why some women do not internalize the values, roles, and behaviours of the feminine stereotype.

Chapter 5 addresses two contradictory visions of women's nature: the sexual rationalist vision that presents males and females as essentially the same, and the sexual romantic[1] vision that presents woman as a being apart from man, with her own unique set of traits, behaviours, roles, and interests. The currently popular sexual romantic vision of women's nature posits that women and computers belong to different worlds and are fundamentally incompatible. The sexual romantic vision of women's nature is shown to be problematic, given the lack

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[1]For the purpose of this paper, Ehrenreich and English's (1978) term "sexual romantic" has been used to indicate what other writers have variously termed "feminine culture" (Donovan 1985), "trait theory" (Mednick 1989), "sexual maximalism", and "sociological feminism" (Riley 1988).

of evidence supporting a separate set of gender-specific traits occurring consistently across a variety of situations.

Because theories of gender differentiation fail to adequately account for gender differences in behaviour patterns in computer education and employment, this study suggests that an interpretation of the symbolic interactionist perspective may offer a more constructive and comprehensive understanding of this behaviour pattern by combining the sociological and psychological perspectives. The symbolic interactionist explanation of gender inequalities in computer use and employment is presented in Chapter 6.

Symbolic interactionism emphasizes introspection, self-control, and the flexibility of human behaviour (Deegan 1987, 3, 5). Consequently, by drawing on this perspective, this study concludes that barriers to female equality in computer use and employment are not built on intrinsic female traits and do not rest on immutable patterns of socialized behaviour. Thus, an analysis which draws on symbolic interactionism could lead to educational policy making at the classroom level addressing this inequality.

To conclude, the study then suggests some interesting areas for future investigations.

CHAPTER 2

GENDER INEQUALITIES IN COMPUTER EDUCATION AND EMPLOYMENT:

DEFINING THE PROBLEM

This chapter explains how gender, as a social construct, differs from biological sex. Having arrived at a working definition of gender, it becomes impossible to see the computer as a gender-neutral tool. To confirm that society at large, rather than the narrower viewpoint of the academic community, sees computers and women as incompatible in some way, a variety of articles from the popular media are presented and analyzed to underline the concerns that they voice.

Gender as a Social Construct

Sex is a biological fact, depending on the chromosomal arrangement and the presence of certain hormones, especially estrogen and testosterone. With a few biological exceptions, it is relatively easy to tell new-born boys from new-born girls. In fact, along with race, this is virtually the only label that can be applied to an individual from the moment of

birth. Only time will tell if the individual will eventually carry other labels: intelligent, wealthy, strong-willed, obnoxious, emotional, shy, successful, or learning disabled.

The investigation of sex differences is not a recent area of concern (Jensen 1989, 61). Major contributors to civilization have pondered the differences between the sexes, immutably linked, as they were until recently, to the separate roles of wife/mother and provider. With the recent social changes in acceptable gender roles and the decline in the centrality of the family and encroachment of the productive sphere, researchers and society in general turned their attention to an examination of innate differences between men and women, independent of their separate traditional roles.

Investigations into whether males and females have different computing styles and interests are a part of this tradition, which seeks to identify and explain individual differences in terms of masculinity and femininity.

> Do the sexes differ in their emotional reactions to people and events? Do they differ in the vigour with which they attack the life problems confronting them? Do they have equal potential for acquiring the knowledge and skills necessary for a variety of occupations? If psychological differences do exist, on the average, are the differences great enough to impose any limits on, or indicate any especially promising directions for, the kinds of lives that individuals of the two sexes may reasonably be expected to lead? (Maccoby and Jacklin 1974, 1)

If differences between the abilities and traits of men and women are found, it is important to discover whether they are inevitable and biologically determined, or "the product of arbitrary social stereotypes that could be changed if society itself changes" (Maccoby and Jacklin 1974, 1).

For example, if women were found to be less adventurous than men by reliable and replicable tests generalizable over a wide variety of situations, might this lack be explained by the protected, powerless and submissive role most women are forced or coerced to play in our society?

Biological sex and gender are frequently used as though they mean the same thing. They do not. When a class is split for extra curricular activities into winter survival camping for boys and cheerleader camp for girls, school administrators have historically divided the class on the visible basis of biological sex. However, the rationale behind the division is rooted in the notion of gender: what is appropriate for males and what is appropriate for females.

Researchers may consider that the imagined finding above (women are less adventurous than men) is biological trait. If this were the case, it would be a difficult trait to eradicate and might suggest that educators ought to real-istically make less demands on their female students to take

part in adventurous over-night winter camping excursions, for example.

Researchers may consider that the imagined trait has been "bred into" women through evolutionary "survival of the fittest." In past times, adventurous women may have left the cave and been killed while exploring. Their timid sisters may have stayed home and raised babies, thus perpetuating the gene for timidity and eliminating the gene for adventurousness. If this were the conclusion, one also might suggest to educators that they make less rigorous demands on their female students to be adventurous because re-education might, in this scenario, take thousands of years.

The "adventure-avoiding" trait may, however, be con- sidered to be socially acquired through the way an individual is brought up and introduced to the social norms for women. In this case, educators might provide their female students with opportunities (perhaps even more outdoor survival opportunities than the male students) to compensate for previous neglect in this area of their education, to develop their latent tastes for adventure, and to encourage parents to avoid restricting their daughters to socially-sanctioned activities that do not involve physical risk-taking. By considering the adventure-avoiding trait a gender trait rather

than biological sex trait, the possibility is left open for changing the trait.

Obviously, there are close theoretical parallels in this fable of imaginary traits to the tendency of society to link lack of computer success to female traits.

Sex is biologically determined, but gender is a social, not a biological, construct. Whereas sex is fairly easy to pin down based on anatomy, gender is a belief system that changes from culture to culture and, to some extent, from individual to individual. Gender is held to be:

> a set of beliefs and opinions about males and females and about the purported qualities of masculinity and femininity. This system includes stereotypes of women and men, attitudes toward the appropriate roles and behaviours of women and men... Gender belief systems... include both descriptive and prescriptive elements -- beliefs about what is and opinions about what should be. (Deux and Kite 1987, 97)

The central concept of gender is that of the importance of the differences between the sexes: "the gender system insists on and rewards differences" (Hess and Ferree 1987, 16).

> Gender differences are socially constructed... and depend on how society views the relationship of male to man and female to woman. (Gailey 1987, 16)

Thus men are seen as adventurous and women as the

opposite, in the example above. The gender system takes no notice of the timid male and the adventurous female, or of all the minute and fascinating variations on the continuum between male and female.

All individuals in a society are aware of their society's expectations for the two genders -- the behaviours, traits, and roles that the gender belief system allocates for each gender -- even if those individuals choose to fight against their own genderizing.

A Gender-Neutral Tool

In the coeducational middle-class Canadian classroom, the computer is considered by many teachers to be a gender-neutral tool, in much the same way a film projector or a ditto machine are gender-neutral tools. From kindergarten to university, it is now commonplace to encounter male and female students using computers for programming, word processing, computer aided instruction, and game playing without observing overt differences between the genders in computer methods or computer competency. Now that the novelty of the personal computer has worn off, "computers are remarkably like other appealing objects in the [school] environment" (Killian et al. 1986, 16).

Yet, in both the popular and the academic literature, there is a fear that computers are not the gender-neutral tools they appear to be:

> Much harder to unthink is the notion that technologies are merely tools, neither good nor bad but neutral... To believe that technologies are neutral tools subject only to the motives and morals of the user is to miss completely their collective significance. (Bush 1983, 154-155)

As part of the hidden curriculum, the "primary impact [of computers] may be through the transmission of a particular educational ideology, which is in turn related to the 'structure of dominance'" (Barakett and Prochner 1987). Karl Marx addressed the notion that technology cannot be neutral or separate from the rest of life: "Technology... lays bare the mode of formation of [man's] social relations and the mental conceptions that flow from them" (Hanmer 1983, 195).

The gender belief system divides appropriate behaviours, objects, and roles into distinct male and female categories. Science, machinery, and technology have long been considered male domains ("the intrinsic masculinity of scientific thought" [Keller 1983, 130]). It is not surprising that the computer has been appropriated by the gender belief system as a masculine object that is closely linked to these traditional masculine domains.

Common Perceptions of Gender Inequalities in Computer Education and Employment as a Social Problem

A recent (December 1989) search through North American Ph.D. dissertations via the on-line Compuserve computer network listed 281 doctoral dissertations on the subject of computer use, limited by the qualifiers "gender" and "equality." The academic community seems to have directed its investigative attention toward equality of access to computer education for female students. This attention might be construed to be one measure of the importance with which this problem is currently perceived.

In order to discover whether "the man on the street" shares with academia the notion that there might be differences between male and female computer interactions, an informal examination of the Lifestyles or Education pages in Canadian, American, and British newspapers was conducted. This revealed no shortage of informative, frequently cautionary, articles on the differences between male and female computer use, with titles like "Computers: Technology is dominated by males," and "Girls shy away from computers and lose in job market: Studies."

In contrast to the notion that computers are gender-neutral tools, these articles attempt to debunk "the most disabling myth of all... that men and women are affected

similarly by and benefit equally from technological change"

(Bush 1983, 164), by presenting several problems related to

computer use by female students and suggesting possible causes

and solutions.

The main issue in the popular press seems to be that

female students are not participating in computer courses,

"open lab" times,[2] and computer camps to the same extent that

male students are. The following extracts from newspaper and

magazine articles are not cited as academic support for this

thesis but, rather, to illustrate the extent to which the

media have identified gender inequalities in computer use and

employment as a social problem:

> A nationwide study by Harvard researchers in 1984
> of 55,000 elementary and high school students found
> that three of four people enroled in computer camps
> were male. (Markoff 1989)

> Another study by Stanford researchers in 1985 found
> that, among students in Grades 5 through 8 from
> middle-and upper-income families, boys are more than
> three times as likely as girls to use a computer in
> the home. (Markoff 1989)

> "At midnight, the only people (in the computer lab
> after class hours) were a certain kind of boy."
> (Markoff 1989)

> In the first study of 87 middle and upper income

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[2]Open labs refer to computer labs, computers in the classroom, and computers in the school library that are available to students with minimal supervision during free periods, after school, and at lunch time, on a casual, drop-in basis. Commonly, these times are used for game-playing, homework, and experimentation.

students in grades five through eight, the 13 per cent who reported owning home microcomputers were all boys... (The Gazette, no date)

"In particular, girls seem much less interested at this stage in careers involving physics, computing, engineering and technology..." (Clare 1989)

In response to the continuing low number of girls entering technological fields, some schools have begun programs to encourage them to take math and science courses. (Keegan 1989)

A 1984 survey by the (Women's Action) Alliance... which examined 700 seventh- and eighth-grade students in California, Nebraska and Vermont, found that boys are far more likely than girls to use the computer in school during free time and more likely to have a home computer and use it. (Keegan 1989)

It is common to find more males than females, in various age groups, taking computer classes, attending computer camps, and indicating greater interest in computers in both home and school settings. (Chen 1986, 265-266)

Adolescent boys were more likely to have taken a computer programming course before and during their high school years. Computers were more frequently found in boys' homes and were more frequently used at home by boys than by girls. (Chen 1986, 278)

"I gave my son a computer. It never occurred to me to give my daughter one." (Sealfon 1986, 14)

...boys accounted for 74 percent of students who voluntarily used computers after school... ...the boy-girl ratio of free-time usage of the library computer centre...was 5 to 1. ...boys outnumbered girls 2-to-1 in high school computer programming class enrolments in three states. ...40.8 percent of the boys at Princeton High school used school computers in their free periods in school while only 8.3 percent of girls did. (Sealfon 1986, 15)

The articles linked this seeming lack of involvement with

the computer to the possibility that girls may not be able to

obtain high-status, high-salary computer jobs in the future.

> With computers commonplace in schools and homes as well as businesses, lack of computer skill has become a significant barrier to success. (Markoff 1989)

> Three new studies show girls shy away from computers, which will put them at a disadvantage in the high-technology dominated job market, two Stanford University psychologists said this week... (The Gazette, no date)

> The consequences of the 'computers-are-for-boys' attitude may become painfully apparent when girls begin to enter the job marketplace of tomorrow. If girls shy away from computers now--and a national survey reveals that girls avoid computer usage as much as 80 percent more than boys do--they may well be limiting their career options for tomorrow. (Sealfon 1986, 14)

> Women are dramatically under-represented on university science and mathematics faculties and in technical careers, even in relation to the numbers of women trained in graduate programs. ...females averaging 59% of males' salaries... Female access to mathematics and science careers has increased but has remained low, going from 8.6% female in 1975 to 13.4% female in 1986... (Linn and Hyde 1989, 17)

The articles also suggest that not only do female

students use the computer less often than boys, but that they

also use it in a different way:

> "Girls generally select games that involve writing or music; boys are more attracted to competitive, 'action' games..." (The Gazette, no date)

> Women and girls use computers, men and boys love them... (Markoff 1989)

> [Women] tend to find that their style of [computer]

work is different. "The most pronounced differences
are that men tend to be more adventurous and riskier
in their programming styles... I sense a lot of
competition between them." (Markoff 1989)

In other words, despite the ostensible aim of the
educational system to ignore gender and teach computer skills
to "persons" rather than specifically to boys and girls, there
is the conviction on the part of many that "a dramatic
opposition prevailed between what were seen as appropriate
roles for adult men and women" (Keller 1983, 130) vis-a-vis
the computer and that these appropriate roles affect career
and lifestyle choices differently depending on sex.

Furthermore, these articles express a belief that even
when girls do use the computer, their computing styles are
significantly different from and probably less marketable than
the computing styles of male users.

The problem revealed in the above-quoted articles seems
to involve a close connection between female students and the
female stereotype. Because women are women, and for no other
reason (certainly not because they are less intelligent than
men), the majority seem to pick their courses and leisure-time
activities in accordance with what they see to be appropriate
behaviour for their sex.

The ideological emphasis in the 1980s on gender-neutral
schooling has gone far toward providing female students equal

access to computers in the classroom but, in practice, equal access has not led to equal outcomes: in the computer world, women do not achieve the same level of success as men.

Webster's New Collegiate Dictionary defines success as "a favourable termination of a venture; specifically the attainment of wealth, favour, or eminence." In the job context, success may be represented by sufficient remuneration to permit a comfortable lifestyle; absence of direct and constant supervision; a degree of job autonomy sufficient to permit innovation, experimentation, and creativity; successful job performance contingent on the quality of work achieved rather than on the amount of work done (quantity); and opportunity for advancement (Glenn and Tolbert 1987, 328-329). It would seem that the media depicts female computer success as declining with age, and female job success as severely curtailed because of the lack of certain technological skills.

In response to the media interest in computer-related gender differences, an exploratory study at the kindergarten level was undertaken to complement this student's long-term involvement with CEGEP-age computer students. It was felt that first-hand observation, rather than reliance upon the academic literature in the area of early computer use and gender, would enrich the study and provide data (however

limited) with which to evaluate the possibly biased newspaper stories, which otherwise could not be construed as valid sources of information.

Gender Differences and the Kindergarten Computer: An Exploratory Study at Northview Elementary School

This brief exploratory study was undertaken to discover whether there is, in fact, an observable difference in the ways boys and girls interact with the computer at the earliest level of schooling as reported in the popular media, to gather information about young children and their computer interactions, and to apply theoretical perspectives to a real-life situation.

The field work was conducted on the naturalistic basis described by symbolic interactionist Norman K. Denzin, that seeks to:

> (1) permit entry into the closed worlds of childhood; (2) provide data on attitude and act; (3) be sufficiently valid so as to permit future investigators to build on such accounts; and (4) be grounded in a theory that purports to explain and organize what has been observed. In addition, these accounts must (5) take children seriously and attempt to understand and comprehend them on their own grounds; (6) be lodged in the natural worlds of childhood...; and (7) give equal attention to all the relevant participants in the socialization process... (Denzin 1977, 10)

There are serious limitations to the scope and content of this study. Carried out as it was by a naive and unskilled observer and relying on four brief (six-hour) observation periods, it was not possible to "(1) permit entry into the closed worlds of childhood". The observed children reacted to the observer as to a stranger in the classroom. There was inadequate time for the children to become accustomed to the observer and, hence, they appeared either shy or excited. Presumably observation by a stranger may elicit unusual or uncharacteristic behaviour.

A methodological point: The observer found it more difficult than anticipated to take effective notes, make friends with the children, prevent inter-personal problems (such as regulating those who would not wait their turn), keep the computer running, and ask questions. As a result, accurate numerical tallies of the children's responses to the interview questions are unavailable. However, the observer feels that some fairly valid impressions were obtained from the experience, especially as her fixed expectation upon beginning the observation was that a great deal of difference between boys and girls would be found. The observer concluded the observation periods with this original expectation completely

unsubstantiated.

Although Denzin's goals (2), (3) and (5) seem to have attained with some measure of success, the validity of this study could serve only as a tenuous basis for future research -- as a starting point for further investigation rather than an end in itself. Furthermore, with reference to goal (4), at the time of the study the observer had not yet espoused an explanatory theory to account for the observations. The various socialization theories introduced in the following chapter, for example, were not researched until the year after the observation sessions.

Goals (6) and (7) were achieved, as the children were observed in their classroom during the course of a regular school day. The teacher did not make any special arrangements for the observation nor were the interviews conducted with any kind of formality that could be construed as disruptive. The children were spoken to quietly and observed as un-obtrusively as possible, given the location of the observer next to the computer. The parents responded in writing to a short-answer open-ended questionnaire, and the volunteer "computer moms" were interviewed to provide insights from other relevant participants in the children's computer experience.

With the permission of the Lakeshore School Board and the cooperation of the principal, brief periods of informal observation at the Northview Elementary School kindergarten were undertaken. The two kindergarten teachers were extremely helpful in allowing the observer to come into the classroom, talk informally with them, and interview the volunteer "computer moms."

Additionally, a questionnaire approved by the principal and covering letter (Appendix A) were distributed to thirty-nine kindergarten families. An accompanying note from the kindergarten teacher supported the aims of the questionnaire and urged parents to cooperate with the study by completing and returning the questionnaire as quickly as possible.

Of the thirty-nine questionnaires distributed, only nine questionnaires were completed and returned. One parent pointed out that the questionnaire took a lot longer than the anticipated ten minutes to answer. This might account for the lack of response.

Although the response to the questionnaires was disappointing, conversations with the kindergarten teachers and parents, and interviews with the children helped to provide a more complete picture of computer use patterns.

Northview is a small (about 300 pupils from kindergarten

through grade six) elementary school in the Lakeshore School Board. Situated at 90 Jubilee Square in suburban Pointe Claire, it draws students from a predominantly middle-class population but also has a significant number of lower-income and latch-key children who may come to school hungry. The school's population is more mixed socio-economically than most on the West Island because it offers an increasingly rare English-based programme for the early grades: empirically, most middle-class West Islanders are sending their children to French immersion programmes, and parents of those children who cannot cope with immersion seem to see the school as a second chance for success. The class was not homogeneous racially, as visible minorities were represented (at least 4 of 20) in all four kindergarten classes observed in 1987 and 1988.

The kindergarten is located in a typical open classroom double-sized room. It contains half a dozen different activity areas defined by small tables surrounded by child-sized chairs. Children gravitate from table to table in:

> ...an open classroom setting in which most learning
> occurs in small groups. In such a classroom,
> children choose activities of interest and no child
> is required to take part in a particular activity.
> (Killian et al. 1986, 13)

There were approximately 20 children in each of the four

half-day kindergarten classes.

The computer, an Apple, was just one of many different activities accessible to the children during the daily free play segment of the timetable (approximately three-quarters of an hour). Computer use is not compulsory but each child may have a turn, time permitting. This non-threatening introduction to the computer mirrors the advice of preschool programme planners:

> introduce (computers) in such a way that they become just one of the interesting objects in the preschool environment... offered to children on a playful and limited basis. (Killian et al. 1986, 13)

The software used is non-violent and non-competitive. It features the Muppet Babies, TV favourites of both sexes. No "score" is kept and the software does not compare one student's performance to another's, so competition is minimized. There are no loud "zap-'em" sound effects -- the whole effect is very gentle, colourful, and controlled. Similarly, the software was designed to appeal to both genders and chosen for the kindergarten with this aim in mind. Both boys and girls responded to the Muppets as old friends.

A volunteer mother trained in the software sits on a low chair near the computer to help and encourage the children with commercially produced reading readiness software. No fathers volunteered to help with the computer. Indeed, father

volunteers are a rarity at Northview where many of the mothers do not work outside the home. The students' first exposure to the computer introduces them to a female computer authority.

There is no attempt to introduce the children to LOGO at Northview and word processing software is not used at this stage.

The computer programme was initiated and financed by the Home and School Association, an organization that emphasizes nurturing and child-centred education and counts a large proportion of mothers in its membership. This attests to the importance that parents currently attach to computer literacy.

Computer literacy at Northview follows the second scenario described below:

> ...the leading experts appear divided into two separate and distinct camps of thought. One group views computer literacy as primarily consisting of a verbal level of knowledge. ...while the approach is primarily conceptual in nature, minimal computer skills are in fact implied. The second contingent's primary focus is on the "hands on model," in which the child exhibits a greater mastery in the actual use of the computer... (Deverensky 1983, 197-198)

At all levels in Northview, students interact with the computer via application software rather than programming. Computer use stresses "hands on" and minimizes overt teaching of conceptual computer knowledge. Teachers and parents seem

to want the children to become comfortable computer users rather than programmers.

Even the most naive observer might expect that the kindergarten child arrives in the classroom with considerable "baggage" acquired during the first five years of life. This socialization "baggage" includes a fairly well-developed notion of the traits and roles associated with their own gender and the expectations that others will have of her or him, based on that gender category into which they fall (Evans 1970, 27).

Unquestionably, many teachers greet first-day students at the classroom door with their own preconceived ideas about the differences between the sexes. Common answers to the question, "What are the differences between girls and boys that you have noticed in your classroom?" are, "The girls aren't as noisy," "The boys are more difficult to handle," "The girls don't show off as much," "I'm always screaming at the boys to sit down and shut up."

The teachers at Northview, Lindsay Place High School, and John Abbott College CEGEP to whom this question was addressed were aware that individual differences are far more important and valid than the gender stereotypes to which they make reference. In other words, teachers were willing, in

most cases, to describe a difference between their female and male students, if pressed, but they were knowledgeable enough and sensitive enough about sexism to make the point that their students were individuals first and males or females second.

The two kindergarten teachers interviewed were particularly reluctant to categorize boys and girls differently, and all of the teachers (both male and female) spoken to seemed very aware of sexism and volunteered the information that they strove to eliminate sexism in their own classrooms. It was not possible to elicit any sexist comments about female students from any of the teachers interviewed.

Similarly, the parents' responses (Appendix A) to the questionnaire revealed little sexism. The "computer moms" also insisted that the girls were just as keen to use the computer as the boys.

However, in observing the kindergarten boys and girls at play, it was obvious that most of the boys gravitated into one group and most of the girls gravitated into another group -- though there was considerable boy-girl interaction and even boy-girl best-friend relationships. It was also easy to verify that boys preferred running around to sitting still. Usually the girls were the first to get involved in crafts, while many of the boys needed a little encouragement. The

boys did seem to pretend to be super-heros, and the girls seemed to play house and school. Certainly, as concerns their play-time activities, boys and girls seemed to support the biological, identificatory, and deterministic theories of gender development as female and male behaviour norms were adhered to by all but a few.

Although the children seem well socialized into their sex-roles, judged by their play, dress, interest in crafts, and friendship patterns, anomalies do exist. For example, the most boisterous, active, and physically/verbally aggressive child in one kindergarten class was a little girl referred to as "queen of the kindergarten" by a volunteer "computer mom." Some of the little boys were labelled shy, quiet, or artistic by their parents and the shyest, least aggressive, and least confident child observed was, indeed, a little boy.

Using the computer is a popular activity amongst almost all of the kindergartners, both boys and girls. There did not seem to be a concern at Northview that computers may affect girls and boys differently or that computers have been labelled "boys' toys." The principal said, "Before I began to teach math, they told me I'd find a big difference between the boys and the girls. Well, to be honest, I was surprised,

but I never did see a difference between what the boys and the girls could do in my math classes," thus illustrating the discrepancy between the popular notion of gender traits and the classroom reality.

During the observation sessions, approximately ten minutes were spent at the computer with each of 39 students, encouraging them with the computer programs and asking them a few informal questions:

* Do you think the computer is more like a machine or more like a person? [Rationale: Some of the newspaper articles cited earlier in the chapter depicted females as more connected, more affiliative, more interested in people than abstractions. The observer anticipated that more girls might identify the computer as being like a person. In fact, not one student out of 39 said the computer was more like a person than a machine.]

* Are computers more for girls or more for boys? [Many students replied, "Both." Many of the girls said computers were more for girls and many of the boys said computers were more for boys. None of the students said that computers were for the opposite sex, but quite a few students didn't answer the

question.]

*   Can you tell me the name of this part of the computer (pointing to screen, keyboard, and disk drive)? [Only the shyest students would not name the computer parts accurately, though a few needed some encouragement. Most seemed proud of their computer abilities. All were able to start up the program, use the RETURN key, and move the cursor confidently. Quite a few seemed very familiar with the location of the letters of the alphabet on the keyboard. There were no noticeable differences between boys and girls in their confidence levels, ability to use the program, or computer knowledge (naming of parts). Some students asked the observer, "Is it OK?" "Can I do this," "What should I do now?" "Is this right?" and so on, while others blasted ahead on their own, not worried about making mistakes. However, these behaviours were not divided along gender lines.]

Based on theoretical perspectives and intuition, it was anticipated that significant differences between the behaviour of the boys and girls at the computer would be observed. In retrospect, these expectations were grounded in gender stereo-

types. It was anticipated that the girls would be able to read the program's prompts better than the boys because of their early well-developed verbal abilities; they would be quieter, shyer, less aggressive, more serious, more friendly, and more timid than the boys. It was expected that the boys would be too active to sit at the computer for long, unable to read the prompts, competitive, physically aggressive, and more difficult to control.

After the first hour of observation, the observer was forced to admit that no generalizable differences along gender lines could be verified. There were differences in activity level, aggressiveness, reading ability, and so on -- but the differences were not clearly delineated between the gender categories. Reactions to the computer and to the observer (the "computer mom" for the day), were determined by in-dividual personality as far as an untrained, inexperienced observer could see. This finding was borne out by the balance of the observation period.

As an adult student in her thirties at John Abbott College wrote perceptively and, it would seem from this exploratory study, accurately:

> I think a lot of these (stereotypical) notions have
> social implications. If we were to look at elemen-
> tary age children, I don't think that we would find
> this different attitude toward computers. Children
> at that age feel that they can do anything and

wouldn't be intimidated by either a machine or social pressures.

* * * * * * * * * *

Gender Inequalities and Computer Education Late in the School Career: John Abbott College CEGEP

Office Systems Technology is a CEGEP vocational program with the stated goal of educating micro-computer technicians, word processing operators, data entry clerks, file clerks, secretaries, word processing supervisors, and office managers.

Students in Office Systems Technology are ninety-eight percent female. There have been three male registrants in the three years that the program has been in operation. Coming into the program from high school, the majority of students enroling in Office Systems Technology have weak marks and a history of plodding academic mediocrity, as revealed in the official high school transcript. Most have left high school lacking a sense of direction, and few link the idea of school achievement with the possibility of high earning power in the future. In written response to the question, "How would you go about earning $80,000 a year, buying a house in Beaconsfield, owning a Corvette, and having a two-week holiday in Acapulco in ten years' time?" only two out of twenty

students mentioned school or personal effort and hard work --
- the rest mentioned lotteries or marriage, or lotteries and
marriage. Most vaguely envision themselves becoming a
secretary or an office "boss" if they study hard enough upon
graduation, but many cannot articulate their career plans.
Most hope to earn "a good salary" and "get promoted." Most
hope to marry and have a family soon, and many state in
informal discussion that they are determined not to "postpone
their life" by remaining in school longer than strictly
necessary. School is seen as a necessary evil and many do not
seem to take responsibility for their own learning.

Although several teachers regularly try to hammer home
the message that education, especially for women, can equal
freedom and opportunity, it is commonly felt that few students
are receptive to the message and fewer will act on the advice.
One student out of seventy expressed the hope to continue her
education at the university level and many state that they
wish to graduate with a minimum of effort.

Despite this inauspicious beginning, once students have
experienced their first semester in the program, some of the
formerly unenthusiastic manage to turn themselves around to
an extent. Indeed, some students who come into the program
with academic averages in the very low 60s "get hooked" on

the program and obtain very high grades (criterion-based mastery learning in which it is possible to obtain high grades simply for expending the effort involved in doing the technical work),[3] during their second and third years. Additionally, many who are poor students academically can do very well in the computer hands-on courses that involve little reading and no writing. Two Office Systems Technology teachers have had some success with learning disabled and physically handicapped students in word processing classes. When questioned, students whose performance has improved tend to respond that the courses they are now taking (as opposed to their high school courses in a general academic stream) have direct relevance to what they will be doing on the job. Helping them to make this discovery is the high proportion (almost one hundred percent of students) holding part-time office jobs related to their course of study.

Those students, both female and male, with an elementary and high school history of academic success have avoided the Office Systems Technology programme for a variety of reasons:

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[3]Note that the course work stresses mastery of computer skills, such as typing, word processing, and data entry, rather than cognitive content, interpretation, problem-solving, critical thinking, analysis, and synthesis. In a recent reading vocabulary and speed test administered by the school's learning specialist, approximately one third of fifteen students were flagged as having serious literacy deficits.

vocational programs have traditionally been condemned as the refuge of the "slow" student; students with high marks are steered by parents, high school teachers, and guidance counsellors toward pre-university programmes; Office Systems Technology (despite its upscale name) cannot shake its "secretarial" image and self-actualized contemporary teenagers do not want to be secretaries; students who have experienced academic success may be more confident to try courses that fall outside the traditional feminine occupations.[4]

Office Systems Technology feeds students directly into the existing power structure that places women at the bottom of the occupational ladder, as support staffers and clerks. Entering the program with minimal self-esteem as learners, they are required to do little reading and writing, and a lot of hands-on computer exercises. Instead of the obsolete typewriter, Office Systems Technology gives them the computer skills required to be a computer <u>user</u> but not an innovator. Instead of the obsolete title "secretary," they are offered the chance of becoming an "administrative assistant" or "word

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[4]Because nursing requires a physics prerequisite that eliminates most poor students and teaching now requires academic credentials, the remaining feminine occupation is office work. The secretarial programme was eliminated from the CEGEP system in 1985, leaving Office Systems Technology as the only training-ground in job skills for the female under-achiever.

processing operator:" new titles for the old positions with little status, low salary, and no power.

Across the hall way from the Office Systems Technology computer labs is the programming department. The male majority often jokes, in the hearing of the Office Systems Technology students, that the OST students will be called in to make coffee. The programming students express their astonishment that some Office Systems Technology students are using Ventura, a difficult desktop publishing software package. The message is that Office Systems Technology students are incompetent office drudges.

* * * * * * * * * *

Milton Chen and other researchers have concluded that although boys accrue more computer experience during their early years, "no difference was found in usage based on more general applications of computers. Gender differences were not significant among male and female students..." (Chen 1985, 278). Similarly, this exploratory study did not point to any overt differences between the sexes in computer confidence, time spent on the computer, or computer knowledge at the kindergarten stage.

It may be seen, however, that by the time students arrive

in CEGEP, women are avoiding high-level computer classes
(specifically programming languages) and enroling in the
Office Systems Technology programme, which teaches the use of
word processing and other software applications packages.

It may seem, on first examination, that "something
happens" to girls during the course of their school career
and maturation that allows males to dominate technology.
Various reasons have been suggested for the seeming tendency
of female students to act in accordance with the feminine
stereotype, including the social structural theories and the-
ories of gender differentiation.

In summary, observation at the kindergarten level sug-
gests that there are little or no differences between male
and female interactions with the computer: the same games seem
to amuse both sexes, computer success is equal, computing
"styles" are the same.

> Gender differences were not significant among male
> and female students in any pre-high school course
> using computers. (Chen 1986, 281)

However, observation and research confirm the newspaper
reports that as the grade level increases so do the dif-
ferences between male and female computer interactions. At
the high school level, gender differences in math, science,
and technology course selection and capabilities have been

documented. At the CEGEP level these differences are even more pronounced.

Therefore, despite a fairly equivalent and gender-neutral introduction to computers in the early grades (Shade et al. 1986, 53-61), female students seem to be steered away from computing or into the less academically challenging word processing and data entry courses leading to a clerical or secretarial career.

Although this study will explore a variety of explanations offered in the literature to explain this shift, easy answers or explanations do not exist. Much of the literature centres around the notion that the social order is imposed upon individuals -- that, inevitably, the vast majority of women will be herded passively into low-paying, low-status clerical and secretarial jobs by the patrimony, the socialization process, "women's essential nature," the reproduction of social inequalities, capitalists, or whatever irresistible force best suits the researcher's ideology.

Further, the noncognitive notion of socialization that pervades popular thought as revealed in the newspapers gives rise to the oversimplification that "eliminating stereotypes would enable girls to considerably broaden their range of career choices" (Ministere de l'Education 1987), but there is

considerable research suggesting the utility of the stereotype as a basic and essential cognitive construct (Hirsch 1988). Both rigid theories of social stratification and notions of the noncognitive inevitability and immutability of gender socialization ignore the individual and negate the function of free will, the possibility of growth and change, and the experience of many successful women in nontraditional roles who have been working to change society and increase women's participation in the sciences and technologies.

In the following chapter, Chapter 3, structural theories that attempt to provide a macro-level explanation of gender inequalities in computer use and employment are outlined and critiqued.

CHAPTER 3

SOCIAL STRUCTURAL PERSPECTIVES

Two social structural perspectives have particular
relevance to the problem of gender inequalities in computer
education and employment: conflict theory and functionalism.
Social structural theories do not place the locus of social
inequities within the individual, in terms of psychologically
or biologically-determined differences between males and
females.

In other words, although social theories accept that "the
sense of self" is affected by the social experience through
interactions with others, they reject the notion that genetic
deficiencies, or intrinsic qualities and traits, explain
failure to achieve. Social theories look to the structure of
society as a whole and seek to identify and describe the
external forces which determine the behaviours and motivations
of group members.

The problem of ensuring equal access to computer educa-
tion for female students so that they will not be left behind
in the job market of the near future may also be seen, at the

macro level, to illustrate an enduring attitudinal conflict between the two aspects of the dichotomy that presents the goal of the educational process as social maintenance, on the one hand, and social change, on the other.

Functionalism

Functionalist theories posit that each component part of the social system is integrated with the whole society and contributes to the maintenance of the whole. Rapid social change, as has been experienced during the twentieth century, results in disequilibrium and may result in dysfunctional consequences of formerly functional processes and/or institutions (Maris 1988, 66-67). As a theory that was developed during the intense period of industrialization and rapid social change following World War II, it is not surprising that functionalism is theoretically relevant to what has been termed the second Industrial Revolution brought about by computerization.

Functionalists tend to "see education 'as a means of motivating individuals to behave in ways appropriate to maintain the society in a state of equilibrium" (Martin 1976). Educational institutions act as a filtering and categorizing system, sorting students into their appropriate occupations

within their appropriate social strata.

Obviously, this theoretical perspective is closely linked to the social maintenance purpose of education and seems conservative in its view of change. Computers, like the educational system, have been seen as instruments of social maintenance:

> Technology always enters into the present culture, accepting and exacerbating the existing norms and values. (Bush 1983, 161)

To paraphrase Chandler Davis of the University of Toronto, "the main function of [computer courses] in advanced capitalist society is the maintenance of social stratification" (Hacker 1983, 38). Although Professor Davis was talking about mathematics courses, the parallel between mathematics and computer science is not unique to this study and, in her article, Hacker begins her research with technological change, in general.

The existing social structure is predicated upon female students receiving a different education to that accorded to male students, as regards both content and methodology. The sexual division of labour has always dictated that male and female education be gender-appropriate in order to increase the efficiency of performance in the heretofore virtually unchangeable life roles of wife and mother (Deem 1978, 29).

Schools can and should make adjustments... to the

fact that marriage now looms much larger and nearer
in the pupils' eyes... There is a clear case for a
curriculum which respects the different roles (boys
and girls) play. (Deem 1978, 59)

In the interests of maintaining the structure of society

(Engels: "The modern individual family is founded on the open

and concealed slavery of the wife."), the educational system

long discouraged female students from serious careers in the

so-called masculine domains of science, mathematics, and

technology (Harding 1986; Hacker 1953).

As instruments of social maintenance, computers were

first brought into schools in conjunction with mathematics,

engineering, and programming courses in which males were

firmly entrenched as the majority. Many computer labs are

still sequestered in remote, highly secure locations where

access is restricted by predominantly male technicians.

Female students in computer career programmes (computer

science, information systems management, quantitative methods)

were seen in much the same way as female engineering students

were depicted in McGill University's "The Plumber's Pot" and

other engineering newspapers during the 1970s (Menzies 1984,

60). The few women who persisted in following a computer-

oriented career path in university succeeded despite being

counselled away from technologies and sciences (Grade 1987,

4) into the more traditional feminine areas of concern such

as secretarial science, social work, teaching, and home economics.

The stereotypical gender division of labour which categorizes math, science, and technology as masculine concerns has largely been maintained by the advent of the personal computer. Today, women dominate the computer field only in the realm of clerical and secretarial support. Ninety-eight point eight percent of secretaries are female (Maris 1988, 172).

> Women's principal involvement in computers thus consists of painstaking but routine tasks like word processing and data entry. (Markoff 1989)

Historically, clerical and secretarial work has been considered feminine and, consequently, undervalued in both salary and prestige by society (Baron 1987, 84-96).

> Armed with few practical skills, and often unfocused knowledge when they enter the job market, [women] readily accept being relegated to the fringes of employment -- the female job ghettos and the part-time work force of which they form 75 percent. (Menzies 1982, 41)

Female competence in word processing does not lead to full equality in the computer world, instead it "confirm(s) women's existing position in society, rather than questioning it" (Deem 1980, 42-43).

From a functionalist perspective, there is no problem implied by the gender inequalities in computer employment.

The division of labour by gender is functional in ensuring the smooth operation of society. A functionalist perspective would observe that schools have some filtering and coercive mechanisms in place that are working very well to steer women away from male computer occupations. This sex-based division of labour is functional indeed, especially if women can be encouraged to be good mothers and good housekeepers through the "education for nurturing" (Martin 1985, 93) urged upon women by advocates of feminine culture (Mednick 1989).

As the productive sphere currently (and perhaps temporarily) needs a large bank of semi-skilled computer workers to simply manipulate and enter information into systems that will be controlled by men, the Quebec educational system in 1986 developed a program to train female students in the low-level use of applications software: Office Systems Technology at the CEGEP level, which is described in Chapter 2 of this study.

Conservative views of women in the business world (Glenn and Tolbert 1987, 329), gatekeepers in the human resources departments (Hacker 1983, 54), and the "old boy" network will ensure that women in the word processing centre or administrative support service will probably remain there until they leave the company. Rather than expanding employment oppor-

tunities for women, Appelbaum notes that:

> Automation has... reduced the upward mobility of clerical workers who want to move from skilled clerical to professional positions... (Appelbaum 1987, 200)

A more optimistic functionalist analysis of the problem of unequal access to computer education and employment by women might point out that recent rapid technological and social changes have made previously functional educational systems and workplaces dysfunctional. Before the women's liberation movement and the mass entry of women into the workforce (it was estimated in 1988 that, by 1990, 57.3 percent of the U.S. labour force would be female [Maris 1988, 176]), the educational system probably did a good job of fitting most males and females into their appropriate places in society. Now that society is in a state of disequilibrium, capitalist enterprise and the educational system must work together to re-balance through institutional reforms.

Because functionalism posits that the way to solve social problems is to increase social integration through the coordination of social groups, it is in opposition to conflict theory's belief in the competing interests of men and women.

Conflict Theory

Conflict theory depicts individuals competing for a limited amount of resources: "Competing interests and differential distribution of wealth, power, and prestige are more real than cooperation" (Maris 1988, 63).

To conflict theorists, there is a limited number of high-status, high-salary computer jobs. These jobs are held by members of the more powerful male sex, who have a vested interest in protecting their positions and maintain a strict gatekeeping over access to these high-level jobs.

To the conflict theorists, "the central social problem is the oppression of nonelites (especially of minorities like women, American blacks...) who lack the resources and power of the elites" (Maris 1988, 60). Conflict theorists look to the future redistribution of wealth, power, and status after the "overthrow (of) ruling elites and institutional arrangements that serve only the elites' interests" (Maris 1988, 63). Marxist feminists equate men with capitalist values and the power elite; and women with anti-capitalist social welfare values and the powerless working class (Donovan 1985, 83).

In these terms, female inequality is a natural consequence of men's refusal to give up their privileged position vis-a-vis the computer (and the power, wealth, and

status that are a corollary to high-level computer occupa-
tions) to women and other members of less powerful minority
groups. Of course, for female members of minority groups
(Blacks, native Indians, the physically challenged, and so
on) the problem is compounded. The conflict theorist would
deny that the total number of high-level computer jobs
available will expand to permit easy access for women, as the
competition for scarce resources is central to conflict theory
(Glenn and Tolbert 1987, 328-329).

Computers brought about rapid change, primarily in the
workplace, and have been seen as instruments of social change
capable of fundamentally reorganizing the social structure:

> [The computer revolution] is also being called a
> second industrial revolution because, like mass
> production machinery before them, computers are
> transforming society, not just adding something to
> its traditional constitution. (Menzies 1982, x)

It was hoped during the past decade that computer
knowledge would provide women with a head start in the rapidly
growing computer employment marketplace: this hope for
redistribution of wealth, status, and power remains unful-
filled. Instead, women remain isolated in a technological
word-processing and data-entry ghetto. Rather than opening
up new career paths to high-salary, high-status careers for
women, differences in computer use between the sexes point to

possible "limits on how far women can go in the computer busi-
ness, and to a disappointment of the hopes that this new
industry would be free of the sex disparities of older fields
of work" (Markoff 1989).

Why has the computer revolution failed to affect the
social structure? Perhaps because society fears change,
especially rapid change, and tends to

> welcome technological change because it is _materi-_
> _al_, believing that it makes things better, but it
> doesn't make them different... The realization that
> technological change stimulates social change is not
> one that most people welcome. (Bush 1983, 161)

Technological changes, as well as changes in society,
can have a destructive (though, perhaps, positive in the
larger sense of forcing introspection and reform) impact on
existing social institutions by rendering them "inappropriate
or irrelevant" (Maris 1988, 26).

Although society remains stratified along gender lines,
those educators who have lived through the 1950s into the
1990s find it self-evident that society, societal expec-
tations, and acceptable social roles for women can and do
change, despite the fear by certain elements of society that
some types of power or dominion over other elements may be
lost. In response, existing social institutions like the
educational system have slowly changed to eliminate or

minimize the "inappropriate or irrelevant" sex-directed education of the 1950s (Friedan 1963, 151).

Women's identity is no longer restricted to the role of wife and mother. Education no longer overtly seeks to fit young women into a gender-specific life role through sex-directed education; and it is not unheard of for educators to encourage their students to challenge the fundamental assumptions of society and work with their students to further undermine the traditions and stereotypes that define social reality (Weiler 1988). However, society remains stratified along the lines of gender.

It would seem that, from the social structural perspectives of functionalism and conflict theory, the computer cannot be a neutral tool because:

> ...we do not interact with a world that is neutral. Ideology, which is defined herein as "a 'system' of ideas, beliefs, fundamental commitments, or values about social reality" ...enters into our interpretations...(Barakett and Prochner 1987)

The computer cannot be seen as neutral. Therefore, in addition to the conflicting attitudes of social change and social maintenance, equal access to computer education and employment by female students is also affected by conflicting social attitudes toward computers themselves.

In capitalist society, wealth is seen as "a good thing."

Computer technology increases production while decreasing labour costs. Therefore, computers increase profits without expanding the total number of high-paying jobs available, making automation appealing to owners and managers by generating more wealth for those who control production.

Additionally, our society links computer knowledge directly to power, control, status, domination, and wealth (Gearhart 1983, 160). But, at the same time, there is an opposing minority attitude that echoes Karl Marx's conviction that "most social problems have their roots in the differences in the distribution of wealth, power, and prestige in a population" (Maris 1988, 10). This minority attitude protests that "the new technology is used by the capitalists to deskill and otherwise weaken the working class" (Carter 1987, 202) by encouraging women to fill easily available, poorly paid automated office jobs with little autonomy or decision-making.

It is obvious, given the dearth of programming, managerial, systems analysis, and other high-level managerial skill courses, and the prevalence of word processing classes, vocational business programs, and evening introductory computer courses for unemployed and welfare-recipient women offered by all Montreal school boards and English-language CEGEPs that this minority attitude has had little or no impact

on curriculum, course offerings, and policy locally thus far.

The educational institutions are feeding women directly into the lowest-paid, lowest-status computer jobs. Although there are exceptions, very few word processing operators and data entry clerks make it into management ranks without a business administration degree. Few word processing operators and data entry clerks can afford the sacrifice involved in taking university courses, either financially or in terms of evenings spent away from familial responsibilities.

The federal government is aware that women are bearing, the brunt of the negative effects of the new technology and it acknowledges that the response of the educational sector (training in office automation) will not free women from the low-status, low-salary trap of monotonous and deskilled employment that is so very functional for the business world. However, short of implementing a small number of A.C.T. programs (Appendix B) through Canada Manpower, no large-scale government initiatives promote affirmative action in high-level computer occupations in Canada.

As a tool of the hidden curriculum, the computer "reflects an educational ideology that helps to maintain and legitimate the structure of dominance or dominant culture" (Barakett and Prochner 1987). Thus, although perceived as an

instrument of social change, the computer in fact serves to

entrench male dominance in the classroom and in the workplace:

> Technology is, therefore, an equity issue. Tech-
> nology has everything to do with who benefits and
> who suffers, whose opportunities increase and whose
> decrease, who creates and who accommodates. (Bush
> 1983, 163)

Those of us who work with computers and teach in the

computerized classroom may well heed the warning that

> ...the advantages offered by these technologies will
> not accrue to all social groups... The media may be
> new, but they raise some distinctly familiar
> questions of equity in the availability and use of
> an important educational technology. The faultlines
> of inequity are stratifying along two types of
> social divisions: wealth and gender. (Chen 1986,
> 265)

Briefly, then, from the viewpoints of functionalism and

conflict theory, the computer is a tool used to maintain power

in the hands of a middle-aged, upper-and middle-class, white,

male dominant group while ensuring that women are permitted

access only to subordinate positions in the computer hier-

archy, preventing women's access to the knowledge and power

that is a corollary of high-level computer manipulation.

The functionalist theory implies that job training must

be a primary concern during the school years preceding

graduation. At the beginning of the school career, an

occupation is a remote goal. Thus, functionalism would

account for the seeming shift in computer use by female

students over the course of the school career in terms of the acquisition of job skills and desirable attitudes toward female participation in the labour force. It does not, however, explain how most female students learn to limit their occupational expectations. Nor does functionalism address the nature of the gatekeeping mechanisms in the personnel office and the upper levels of the computer hierarchy that exclude even those women with high-level computer qualifications from top jobs.

Similarly, conflict theory can be used to explain the difficulties encountered by female computer science students and by well-qualified female programmers who fail to attain high-level positions in terms of the white male patrimony protecting its hegemony. In addition, conflict theory points out that educational institutions pre-select male students for high-level computer occupations by eliminating women from mathematics prerequisites and steering them into low-level word processing and data entry courses of study.

Structural theories are appealing because they accurately describe a relationship between the needs of the business world and the educational process. Office Systems Technology well illustrates how efficiently the needs of the marketplace are filled by the educational system.

Yet, the filtering system is imperfect and some female students graduate from high-level computer programming courses of study to succeed in business. For example, Grace Hopper of the American armed forces invented COBOL (the business programming language) and rose to the top of the military hierarchy in the 1960s. Further, the macro level of analysis ignores the classroom processes through which the filtering system works, and the unpredictability of the individual. Female students are seen as complacent, passive cogs in the machine of advanced capitalism or as pawns of the male dominant class, who may struggle -- but in vain -- to attain wealth, power and prestige.

Although the correspondence between existing gender inequalities in computer education and employment cannot be denied, structural theories seem to call into question the freedom of the individual and deny the possibility of large-scale societal change. Further, structural theories fail to answer the question, "Why do female students and workers accept being relegated to a subordinate position?"

Chapter 4 turns to a more micro level of analysis in order to focus on the processes through which theorists believe that individuals learn to accept the limiting gender-appropriate roles assigned to them by the social structure.

CHAPTER 4

GENDER DIFFERENTIATION

Chapter 3 addressed explanations offered by macro-level social structural theories to account for the increasingly unequal gender differences in computer education and employment observed over the course of the school career. As noted, both conflict and functionalist interpretations of the larger societal processes impacting female computer success are flawed, particularly in that they do not address the individual students or the socialization process. Rather than searching for explanations for gender inequalities in computer use and employment in the forces at play in the larger social environment, this chapter is oriented toward those inter- and intrapersonal processes that mould the individual's behaviour and motivations.

Although theories of gender differentiation do not neglect the contribution of society at large to the moulding of behaviour patterns, they locate the mechanisms that produce gender inequalities at the micro level, within the individual. Either because of some intrinsic quality or trait belonging

to the essential nature of a man or woman or because of the internalization of societal values and expectations, adult men and women differ in thought, feeling, and behaviour (although new-born infants may not). These differences may be significant or insignificant with reference to the educational process.

Many theories of socialization into gender roles -- how boys and girls "fit into" their appropriate, socially determined roles and acquire suitably "masculine" or "feminine" traits and behaviours -- have been suggested. They range from the immutable biological theory through to the theory that sex roles are purely artificial: "The 'normal' sex roles that we learn to play from our infancy are no more natural than the antics of a transvestite" (Greer 1970, 29). The four major theoretical approaches gleaned from the literature (Mackie 1983), are the biological theory, the identification theory, social learning theories, and cognitive development theories.

In order to understand the implications of the following theories of sex-role development for a consideration of women as computer "second-class citizens," it is first necessary to explore the concept of socialization.

Socialization

Socialization is a "complex learning process through which individuals acquire the knowledge, skills, and motivations for participation in social life" (Mackie 1983, 83). In other words, socialization is not genetically- or hormonally-determined: it is not something individuals are born with, or develop automatically as they grow up, but something individuals must learn in order to participate in social life.

There is a remarkable consistency in the way individuals come to acquire common knowledge, skills, and dispositions. This leads some researchers to the deterministic belief that:

> the individual is perceived as responding in more or less automatic and stable ways, as a consequence of prior experiences, to configurations of stimuli coming both from the external environment and from within the learner himself. (Goslin 1969, 3)

Socialization involves learning "rules" or guidelines for socially acceptable behaviour (for example, it is socially acceptable for women to take primary responsibility for childrearing). In our pluralistic society today, there is a fair amount of latitude in the rules and interpretation of the rules (for example, society sanctions working mothers, as long as they continue to take primary responsibility for their children). Individuals are even free to break the rules (for

example, in the comic strip "Adam," the mother works and the father takes primary responsibility for the children).

However relaxed many of our social rules may be, it is an inescapable fact that conformity to the norms of society is pervasive:[5]

> ...societies and groups would not be possible without an extraordinary degree of conformity by group members to commonly held expectations regarding what constitute appropriate behaviours, attitudes, and values... (Goslin 1969, 2)

How we acquire this conformity to commonly-held gender expectations is a matter of theory, several of which are discussed below. Each theory will be used to analyze how gender differentiation affects computer education and employment.

Biological Theory

Our genetic make up consists of 46 pairs of chromosomes, half from each parent. One of these pairs is the "sex" determinant. Hormones secreted by the endocrine system "masculinize" or "feminize" us. There are differences between male and female bodies: sex organs and secondary sex characteristics, the ability to bear children is restricted to the female, physical size and strength (males are larger and

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[5] Of course, the concept of normative behaviour was first arrived at by observing that individuals tend to follow certain behaviour patterns, so this is a circular argument.

stronger), higher basal metabolism (males have a higher rate), maturity rate (females mature earlier), longevity (women live longer), mortality (males have greater mortality rates) (Maris 1988, 163-164). These minor differences ought not to blind us to the incontrovertial fact that women and men are more similar to each other than to any other entity.

The above traits do not seem to have any link to the abilities or intelligence of either sex, which might affect classroom or on-the-job success with computers. However, these traits have had a relationship to social role in that men's size and strength may have better suited them for their historic role of provider and protector, while women's earlier maturity rate and lower mortality rate may have helped to ensure survival of the species by maximizing the number of healthy childbearing years.

Sociobiologists have postulated that other significant differences between the sexes have evolved:

> ...thousands of years of evolutionary history have selected for nurturance in women and for philandering in men, so that the current unequal division of child care is genetically determined and, therefore, irreversible. (Sayers 1987, 73)

Some also believe that women's hormones make them more nurturant, while men's hormones make them more aggressive.

> It is accordingly argued that it is futile for feminists to hope to achieve sex equality in work and public life. (Sayers 1987, 74)

These positions tie into the notion that women are intrinsically more suited to stay at home and look after children than to compete equally in the computerized workplace. If women are compelled by their biological heritage toward the home, it ought not to come as a surprise that they avoid the computer. Computers are seen as the antithesis to the warm, nurturant, loving relationship of mother and child: hence, the rejection of the computer world by women.

Women have also been thought, by some, to process verbal and visual-spatial information on both sides of the brain, while men process verbal information with the left and visual-spatial information with the right cerebral hemisphere. "Not surprisingly, this argument has been used to suggest that women are better fitted for child care than are men" (Sayers 1987, 74). Additionally, it might be suggested that women's enhanced language ability might suit them more for the arts and for teaching than for the highly-abstract logical world of the computer analyst and programmer.

The biological argument can be used to support traditional sex roles and traits. It postulates that these roles and traits will develop "automatically" (independently of socialization) within each individual. For example, nurturing is natural for women in that it is a genetically-hor-

monally produced inevitable trait.

Eleanor Emmons Maccoby and Carol Nagy Jacklin examined over 1,400 research studies to identify sex differences that withstood scrutiny. They discovered little to support the notion that women's biological heritage is linked to specific cognitive and behavioral traits. For example, nurturant behaviour is commonly associated with women. Yet a 1974 study by Parke and O'Leary, cited by Maccoby and Jacklin, seemed to show that fathers from both well-educated and working-class families "engaged in more nurturant interaction with the infants than did mothers..." (Maccoby and Jacklin 1974, 221). Similarly, David G. Winter reports evidence from both original and prior research that there are no differences in need for power between males and females: he suggests that gender is irrelevant to power needs and that gender is not a consistently valid explanation of personality traits (i.e., it is not valid to assume that the female gender as a whole is uninterested in obtaining power inside or outside the home) (Winter 1988, 510 and 519).

Maccoby and Jacklin found reliable evidence for few sex differences only: greater verbal abilities for girls, greater visual-spatial and mathematic abilities for boys, and aggressiveness for boys (Maccoby and Jacklin 1974, 351-352).

In 1983, Benbow and Stanley (Benbow and Stanley 1983, 46-49) did not find "substantial differences between boys' and girls' attitudes [toward mathematics] or backgrounds [in terms of previous mathematics courses]." Neither did they find that "sex differences in mathematical reasoning ability arise mainly from differential course taking." Nor did they find that sex differences in mean SAT-M scores became significantly larger during high school as a result of "intensive social pressures" during adolescence. In other words, they reject the notion that these small sex differences at the upper range of performance occur because of intense adolescent sex-role socialization.

Although Benbow and Stanley fall short of linking this difference in mathematical ability at very high levels of intelligence with the biological fact of maleness and femaleness, neither do they link this difference to the socialization process during adolescence (though they do not discount early socialization), to a difference in course selection, to social class, or to gender-specific attitudes and expectations.

Recent findings show that the few accepted differences between males and females are disappearing. It is important to emphasize that significant cognitive differences in

intelligence and cognitive ability have never been measured,

though certain areas of slight advantage for each sex have

been identified:

> ...evidence from meta-analysis and process analysis
> indicate that (a) gender differences on cognitive
> and psychosocial tasks are small and declining, (b)
> gender differences are not general but specific to
> cultural and situational contexts, (c) gender
> differences in cognitive processes often reflect
> gender differences in course enrolment and training,
> and (d) gender differences in height, physical
> strength, career access, and earning power are much
> larger and more stable than gender differences on
> cognitive and psychosocial tasks. These trends
> imply that small gender differences in cognitive and
> psychosocial domains be deemphasized... (Linn and
> Hyde 1989, 17)

Although there is little support today for the "biology

is destiny" perspective, despite a century of research

evidence, the persistent grassroots conviction is that there

are essentially male and essentially female traits:

> ...parents -- particularly mothers -- believe in
> sex-stereotyped ability more strongly today than
> they did in the mid-1970s... (Keegan 1989)

It is far from unusual to read in the popular press that:

> Boys are competitive; girls are cooperative. Boys
> often prefer individual work; girls do better in
> groups. Boys seek leadership roles; girls are more
> willing to be led. Boys believe that they earn high
> grades, while girls more often attribute their
> success to luck. (Keegan 1989)

Note that the author uses a qualifier ("often") only

once, the rest of the time Keegan lists gender differences as

though it were an incontrovertible fact that <u>all</u> boys and <u>all</u> girls possess these traits. These newspaper quotations are important because they demonstrate the tenacity with which the general public equates females and males with sets of separate genderized traits.

In conclusion, the biological theory of gender is inadequate to explain the inability of researchers to identify or measure significant and unambiguous differences between male and female cognitive functions. Researchers who favour the biological explanation acknowledge that biology seems to have little impact on cognitive functioning (Leder 1985, 304). There do not seem, therefore, to be any innate cognitive deficits that may prevent female students from doing as well as male students in higher-level programming courses. Despite the fact that the debate continues today, this cognitive equivalence of male and female pupils has largely been accepted since the turn of the century (Hacker 1983, 39).

Maccoby and Jacklin and others have also cast doubt on the validity of genderized personality traits, including aggression, power, and nurturance. If these personality differences are vague, situation-specific, and inconclusive, then the argument that women are unsuited to the business world because they are biologically incapable of acting

aggressively is specious. Winter concluded that career-oriented women and career-oriented men exhibited the same power needs. He identified "few sex-differences in how this power is established, maintained, and expressed" (Winter 1988, 512). Consequently, it cannot be held that women do not want high-level computer jobs and, thus, are rejecting them or failing to pursue them. Similarly, it cannot be said that women are more nurturing than men, and hence ought to devote their lives to the domestic sphere. Maccoby and Jacklin have shown that, in specific domestic contexts, male nurturing behaviours can be equivalent to female.

It is evident that the biologically-based physical differences between males and females ought not to be a barrier to computer success: in fact, it may be argued that collectively women data entry clerks and word processing operators have spent more time physically seated in front of a computer workstation than male programmers and analysts during the past decade. Since the Industrial Revolution, women have endured long hours at the loom, sewing machine, or typewriter.

Finally, if gender is a function of biology and not a learned set of behaviours, it is surprising that this observer and others have been unable to identify specific male or

specific female behaviour patterns in interactions with the kindergarten computer -- unless a biological theory of gender presupposes a developmental approach, wherein the child becomes progressively more male or female as sexual maturity approaches. This student has not been able to locate such a corollary to the biological theory of gender in the literature.

Identification Theory

Identification theory states:

> becoming male or female occurs at one fell swoop,
> once the crucial identifying link has been formed.
> In addition, they assume that this global process
> does not require reinforcement." (Mackie 1983, 107)

Like the biological theory above, the identification theory does not rely on socialization. In other words, it is not a learning theory. Identification theory postulates that, rather than being a gradual process requiring observation, imitation, reinforcement, and so on, children acquire their gender role and identity suddenly. Once a gender identity is acquired, it is fixed for life.

Unlike the biological theory, identification theory posits that we are born "gender-neutral" and that it is only through identification with the correct parent that we become "masculine" or "feminine."

Identification theory supports the notion that men and women have their very specific lists of appropriate traits, acquired "at one fel‘ swoop" independent of learning and cognition. Furthermore, to an identification theorist, intervention during school years to develop "masculine" traits (computer competency, for example) will be a matter of too little, too late.

Identification theorists would lead us to anticipate that, at the time they first encounter the computer, children have already acquired their gender roles and traits. This implies that children as young as kindergarten age ought to be expected to display observable gender differences as they interact with the computer. As described in Chapter 2, such differences were not observed. Further, additional studies have confirmed the essentially androgynous nature of computer interactions (where gender-neutral software is used) at this early age (Chen 1986; Shaefer and Springle 1988; Shade et al. 1986)

As previously discussed, the large body of research reviewed by Maccoby and Jacklin refutes the existence of a gender-appropriate set of traits, capabilities, and behaviours -- whether acquired through the process of identification or biologically determined.

Social Learning Theories and Behaviourism

According to social learning theorists, individuals learn their gender roles gradually, "through the influence of a wide variety of models" (Mackie 1983, 108), because there are incentives from the external social environment to learn these roles.

Behaviourism, associationism, and hedonism are three key social learning concepts relevant to our discussion.

Behaviourism discounts all basis for action except observable phenomena (Mackie 1983, 108). Behaviourism is strictly non-cognitive: insisting that science "rid itself of psychic fictions" (Kratochwill and Bijou 1987, 139) like thought and feeling. To the behaviourist, Pavlov's dog did not salivate at the sound of the bell because it "thought" that the bell meant food was on its way: it salivated "auto-matically" because a stimulus-response link had been es-tablished.

John B. Watson, one of the founders of behaviourism, stated that "the human person was in fact a machine" that could be programmed to become anything that the scientist wanted the child to become (Ehrenreich and English 1978, 203-204): industrial worker, doctor, phobic, manager and so on.

In other words, the socialization process occurred completely outside the control or understanding of the child. The child would "automatically" or "unconsciously" perform behaviours, providing the correct stimulus and reinforcement were used, and take its destined place within the social order. Clearly, there are functionalist implications for Watson's theories. It is interesting, in terms of social maintenance, that Watson wanted to "control behaviour" rather than "explore consciousness" (Kratochwill and Bijou 1987, 135) and became a best-selling authority in the 1920s on child-raising methods.

Associationism refers to the stimulus-response link that is central to the behaviouristic notion of learning. Cognition plays no part in associationistic or stimulus-response learning, or operant conditioning. Individuals will display certain behaviours as a result of prior experience "automatically" like Pavlov's dog.

Hedonism sees the motivation for behaviour in terms of rewards and punishments. People seek rewards and avoid punishments.

These three concepts (behaviourism, associationism, and hedonism) provide us with a possible mechanism by which socialization "works": Supposing a little boy plays with a

Barbie doll. If his parents frown and take the doll away, chances are that next time he won't choose a Barbie but something completely different (a truck, perhaps). If a little girl elects to wear a pretty dress, her parents may smile at her and make a fuss over how pretty she is. Chances are, next morning the little girl will want to wear a dress again instead of a unisex jogging suit.

The social learning view of socialization has captured popular imagination (as evidenced by the newspaper articles quoted earlier) and is the model taught to CEGEP-level students in the following extract from a contemporary (1989) college textbook on sexuality:

> Very early parents reinforce the behaviours deemed acceptable to their child's sex with such remarks as "What a good, sweet girl!" or "What a big, strong boy!" accompanied by smiles and nods of approval and pleasure. There is no doubt that most, if not all, the forces of socialization in our culture... encourage different behaviours in boys and girls. The resulting sets of traits are what we call masculinity and femininity. (Greenberg 1989, 375)

Note the inevitability implied by the use of the adjective "resulting" in the final sentence: a set of specific feminine traits will result "automatically" or "unconsciously" because of early socialization. Women, in this view, passively accept their socialization into gender traits and roles: Women are acted upon rather than acting.

If women are avoiding advanced computer courses and high-level computer jobs, associationism might lead us to suspect that computer behaviour is not being reinforced or is even being punished. Traditional (some would say "male") reinforcements are good grades, money, status, power, approval, group affiliation, and so on. A social learning theorist might postulate that women may not be motivated by the same reinforcers that motivate men (though this argument has been refuted by Winter, above, for women who are high in the need for power) or that women are not reinforced by their reference group for computer behaviour to the same extent that men are. Indeed, this is a common belief echoed in the media for the enlightenment of the general public: "Girls generally do worse at mathematics than boys because... their teachers tend to **ignore** them" (Clare 1989), "When girls get to be junior high school age, it's **not cool** to be good at calculations or computation..." (Markoff 1989). The message is that female students are not being reinforced for their interest in math, science, engineering, or technology (<u>Grade</u> 1987, 4).

Operant conditioning ("the conditioning of operant behaviour wherein a consequent stimulus strengthens a class of behaviour on subsequent similar occasions" (Kratochwill and Bijou 1987, 138-139)) is central to the social learning

perspective on the learning of sex-roles:

> a viable explanation of sex role acquisition...
> [must demonstrate] that parents and other social-
> izers differently reinforce and punish boys and
> girls in accordance with sex-role standards. (Mackie
> 1983, 109)

Although social learning theory has a common-sense appeal
when applied to the unequal participation of female students
in high-level computer courses and occupations, it has been
criticized because, in fact, children do not learn through
stimulus-response (operant conditioning) (Mackie 1983, 110).
If they did, learning to speak would take forever. Addition-
ally, in contrast to the Greenberg quotation above, Maccoby
and Jacklin "conclude that the sexes are not trained very
differently when young," though "direct pressure to conform
to [social norms] increases as children get older" (Mackie
1983, 109-110). We have already seen that sex differences in
SAT-M mathematical ability did not seem to increase through
adolescence, which is presumed to be a period of intense sex-
role socialization.

These findings would seem to call into question social
learning theory's emphasis on the socialization into sex-roles
in terms of differences in reward-punishment for the sexes.
As observed at Northview, kindergarten children of both sexes
seem to be reinforced equally by parents, teachers, and peers

for computer use. Further, there is wide variety in child-rearing styles between families and it is quite reasonable to expect a wide range of parental support for computer use that is not divided along gender lines. Thus, the social-learning theory does not seem to account for the increasingly large difference between males and females in terms of later computer success -- though it is felt that during adolescence the reference group exerts the punishment of negative sanctions on female computer users who become too involved with the computer. (An interesting alternative viewpoint presented by female CEGEP students is the belief that the computer lab is a good place to meet boys: thus, computer involvement is encouraged.) It is moot whether the negative reinforcement of the peer group is severe enough to warrant withdrawal from computer involvement for this reason alone, if indeed such negative reinforcement exists. This is a promising avenue for further research.

Behaviourism was incorporated into the "naive psychology" of the general public in the 1920s via John Watson's Psychological Care of Infant and Child. There is a commonly-held assumption in behaviourism that individuals passively or unconsciously or "automatically" accept or are formed into their gender roles through socialization. Socialization is

seen as a process over which we have no control, that takes place in childhood and is thereafter cast in stone.

This non-cognitive view of the socialization process is unsatisfactory. Beyond the obvious question posed by those individuals (Mary Wollstonecraft, Ada Augusta Byron, Hester Stanhope, Grace Hopper, and so on) who did not passively accept their gender roles, there are those who feel that the philosophy (Skinner 1974, 3) of behaviourism negates human dignity and free choice. Human beings seem to be able to over-ride stimuli and act contrary to their self-interest: suttee was certainly contrary to the hedonistic self-interest of Indian wives, criminals are not deterred by the aversive stimulus of the electric chair, homosexuals come out of the closet, parents run into burning houses to save their children. Behaviourism neglects individual differences, personality, and personal autonomy. In fact, individuals "are not mere captives of the definitions of other people" (Shibutani 1961, 309) who will inevitably be socialized into their socially-sanctioned gender roles.

In our society, it is not unusual to encounter a mother who is also a computer programmer, as was one of the respondents to the Northview questionnaire. This seeming incompatibility of social norms for women and actual life patterns

is not so rare or shocking as to cause comment. Again, one is led to question the behaviouristic assumption in much of popular opinion that women are socialized into certain gender behaviour patterns that cannot be broken.

Cognitive-Development

The cognitive-development theory is currently the most popular perspective from which to study the socialization process, because of its emphasis on "internal mental processes" (Hilgard 1987, 422).

To the cognitive-development theorist, the learner strives to make sense of the environment "making choices, seeking out new roles, and deciding as well as being unconsciously induced to acquire new skills or alter behaviour" (Goslin 1969, 3). The entire socialization process is seen as a cognitive and active process rather than a passive ("automatic" or "unconscious") one. The child is perceived as socializing itself ("self-socialization" as envisioned by Kolhberg) to a great extent (Kohlberg 1966).

Gender is seen as one way in which the young child can organize his or her world. It provides an organizing category into which all children can fit and on which they can build an early form of identity (Kohlberg 1969, 431-432).

Through observation, the child builds a notion of what "boy" and "girl" means, or what is appropriate behaviour, dress, and so on for each sex: peers and the media are the primary reference group (Mackie 1983, 111-112), not parents (Bandura 1969, 215). The process is selective and reflexive: "Observers do not function as passive video-tape recorders which register indiscriminantly..." (Bandura 1969, 215 and 249-250).

Cognitive theories of socialization accommodate changes in the socialization patterns and acceptable sex roles because they allow the individual an active role in the selection and rejection of behaviours to emulate (Bandura 1969, 250).

The child is socialized into a gender identity because he or she is "motivated to match his behaviour" (Maccoby and Jacklin 1974, 364) to his or her idea of what a boy or a girl does. Kohlberg attributes this motivation to act in a gender-related way to the development and nurturing of a positive self image (Mackie 1983, 112).

Once a child has identified with the label "boy" or "girl," Kohlberg believes that it becomes inherently rewarding to act as a boy or girl, or use boy or girl things (Mackie 1983, 113). It follows that once the computer is seen to be used more often or more "energetically" by boys and once the

computer has taken on a "masculine" label or aura, boys would be increasingly more likely to use it. Computer use, for boys, would become intrinsically rewarding, as a "boy thing" or male activity. Computer use, when seen as a "boy thing to do," would be avoided by girls in the interest of their positive self-image.

As a footnote, it has been suggested that, since in our culture men hold a more powerful and higher-status position, it is more important for boys to avoid using "girl toys" than for girls to avoid using "boy toys" (Mackie 1983, 86).

Individuals do not develop their self-concept in isolation. The process of socialization helps form the self-concept, as do notions of gender (the question "who am I" can first be answered in terms of sex). The centrality of gender to self-image and the perception of socialization as operating under some degree of personal control will be further developed in a later chapter on symbolic interactionism.

A cognitive theory of socialization affords many insights into the process of sex-role acquisition. However, it leaves many problems unsolved: How, for example, do individuals radically change their behaviour later in life? Are small boys and girls treated differently enough to turn them either into masculine or feminine adults? How can a submissive

female undergraduate leave university with an M.B.A. to become a boardroom tyrant? How is it that two Marxist parents raise an arch-capitalist entrepreneur or two Baptists fundamentalists raise a Hare Krishna? How does one sister become a traditional wife and mother, while the other sister becomes a single heavy machinery operator? How is it that we, as parents, can sometimes sense a child's personality almost from birth and feel ourselves powerless to change it? Are we socialized into gender identity or into the popular mythology of the gender stereotype?

The centrality of gender to personal identity that Kohlberg postulates for young children seems to diminish, in many cases, as the child grows. This may be an argument for believing that the gender-centred self-concept is a developmental stage that may be outgrown. Perhaps this might be another avenue for future research.

In the following chapter we turn to two conflicting visions of the nature of women that have been used either to encourage women to enter the workforce or to encourage a re-evaluation and new appreciation of the traditional roles and traits of women in the home.

CHAPTER 5

CONFLICTING THEORIES OF

THE NATURE OF WOMAN APPLIED TO

GENDER INEQUALITIES IN COMPUTER EDUCATION AND EMPLOYMENT

As presented in the previous chapter, a century of research has failed to prove that there is either a consistent set of gender specific traits or that the cognitive functioning of men and women is significantly different. Yet it is obvious from the newspaper quotations in Chapter 2 that society at large accepts the so-called feminine traits as fact and believes that gender affects how one learns and how one thinks. It is for this purpose that two visions of the nature of woman are considered in this chapter.

Returning to the distinction between sex and gender noted earlier, this insistence on the non-physical dichotomization of the sexes despite the dearth of supporting evidence underlines the importance of the "set of beliefs and opinions about males and females and about the purported qualities of masculinity and femininity" (Deaux and Kite 1987, 97) which comprises the gender belief system.

The gender belief system, as it concerns women, is not monolithic but divided into two interwoven but distinct strands that form a leitmotif in feminist history. As noted earlier, these conflicting visions of women are termed, for the purposes of this study, sexual rationalism and sexual romanticism.

Sexual Rationalism and Sexual Romanticism

The sexual rationalist perspective, or sexual minimalism, argues in favour of absolute equality between the sexes-- almost to the point of interchangeability. Men and women, to the sexual rationalist, think the same way, "are naturally equal and ontologically the same." To the sexual rationalist, "it is pernicious to look upon a woman as a female first and a person second" (Donovan 1985, 17). Stereotypical genderized traits are seen as artificial products of a repressive society rather than inherent characteristics of males and females. Sexual rationalists work to "admit women into modern society on an equal footing with men," to "assimilate" women into what has traditionally been the world of men (Ehrenreich and English 1979, 20-21). There are no grounds, in the sexual rationalist philosophy, on which to base the widely-held notion introduced in Chapter 2 that men and women might

intrinsically have different computing styles.

In other words, from the sexual rationalist perspective, women's inequality in the computer world cannot be blamed on deeply socialized or innate feminine traits. Rather, this inequality has a variety of external causes: the social structure, hiring procedures, anti-woman sentiment in the business world, lack of female role models, and so on.

On the other hand, sexual romantics seek to "keep (woman) outside" (Ehrenreich and English 1979, 22) the world of men and maintain her status as the Other. The crux of the sexual romantic position is the difference between men and women in terms of the mutually exclusive sets of traits they possess.

> The "different voice" is part of a currently popular category of theories, sometimes referred to as cultural feminism... that argue for women's special and even superior nature... Such theories link personality traits, such as relatedness and nurturance, to female anatomy and generally hold that women's fulfilment is possible only through material love or various sublimations thereof. These views place maximal emphasis on sex differences... (Mednick 1989, 1120)

Sexual romantics reject science, the workplace, liberal education, and computer technology because they are masculine and anti-woman:

> ...this access to a male-dominated culture may equally be felt to bring with it alienation, repression, division -- a silencing of the "feminine," a loss of women's inheritance. (Belenky et al. 1986, 199)

A Sexual Rationalist Critique of the Sexual Romantic Vision of Woman

Despite the current popularity of the sexual romanticist positions taken by such feminist scholars as Martin and Gilligan, there is a lack of scientific support for the sexual romantic belief in a gender-specific set of traits.

However, sexual romanticism as a dogma (Webster's· "something held as an established opinion... a point of view or tenet put forth as authoritative without adequate grounds.") holds a central position in our culture -- whether or not a maximalist view of sex differences is "true" -- because it is closely related to the gender belief system:

> Despite evidence of considerable overlap and situational specificity of gender-related be-haviours, beliefs in sex differences are held tena-ciously. (Deaux and Kite 1987, 97)

> There has been an inclination to press an abstract dichotomization by sex on the natural diversity of humanity, ignoring variations within a group and reifying group differences as an attribute of persons. Male and female have been taken as opposite ends of a continuum, as discrete and non-overlapping categories, and as biologically defined traits rather than as socially constructed labels that carry a situationally variable degree of significance. (Hess and Ferree 1987, 12)

The conflicting perspectives of sexual rationalism and sexual romanticism can be traced back to the Industrial Revolution and the weakening of the traditional family

structure.

Sexual romantics rejected the "dark Satanic mills" of the productive sphere, condemned rationality, and cherished the notion that "the home will be that refuge, woman will be that consolation" from the workplace. Woman, to the sexual romantic, "is intuitive, emotional,... tender and submissive" (Ehrenreich and English 1979, 23). Women, being different from men, had the moral vision and maternal altruism needed to "clean up the corrupt masculine world of politics... [through] pacifism, cooperation, nonviolent settlement of differences, and a harmonious regulation of public life" (Donovan 1985, 32).

From the sexual romantic perspective, computers and the technological workplace are seen as hostile to women's interests and incompatible with women's traits.

Thus, women's inequality in computer education and employment is often attributed in the popular press to the way they use computers (The Gazette, no date; Markoff 1989).

That sex differences in patterns in computer use are rooted more in the artificial and changeable constructs (such as power relationships and sex roles) of the reproductive and productive spheres than in the biological feminine nature is not an issue to the sexual romanticist, but it is germane to

the sexual rationalist theorists.

The rejection of science and technology by women because they are seen as alien to women's traits and interests, and the rebirth of an anti-technological interest in the ecology, intuition, and the connection with the natural world has its roots in the sexual romantic rejection of the workplace and glorification of the home.

Evelyn Fox Keller draws attention to the conflict within contemporary feminism between the sexual romantic vision of science and technology, and the sexual rationalist vision:

> There is a growing voice among contemporary femin-
> ists reasserting the age-old dichotomy between women
> and science on the other hand, and the affinity
> between women and nature on the other... In opposi-
> tion to the coercive and manipulative relation that
> male science and technology have traditionally
> maintained to nature is offered a more sympathetic,
> intuitive, respectful, and loving relation -- one
> that recognizes the interconnectedness of all
> things... While liberals attempt to escape the
> belief system which identifies science as male and
> nature as female, the very same beliefs are being
> re-embraced by a number of feminists. (Keller 1983,
> 132)

This tension in contemporary feminist thought between the mutability and interchangeability of sex roles as socio-political constructs on the one hand (sexual rationalism) and the notion that there are essentially male and essentially female traits (sexual romanticism) is evident in both academic and popular writing.

Sexual romanticists are criticized for ignoring, in their research and analysis, the "relationships of domination and subordination in society" that must give context to women's own understanding and articulation of their experiences and effect what appears to be their "true nature" (Ackelsberg and Diamond 1987, 515).

In other words, data on which the sexual romantic vision of woman is based do not take into account, for example, that women's lack of aggression in board meetings may be primarily influenced by their status as token rather than by gender alone (Kanter 1987). In the same context, Winter (Winter 1988) and Parke and O'Leary (Maccoby and Jacklin 1974, 221) demonstrate that women and men are shown to possess the same traits if the situation is equivalent. Frequently, trait studies are conducted on a population of women who are not in powerful positions, simply because the structure of society places women in a subordinate position to men. Women, for example, may experience an equal need for power -- conclusions as to their need for power cannot be made based on statistics that show few women as top executives. The tautology legitimates itself: If researchers study women who are unequally placed in society, certain traits will be observed simply because they are the traits exhibited by individuals who

occupy subordinate positions and, in turn, these traits will be allocated to women by the researchers.

The sexual romanticists are also criticized for viewing "women" as a monolithic category with one set of traits, emotions, experiences, and behaviours. Martha T. Mednick refutes the sexual romanticists, emphasizing that "women's behaviour is a function of much more than a supposedly universal trait" (Mednick 1989, 1120).

Further, once a set of different traits and strengths has been accepted for women, Mednick fears that a logical progression would be to the functionalist argument that "since women and men want different things, they might best be suited for different work organizations... different family and social roles" (Mednick 1989, 1120). They may be encouraged, by their own sex, as well as by the so-called patrimony, to avoid "cold science" and the alienating, unconnected technological workplace in favour of staying at home and nurturing husband and children. The danger is that, once gender differences are accepted as real, women will cease to question and change the "artificial" sociopolitical constructs that bolster the sexist status quo.

In accepting the sexual romantic view of women as "closer to nature... more instinctive, intuitive, expressive, and

emotional... embody[ing] softness and things of the heart" and rejecting "things of the brain -- reason, instrumentality, and science" (Gailey 1984, 79), women risk cutting themselves off from the reality of the productive sphere and trapping themselves in the limited, unidimensional, stereotypical wife/mother role described in The Feminine Mystique (Friedan 1963).

Sexual romantics (Martin 1985; Belenky et al. 1986) reject so-called male-based education as anti-woman, and plead for gender-specific education. Historically, American Blacks have fought the status quo of "different but equal" schools: a fight that resulted in desegregation. A "different but equal" notion of education for women has always, in the past, downgraded expectations for women students and produced a gender-specific curriculum rich in typing and domestic science but lacking in the sciences and technologies, and university pre-requisites.

The popularity[6] of the sexual romantic notion of "different voice" is based on the grassroots conviction that stereotypical trait differences between men and women are

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[6]"Society is more open to Gilligan, Daly, and Chodorow's "evangelical notions about women as the more caring sex" than it is to "research reporting similarities between the sexes." (Gailey 1987, 83)

solidly grounded in reality (Mednick 1989, 1122). Bluntly stated, individuals believe that women as a category are more connected, nurturing, intuitive, and so on, than are men. No doubt individuals also believe welfare recipients are more lazy and less educated than workers; Orientals are more mathematically-minded and inscrutable than Westerners; and WASPS are more uptight and repressed than ethnics. To reify the feminine stereotype by building a philosophy upon it is to found that philosophy on dubious premises.

Although many sexual romantic theorists legitimize the traits and roles of the fading feminine cultural stereotype as appropriate and even essential for women, they are reluctant to tie these traits and roles to biology:

> it is possible that... having the biological attributes of a male or a female makes no difference to learning... ...no research has yet been done that shows conclusively that being female affects the way one learns. (Martin 1985, 19)

In the face of evidence that male and female cognitive functions are, in so far as can be proved after a century of investigation, identical, sexual romanticists (Belenky, Gilligan, and Martin, for example) persist in clinging to the gender belief system that provides the only rationale for the notion that males and females learn differently.

If gender traits and roles are not biologically "compul-

sory," but artificial and changeable constructs of the gender

belief system that can be modified or eliminated by changing

the male-dominated society in which we live, it follows that

sexual romanticism builds its conviction of a separate culture

on shaky ground.

> If the male-female difference is not in the genes,
> then the assumption is that it must be a matter of
> social environment; if this is the case, then the
> traits that we attribute to women and men must be
> seen as mutable. A change in socialization, or
> education, or social circumstance would produce
> different gender identities or no such identities
> at all. However, if gender identities and the
> cultures that go with them is historically a matter
> of social construction, then any political ideology
> based upon them, such as cultural feminism, seems
> less secure than if based upon an immutable con-
> struct such as biology. (Donovan 1985, 61)

If the "essential feminine traits and qualities" are not

genetically and hormonally produced, one is left with sociali-

zation as their source. As we have briefly seen in Chapter

4, a cognitive model of socialization does not rule out the

possibility of nonconformity to stereotypical roles and

traits, and makes it clear that socialization is not a

passive, unconscious, or "automatic" process. Though social

norms are most commonly adhered to, society is not homogene-

ous or monolithic. Neither are social norms stable over time,

or impossible to change. This theme will be further developed

in the following chapter, in which a symbolic interactionist

interpretation of gender inequalities in computer use and employment is suggested.

The history of feminism, like the history of so many other social movements, is a history of action and reaction, social change and social maintenance. Simone de Beauvoir, who at times echoes both the sexual romantic and the sexual rationalist perspectives, fears that "this renewed attempt to pin women down to their traditional role... that's the formula used to try and keep women quiet" (Mednick 1989, 1123).

Conflicting Visions of Women and the Workplace

Women are, on the one hand, being pressured to enter the workforce as equals. Sexual rationalists tell them that they are naturally equal and ontologically the same as men. Frustration at the inability to escape the lowest levels of the occupational hierarchy even with their rudimentary word processing knowledge can be seen from a conflict theory perspective: External (social structural) forces can be held accountable by sexual rationalists for women's lack of high-level occupational success. Since women and men are essentially "the same", male hegemony in the workplace must be responsible for keeping women out of powerful, high-status computer occupations.

The sexual romantic rejection of the workplace as "bad for women" explains and justifies women's lack of success in the computer world differently: Women are told that they cannot succeed in the productive sphere because their feminine nature renders them too emotional, uncompetitive, unaggressive, to fit into the workplace as it now exists -- so it is no longer frowned upon for women to accept subordinate roles as housewives and mothers in a male-dominated society. If men dominate the computer culture, the reasons lie within the nature of this "fundamental difference between men and women, their psychologies, culture, and value systems" (Donovan 1985, 184). Male domination of the computer world must be functional for society: indeed, as noted above, Mednick and others have criticized trait theorists for supporting conservative politics and bolstering the unequal status quo. If society is to change, from the sexual romantic viewpoint, it will be to reject male concerns utterly and orient itself toward nurturance and an ethic of care. Thus, women will radically change technology itself and reject that cold logical objectivity of what has been called "Nazi science."

Women are intrinsically oriented toward interpersonal relationships and the home, according to the sexual romantic

vision of the nature of woman, hence female education has been directed toward this end: Men are competitive and aggressive, hence their education has prepared them for a role outside the home in the workplace. Interestingly, one of the "computer moms" introduced an extraneous element of competition into the Northview kindergarten computer experience.

This division of labour along the lines of gender is not only functional for society: It is also functional for individuals, who will find fulfilment ("women's fulfilment is possibly only through maternal love or various sublimations thereof" (Mednick 1989, 1120)) in using their male or female traits within an appropriate setting.

Women, to sexual romanticists, have been avoiding the computer because of the essential incongruity or incompatibility of women and technology. Further, when women do involve themselves with the computer, despite this incompatibility, they favour software packages that emphasize creativity and personal development. "Programmer" is not an appropriate role for women: Women in programming jobs are felt to deny their essential feminine qualities and risk becoming "little men." "Procedural" and "scientific" thinkers are alienated from women's own natural mode of "maternal thinking" (Belenky et al. 1986, 201).

Sexual romanticists tie women to the primary role of wife and mother: It follows that women will not select demanding careers that call for a long learning process and internship. CEGEP-level women will enrol in interest courses to fill in the time before marriage, or the less-demanding vocational courses (like Office Systems Technology) that will allow them to work in an office, day-care centre, or hospital until they give birth. They will have some skills to "fall back on" after the children are in school.

In opposition to the sexual rationalist belief that education (and computer education by extension) leads women to self-respect (Wollstonecraft 1967, 201), a sexual romantic explanation would attribute computer inequalities between the sexes to the masculine methodologies in the classroom, where "the intellectual disciplines... deny the truly feminine qualities she does possess" (Martin 1985) and a curriculum that treats women as though they do not exist. In an environment where it is possible for women to be raped, shot, or otherwise brutalized by men (Martin 1985, 35-36; Menzies 1984, 60), it is not possible for women to attain equality or develop self-respect.

Belenky suggests that women distort their true nature in university, because schools only value the "masculine mode"

of thinking.   Instead of being interested in theories, abstractions, and logic, women are attracted to more concrete subjects that are grounded in experience.   Women want their abilities as learners to be confirmed by the teacher.   Women prefer competency-based programmes, where the teacher functions as a coach more than an authoritative teacher.   Women need useful information, "facts on child-rearing, how to dress for a job interview" (Belenky et al. 1986, 219), for example.

Sexual romanticists like Belenky, Martin, and Gilligan believe female students are unsuited to the classroom in general, and the technology classroom specifically.   However, when newspapers quote teachers and researchers as follows, it is not possible to know where trait theory begins and popular mythology about women ends:

> ...most girls [will not take] leadership roles...
> on their own...
>
> Women students are much less likely than their male
> classmates to feel confident about their preparation
> for and their ability to do graduate work.
>
> While many boys seem to enjoy the computer for its
> own sake... many girls seem to value the computer
> for how it can help them do what they want or have
> to do.   In other words, computers are often means
> for girls but ends for boys. (Keegan 1989)

According to sexual romanticism, women would avoid the challenging high-level computer programming classes in which computers are an end in themselves -- and enrol in word

processing classes, where computers are the means to produce neat-looking and potentially creative written work.

Observation at Northview kindergarten did not support the sexual romantic notion that female students are at a disadvantage in the classroom. At the start of the school career, teachers and computer volunteers are predominantly female. The classroom atmosphere is supportive, nurturing, and "home-like" and the teachers seem to make deliberate attempts to avoid sexism. The classroom, however, may become increasingly male-oriented as the school career progresses. This may provide some interesting avenues for further research and possibily illuminate the process by which female students come to avoid high-level computer interactions at the high school and CEGEP levels.

It is clear that educational institutions have a long way to go toward ensuring equal treatment for males and females. It is not the contention of this study to portray the current computer classroom as a welcoming, friendly, and supportive environment (for men or for women), although experience shows that it can be such a place. Although the "different voice" theory that urges the acceptance of a separate set of traits for women students suggests modifications to the existing pedagogical methods to increase female

school success (Menzies 1984, 60; Lewis 1987, 274-275) by making the classroom a more humanitarian environment, both genders will benefit because traits and learning styles are not divided along male-female lines.

However, the positive contribution of the sexual romantic perspective is outweighed by the negatives: By perpetuating the notion that women cannot succeed in the male-oriented computer lab, sexual romanticism is in danger of creating a self-fulfilling prophesy. In providing a rationale for dropping the "hard" sciences and technologies for what are seen as appropriate feminine areas of concern, sexual romanticism diminishes the value of the significant achievements of women in non-traditional occupations.

The sexual romanticism/sexual rationalism dichotomy is an appealing one. It seems to explain the conflict within current feminism and the history of the feminist movement; further, it expresses the ambivalence within the soul of every working mother who is torn between the two opposing visions of "Woman." An interesting course of future research may be to explore the relationship (if any) between women who hold to the sexual rationalist vision and the lifestyles they construct. It is tempting to speculate that these women will take on the challenge of the "sites of capitalist production"

while their sexual romanticist sisters remain at home.

As sexual romantic theories on the nature of women are frequently used to explain gender inequalities in computer use and employment, it is important to re-state the shortcomings of the sexual romantic perspective in this particular area.

First, as presented above, there is a lack of objective evidence that a separate set of gender traits exists apart from the non-concrete stereotypes "man" and "woman." Second, sexual romanticism is linked to political conservativism and male domination (Mednick 1989): certainly this vision of the nature of woman strongly suggests that women are intrinsically best suited for motherhood and the home, a notion many feminists find retrogressive and limiting. Third, although the irrelevance of the computer culture to women's role as .wife and mother may help to explain the lack of women in computer programming classes and high-level computer occupations, it fails to consider the relatively short period of a woman's life which is devoted to mothering today.

With an expected life span of over eighty years and an average of less than two children per WASP family, Betty Friedan and others have emphasized that child-rearing does not fill one's day optimally once the children are in school. In

addition, divorce is common today and women's life expectancy is greater than men's. Thus, many women will spend a significant number of years alone, as neither mother or wife. In 1984, 25.7 percent of all American families were one-parent families, of which the majority (22.9 percent) were supported by the mother (Maris 1988, 455-456). It is unrealistic, to say the least, for women to predicate their lives on the assumption that their only role will be that of wife and mother.

Perhaps the centrality of the wife-mother role may be more accurate for upper- and middle-class white women, but it is not the case for underprivileged minority women in the United States (Donovan 1985, 157) or the Third World:

> ...between 20% and 30% of households in the developing world are headed by women... who bear sole responsibility for their families' support. (Tiano 1987, 226)

It is true that young women seem to pick their careers based more on short-term expediency than on long term job security, status, autonomy, and salary. As mentioned in Chapter 2, few make the correlation between education and future "success," preferring to dream of marriage and lottery winnings. The sexual romantic vision of woman's nature ratifies this choice, but society does not reward it in view

of the statistical likelihood of marriage failure, childless-
ness, poverty, widowhood, and so on.

Forth, the statistics presented in Chapter 2 show that
the proportion of women in high-level computer courses does
not equal the proportion of men. The statistics do not show
that the male-based curriculum and male-oriented methodologies
criticized by the sexual romantics preclude the possibility
that large numbers of women can (and do) succeed in the
traditional computer classroom. For every anecdote offered
by Belenky et al. in support of the systematic alienation of
female students in the traditional classroom, there may be a
contrasting anecdote illustrating the success of a female
computer user within the same environment.

Thus, the conviction that women and computers are
incompatible seems less related to actual cognitive or
behavioral differences between the sexes than to the obliga-
tory separation of men and women into mutually exclusive
categories, each having its own appropriate abilities,
personalities, roles, props, and behaviours that is funda-
mental to the gender belief system.

The gender belief system ties men to science, technology,
engineering, and logic. It also depicts machines as ap-

on clear-cut differences, women and computers must be seen as incompatible despite the evidence that some women have achieved success in computer occupations.

CHAPTER 6

A SYMBOLIC INTERACTIONIST PERSPECTIVE AND INTERPRETATION OF GENDER INEQUALITIES IN COMPUTER EDUCATION AND EMPLOYMENT

Considering the limitations of the theories discussed in the previous chapters, this chapter outlines how the socialization process, analyzed from a symbolic interactionist perspective, provides us with a more comprehensive understanding of gender differentiation in computer use, education, and employment.

Computer behaviour and choice of computer courses cannot be seen purely as a function of gender and age (or class and race, should these be the categories under consideration). It is misleading, if not inaccurate, to state that as females mature they avoid interacting with the computer in an empowered way. A whole series of meanings, including definition of the self and definition of the situation, must be taken into consideration from the CEGEP-level student's point of view.

The question, "How do people conform to norms?" can be seen as a question of control. Successful socialization is

often depicted as "internalizing social controls over be-
haviour" and social stratification theories depict the self
as "a vehicle of social control" (Hewitt 1976, 60).

As illustration, preschool boys with "feminine" behaviour
patterns were seen (as recently as 1980) as representing the
failure of the socialization process (through the mother's
behaviour) to inculcate "correct" masculine behaviour and
control the tendency toward what was seen by the researcher
as feminine behaviour (Cahill 1987, 87-91). In other words:

> When... conduct fails to be appropriate to a role,
> mechanisms of social control will come into play -
> - people will be sanctioned for their departure from
> the norms and efforts will be made to resocialize
> them. (Hewitt 1976, 170)

However, the symbolic interactionist viewpoint emphasizes
that although socialization and the social structure may shape
behaviour patterns and mould self-conceptions in a general
direction, the socialization process is not perfect -- indeed,
it is largely problematic. Socialization does not produce

> selves that work perfectly to control behaviour, so
> that the normal individual is viewed as one who is
> thoroughly pliant in the face of others' expecta-
> tions. ...individuals are never perfectly com-
> pliant, and socialization is never so complete.
> (Hewitt 1976, 60)

In the above example of "feminine" boys, a more valid
analysis may lie in the assumptions of meaning held by the
researchers about the categories "masculine" and "feminine"

than in seeking a mechanism of control over the individual.

Individuals, according to the symbolic interactionist
perspective, are not created by "autonomous" (Hewitt 1976,
151) roles, institutions, and social structures: rather, these
systems and mechanisms are constantly re-created anew by
individuals. Although structuralist theories present the
social order as determined by societal forces outside the
control of the individual, the symbolic interactionist (Mead
1934, 262-263) believes this deterministic viewpoint is in-
adequate when applied to the observable reality: Order is the
result of

> people's self-conscious efforts to produce order...
> bargaining, negotiation, deliberation, agreements,
> temporary arrangements, deliberate suspension of the
> rules. (Hewitt 1976, 151)

Symbolic interactionism is · a social psychological
perspective that combines psychological theories of the
individual with sociological theories of group behaviour. It
is concerned with the behaviour of individuals and groups, and
seeks to relate the macro-level patterns in social organiza-
tion to the individual. The emphasis is on the creative,
dynamic, problem-solving individual who is capable of shaping
his or her own self-concept through interaction -- and,
perhaps, even capable of changing society (Mead 1934; Hewitt
1976; Deegan, 1987; Shibutani, 1961).

Symbolic interactionism sees the socialization process as less rigid and less under the control of the socializers than does the cognitive-development theory of socialization. Symbolic interactionists describe socialization as "a fluid, shifting relationship between persons attempting to fit their lines of action together into some workable, interactive relationship" (Denzin 1977, 2).

Socialization continues through the life-span and involves much thought, internal debate, active negotiation, and problem-solving on the part of each individual. People build their own self-concept, values, and goals through interaction: these are not structurally determined, "whereby the values and goals of social systems are instilled in the child's behaviour repertoires," but "negotiated and potentially problematic in every interactional episode" (Denzin 1977, 2-3, 10).

Symbolic interactionism rests on the foundation of a complex notion of identity that sees individuals as influenced by others and by their social environment (Mead 1934, 156), but fundamentally in charge of and responsible for their own self-creation. Individuals are capable of constructing an identity that is strong enough to allow them to withstand all the pressures society can bring to bear:

A person may reach a point of going against the

whole world about him; he may stand out by himself over against it... We can reform the order of things... We are not simply bound by the community... We are continually changing our social system in some respects, and we are able to do that intelligently because we can think. (Mead 1934, 168)

Indeed, to the symbolic interactionist, "routine conformity is... rare" (Hewitt 1976, 65). Thus, symbolic interactionist studies include such atypical phenomena as female doctors and policewomen, battered women, transsexuals, and an automobile repair shop run by lesbians -- life experiences that go against the norm and that other social scientists may have studied as failures of socialization because their lives have not mirrored social norms. These women and men are shown as creating a viable, though sometimes painful, alternate lifestyle despite the sanctions imposed on them by some members of society (Deegan and Hill 1987).

Self-Concept

The notion of the construction of one's own identity, as elucidated by George H. Mead, Erving Goffman, and others, suggests that the different roles individuals play in life carry with them different expectations of behaviour and necessitate differing perceptions of the self, both by the individual and by others. Even if individuals have been socialized into the traditional feminine role and traits,

these roles and traits may be defined as irrelevant or destructive when the primary identity or master status (Hammond 1987, 141) is "intellectual," "business woman," or "systems analyst." Instead of merely accepting our gender roles, individuals try to come to an understanding of what is expected of them by others and try to make sense of conflicting demands by referring to their past experience, reading, conversations with others, and so on (Hewitt 1976, 74).

Conflicting or non-congruent roles (for example, "woman" and "intellectual") at the beginning of adulthood may be resolved, at this time of intense sexual and social pressure to acquire a sexual partner, in favour of what is perceived by the actor to be the socially acceptable feminine role. Betty Friedan presents this point of view in The Feminine Mystique: she, herself, was an intelligent female student who left academia for marriage in her early twenties. It ought not to be supposed that CEGEP women value "a boyfriend" more than they value academics because they have been socialized to prioritize their values in this way, or because they are discouraged from pursuing academics by the anti-female classroom dynamics referred to above (Lewis 1987). For example, women medical students have developed strategies to "align their actions with cultural norms" and arrive at a

self-concept that makes these gender-specific experiences, goals, and values irrelevant (or even complementary) to their course of studies and self-concept (Hammond 1987, 141-148). Thus women manage to break through typical role expectations.

The value that CEGEP women place on the traditional wife-mother role is not completely dependent on gender socialization or outside pressures to conform to social norms, although it may be influenced by these forces. Rather, symbolic interactionism allows us to see that values are derived through realistic reflexive analysis of the individual's life goals and perceived opportunities. As Anderson points out, it is an error to cast housewives as victims and think that all women will be feminists, "once they have seen the light" (Anderson 1987, 188-189). Similarly, CEGEP women may be "buying in" to the feminine gender stereotype because they have valid reasons to buy in, over and above abstract notions or forces (like the patrimony or capitalistic oppression).

It must be emphasized that many women who opt out of training for high-level computer occupations will receive "many of the benefits of a system of unequal privilege and economic inequality" through marriage, that they could not realistically have hoped to attain in the workforce:

> For most women in the paid labour force, work has meant low wages, low prestige, and little in the way of work satisfaction, autonomy or creativity.

> As long as these conditions remain, it is little
> wonder that women... will prefer traditional roles
> of homemaker and volunteer (Anderson 1987, 188).

Newspaper articles demonstrate that our society sees high-level computer occupations as unusual for women, but it ought not to be concluded that these occupations are socially unacceptable or viewed as deviant. Deviance, to the symbolic interactionist, implies behaviour that is "personally dis-creditable" (Hewitt 1976, 206). Mead strongly believed that our society values individuality, which he defined as "departure from, or modified realization of, any given social type," (Mead 1934, 221) even during the 1930s. Non-traditional occupations for women are not excluded from the realm of possibility in today's society, even though they are commonly (or stereotypically) labelled "masculine." According to Hewitt, "by and large, people resist... the labels others seek to apply" and see themselves as "problem-solvers in a malleable world, not as victims of a fixed reality" (Hewitt 1976, 11, 232).

In view of the fact that the majority of female students will probably occupy traditional feminine jobs in service to male managers; have little confidence in themselves as learners; and are in a pink-collar ghetto at CEGEP; it would not be surprising if:

> ...by acquiring an image of themselves through their

interaction with others as academically incapable, the pupils learn to see those occupations that require some form of educational qualification for entry as beyond their reach. (Persell 1977, 166)

Using the symbolic interactionist perspective, it is not difficult to hypothesize that these under-achieving female students may choose their programmes of study and their future careers based on what they consider to be appropriate sex-role stereotypes. However, women can succeed in going against the norms but it requires a strong self-image as a competent learner and achiever to persist in a rigorous, non-traditional course of study. It has convincingly been argued that more effort is required for a woman to succeed than a man (lack of rapport with male teachers, lack of "male bonding" support groups, lack of interest in "sexist" hazing (Gazette, January 13, 1990), lack of familial support, and so on). The low-achieving women in Office Systems Technology may be unwilling to put out the effort required to succeed in school, because they are "afraid of the costs of making the necessary... changes, of the disruption of their highly predictable world" (Maris 1988, 169).

If these women cannot hope to succeed as managers, programmers, doctors, or engineers, there is another route. The female stereotype equates secretary with women -- "The gender expectations for female workers include low-status jobs

without power, such as secretaries, elementary school teach-
ers, domestics or social service workers" (Maris 1988, 173)
--and Office Systems Technology provides an updated secretari-
al training. Office Systems Technology is a "sure bet" for
female students with poor academic records because the only
serious qualification is gender.

Typifications

Social scientists and psychologists are not certain what
impact the male and female stereotypes have on our behaviour.
Stereotypes may be the "schemata" or "provisional theories"
that J.D. Hirsch described as "surface elements [used] to
stand for larger wholes" that human beings use to organize
both cognitive constructs and the concrete world (Hirsch 1988,
54-55), having very little direct influence on behaviour. Or
stereotypes may be "cognitive shortcuts" that do affect social
interaction (Deaux and Kite 1987, 97-98). Or stereotypes may
be the templates that regulate our every thought and action.

It is certain, though, that the stereotypes are changing
and increasing in number, "The gender belief system is
peopled with many different types of women and men... sex
object, career woman, housewife, and athlete..." (Deaux and
Kite 1987, 102). Presumably, there are parents today who

consciously attempt to socialize their daughters into the career woman stereotype. Some social scientists believe that the male hegemony is being re-evaluated and may even be in a weakened state under siege by ethnic, racial, and gender minorities (Hewitt 1976, 176).

Women who have observed other women in non-traditional roles and have themselves had the opportunity to experiment with alternative roles may be less inclined to take their functionally preordained place in the social order and less likely to become

> a patient druge, who fulfils her task, like a blind
> horse in a mill, [and] is defrauded of her just
> reward..." (Wollstonecraft 1967, 113)

Many sexual rationalists believe that the accuracy of the traditional feminine stereotype can "be disconfirmed by the actions of a target" and that "this disconfirmation feed[s] back to the original belief system" (Deaux and Kite 1987, 106). Intuitively, this seems to be the case for many women who rejected their mother's teachings and pursued a lifestyle in opposition to the traditional woman's role. It provides a persuasive argument for the presence of confident female teachers in the computer classroom, and the introduction into the curriculum of a wide variety of possible feminine roles, modes of behaviour, and occupations.

Additionally, though we may at first react to another human being as a member of a stereotyped group, upon prolonged acquaintance there is a tendency to get past the stereotype to a more realistic assessment of the person's capabilities and traits. This argues for the potentially liberalizing impact of women computer teachers on male, as well as female, students. If boys see women in positions of control and authority vis-a-vis the computer, this may produce a more open and broad-minded conception of female capabilities, traits, and roles.

Interestingly, it would seem that if the gender stereotype tends to affect our behaviour earlier in life, before we have a fully-developed sense of our own identity, young girls in kindergarten ought to demonstrate more of a tendency to act in a stereotypical way (rejecting the computer as a male domain) than young women in CEGEP. Kindergarten boys ought to have stated that "computers are more for boys" in the interview situation, if influenced by the gender stereotype. This clearly was not the case in the observations at Northview.

Our analysis using symbolic interactionism gives us the insights that allow us to break through the barriers that prevent the possibility for social change in gender differen-

tiation and computer education. Socialization cannot be thought of as a linear, homogenous process (Masters et al. 1985, 197). Nor is socialization a finite process which takes place in childhood and adolescence and is then cast in stone. Individuals are constantly adjusting to new environments and, in adjusting themselves, they change the groups within which they function (Mead 1934, 215). Mead depicted individuals as constantly evolving, with the potential for improvement (Mead 1934, 386).

If the biological, identificatory, and social-learning theories are rejected in favour of a symbolic interactionist interpretation of socialization, it follows that some element of will and personal choice, at least at some point in the life cycle, must be incorporated within the interpretation of gender differentiation (Anyon 1987, 334).

Interestingly, studies have shown that mature women -- even those socialized into the stereotypical role expectations of an earlier time -- experience a growth in perception of learning ability and intellectual self-esteem through their late thirties and early forties (Mackie 1983, 84; England and McCreary 1987, 292).

A symbolic interactionist emphasis on the interactional aspects of socialization theory focuses on the influence of

personality, motivations, environment, maturity of the in-
dividual (Mackie 1983, 84), and individuality on the social-
ization process may encourage women to pursue their computer
interests and other interests labelled "masculine:"

> ...the awareness of change and inconsistency within
> individuals as well as between them has rendered
> traditional theories of socialization based on
> assumptions of internalization and compliance
> obviously inadequate... Recognition of how people
> do not become what they are expected to be has
> produced growing criticism of functionalist ideas
> embedded in the concepts of "sex role" and "social-
> ization." (Hess and Ferree 1987, 14)

During the lifespan, individuals evolve many roles:
"There are all sorts of different selves" (Mead 1934, 142).
Some roles are congruent and some are disparate, resulting in
conflicts both external and internal. In recognition of the
complexity of society, in which a woman may play the roles of
wife, mother, daughter, employee, intellectual, friend,
mentor, revolutionary, and capitalist entrepreneur all at the
same time, it is possible that the stereotypical female role
may have little to do with her self-concept.

Because women have been socialized into the role of wife
and mother and into the so-called feminine traits, it is not
necessary to conclude that this past experience will have a
detrimental effect on future development (Goslin 1969, 10-11;
Mackie 1983, 84). Nor does early socialization negate the

possibility of later reorientation because:

> [the] gender model include[s] ambivalence, conflict,
> and rebellion... Gender is constantly being reneg-
> otiated and reconstituted. (Hess and Ferree 1987,
> 16-17)

Previous chapters viewed gender inequalities in computer education and employment as logical and inevitable, given the tenacity with which male interest groups control the workplace, the damaging effects of gender socialization, and the inherent female traits that stand in opposition to technology. The weaknesses in social structural theories and theories of gender differentiation explicated above are answered through applying the symbolic interactionist perspective.

Symbolic interactionism allows us to interpret the socialization process in a way that undermines the deterministic cause-effect relationship between early inculcation of the female stereotype and development of the self-concept. It is unnecessary to conceptualize the individual as, of necessity, internalizing the limiting social norms for women when the socialization process is seen as fluid and the individual is seen as a responsible agent in building the self-concept.

Unlike the sexual romantic theory of the nature of woman, the symbolic interactionist perspective allows individuals to break through the artificial constructs of a patriarchic

society and consider alternative behaviours and lifestyles to the stereotypical. In addition, the symbolic interactionist perspective presents the notion that change is inevitable and the result of individual interactions: this is a powerful statement of individual potential and social liberation (Mead 1934, 389).

Social structural theories, theories of gender differentiation, and the sexual romantic vision of woman point to the failure of women to achieve numeric equivalence to men in high-level computer occupations and draw the conclusion that women are destined to be unsuccessful in the computer milieu.

To the symbolic interactionist, however, the success of individual women (however few) confirms the possibility of change and underlines the possibility of achieving computer success despite social structural, familial, and other barriers.

As this study progressed, the literature and primary data acquired through interviews and in the classroom demonstrated that failure to achieve in the computer field is frequently attributed to early socialization into the feminine gender traits and roles. The deterministic belief that acts of the will are controlled by antecedent causes in the sense of being predetermined ("to impose a direction or tendency on before-

hand", "foreordain", "predestine" according to Websters') is
bad for women. The notion that social norms are forcefully
imposed on individuals does not encourage women to experiment
with modes of self-expression alternative to the feminine
stereotype. As George H. Mead makes clear, "individuals are
influenced by others and tend to act in accordance with broad
patterns of behaviour but are ultimately capable of self-
determination and must be held responsible for their own
acts" (Mead 1934, 156).

Symbolic interactionism is a perspective, almost a
philosophy, that stands in contrast to deterministic inter-
pretations of the individual. Its optimism about the human
condition and its emphasis on the controllability and mal-
leability of social institutions and structures echoes the
notion that women are free to a significant degree to es-
tablish their own destinies.

As for the young women who graduate from Office Systems
Technology to fill the easily-found job openings in undemand-
ing clerical and secretarial positions -- a symbolic interac-
tionist perspective leads to the conclusion that they have
made a reasonable, rational, and (in many cases) well thought-
out decision in view of the present reality of woman's
situation.

CHAPTER 7

CONCLUSIONS: TOWARD ENSURING

EQUAL ACCESS TO COMPUTERS BY FEMALE STUDENTS

This study was undertaken to analyze and critique the most commonly cited theories (social structural theories, theories of gender differentiation, and theories of the nature of woman) offered in support of women's subordinate role in computer education and employment.

Essentially, the study "bends" these existing theories in an attempt to explain why female computer behaviour seems to "deteriorate" between the kindergarten and CEGEP, and to explain why recent progress toward a more gender-neutral schooling has gone far toward helping female students to obtain equal access to computers in the classroom but has not led to equal outcomes in terms of occupation for male and female students.

As stated in Chapter 1 of this study, most research into gender inequalities in computer education and employment has been oriented toward either proving the existence of these

inequalities or toward drawing attention to the prejudicial practices that work against female computer success both in the classroom and on the job.

At the kindergarten level, it was observed that there were no overt gender differences between male and female interactions with the computer.

Indeed, observation and research confirm that as the grade level increases so do the differences between male and female computer interactions. At the high school level, gender differences in math, science, and technology course selection and capabilities are well documented. At the CEGEP level these differences are even more pronounced.

Thus, despite a fairly equivalent and gender-neutral introduction to computers in the early grades, in practice female students seem to be passively steered (perhaps by socialization, by sexist academic advisors, by parental pressure, by lack of math prerequisites, by affiliative needs, or for any other of a myriad of reasons sociologists and naive observers have suggested to explain this phenomenon) toward the less academically challenging office systems management course of study, leading to a clerical or secretarial career.

Social structural theories were seen to provide the social scientist with some illuminating paradigms of articula-

tion between the sites of production and the educational system. The close relationship between the needs of the labour market for part-time and temporary computer input employees to fill low-level, routinized, highly supervised office occupations and the role of the educational system in directing female students into word processing and data entry courses of study cannot be denied. However, social structural theories do not provide details of the mechanisms by which female students are led to accept their destination at the bottom of the occupational hierarchy. Nor do they allow that, despite male dominance, it is not impossible for women to obtain high-level employment in the computer field.

Further, the macro analysis of patterns and relationships between groups (those who control the means of production and those who train future workers, for example) and institutions neglects the individual and the individual's thought processes, and the complex relationship of the individual to the larger social structures (Hewitt 1976, 5).

Theories of gender differentiation also shed some light on the process by which individuals seem to acquire common behaviours, motivations, and emotions. Yet, theories of socialization seem to deny the richness and individuality of actual human behaviour. Socialization theories depict the

individual as meekly accepting "appropriate" social roles and passively conforming to internalized gender stereotypes. However, the life experiences of many women systems analysts, programmers, telecommunications specialists, and so on support the notion that socialization into a traditional feminine gender stereotype is neither homogeneous, inevitable, nor finite.

Two opposing visions of the nature of "woman" have been examined. Sexual romanticism is grounded in that vision of woman that rejects the scientific and rational working world for the nurturing and intuitive world of the home. Yet, as critiqued, this vision is not accepted by all feminists nor is there scientific evidence to support a belief in a separate set of female traits consistent across situations and independent of the subordinate position women currently occupy in our society. There is little factual basis for, and divided philosophical opinion on, the notion that women, by nature, are incompatible with computer technology.

It is argued that a symbolic interactionist interpretation of gender inequalities in computer education and employment provides a more dynamic view of the phenomenon.

As George H. Mead makes clear, individuals are influenced

by others and tend to act in accordance with broad patterns of behaviour, but are ultimately capable of self-determination and must be held responsible for their own acts and cognitions.

Critics of the symbolic interactionist perspective believe it neglects the structural forces of society. However, an individual brings the knowledge of that individual's world (including the larger social and institutional forces), as he or she knows it, to the classroom and this knowledge has an impact on the individual's cognitions and behaviours. Further, upon graduation, the individual must struggle to make sense of the new environment in which that individual has found himself or herself. The entry of the individual into employment poses a new set of problems with which the individual must come to some working arrangement. In the same way that the individual is affected by the marketplace, so the individual affects the marketplace. Symbolic interactionism depicts a dynamic interchange between the individual and the groups with which the individual has dealings.

Symbolic interactionism suggests the inevitability of change. As individuals may be changed by groups and institutions, so may groups and institutions be changed by the in-

dividual. The possibility for change inherent in the symbolic interactionist perspective provides the theoretical impetus for practical classroom implementation of a wide variety of interactionist strategies that may increase opportunities for the development of a female "self" that is not incompatible with computer technology.

Recommendations for Further Research

This study indicates a need for specific research that illustrates the possibility for change given the present educational structure. Existing research is grounded in limited conceptual frameworks that do not account for the increasing need for educational and social change in a growing technological society. It can be argued that computers are a means to an end, as are the politics of gender, bureaucratic control, and routinization of work. The body of educational research does not address this very serious problem of labour stratification exacerbated by science, technology and, in this case, computers. If unaddressed, the problem of gender differentiation in computer education and in the labour force will simply compound the ongoing problem of social inequality.

This study used data derived from research influenced by

specific ideologies. It is important to collect original data that is not "borrowed" from possibly biased studies. There is a lack of data for example, on women who are high-level computer users or who use the computer in non-stereotypical occupations.

Research ought also to be directed toward exploring the connection between the female stereotype and the self-concepts of "a-typical" women. Why, in other words, do some women reject the female stereotype while others embrace it?

Until a research base has been established, however, recommendations for further action may be made: although it must be stated that these recommendations are in the nature of "tinkering" with the existing system, rather than eliminating large-scale social inequalities.

Strategies for Social Change

An important first step toward large-scale change may be to promote awareness that women are being channelled into low-status, low-paying computer jobs and to make explicit the necessity for female students to plan for a significant number of years spent within the labour force. Women's roles as worker and mother ought not to be seen as mutually exclusive, but as complementary roles that may assume greater or lesser

centrality depending on the stage of the life cycle. In the 1960s, this iconoclastic process was termed "consciousness raising".

Curriculum changes are necessary. Curriculum changes can take the following form: Compulsory higher mathematics courses at the high school level would counter the present tendency of female students to drop out of mathematics (despite their competency in this field) as soon as permitted. Thus female students will not be ineligible for career training in the sciences and technologies, which still insist upon a higher mathematics prerequisite.

A computer in every kindergarten classroom would provide early and relatively gender-neutral exposure to computer technology and develop female students' self-concept as a "computer-competent learner". Follow-up studies may demonstrate that this confidence may carry over into career choice at a later stage.

Compulsory computer keyboarding courses will increase computer confidence and efficiency of keyboard input of both genders and counter the gender stereotype of typing as "something women do". Applications software (word processing, in particular) must receive at least the same emphasis as programming at the elementary and high school levels to ensure

that the maximum number of students develop an interest in the computer and a broader understanding of its capabilities (notably in the area of visual and verbal self-expression).

The personal computer is a "toy" commonly seen in middle-class homes: toys acquire gender labels very early in the child's development. With the popularity of male-oriented computer games, it is doubly important for girls that they obtain early experience with computer success using the (for example) gender-neutral Muppet Babies and Sticky Bear software in the Northview classroom. Sexist, violent, or gender-specific software has no place in the elementary and high school computer lab. Once the computer has been labelled a "boy's toy" it is inevitably deemed inappropriate for girls.

Although a symbolic interactionist perspective emphasizes the individual's personal freedom to assert the self in opposition to perceived social norms, a revised curriculum may make it easier for all women (not only those with a strong sense of self) to take advantage of educational opportunities in non-traditional areas.

Familial changes: Today, working mothers are not atypical. They bring their experiences in the workforce to bear on the problems of childrearing, and they open their children's eyes to the possibilities of other lifestyles.

Those kindergarten parents (nine out of a total of thirty-nine) that responded to the questionnaire in Appendix A were aware that women have not achieved equality with men in the workforce, specifically in the computer world. Many parents of both sexes actively sought to promote their daughters' computer literacy, for example buying a home computer, joining a parent committee on "computer literacy", or taking computer courses themselves. At Northview, the "computer moms" provide influential role models for female computer success. At the high school and CEGEP levels, female guest speakers in high-level computer occupations may help reinforce the conviction that women can succeed in the computer world.

Changes in classroom dynamics: Books like In A Different Voice by Carol Gilligan and Women's Ways of Knowing by Mary F. Belenky et al. are bringing to the attention of educators the idea that female students may have gender-specific problems in math, science, and technology courses that male students do not have. Although, as discussed, there is a lack of evidence to support the existence of a discrete set of feminine traits, these books make a positive contribution by sensitizing the educator to the possibility of sexism in the classroom and provide thought-provoking and controversial subject matter for the pedagogical workshop circuit.

If even some women have learning styles and modes of existence which are alien to the so-called male world of rationality and logic, perhaps it may be necessary to encourage female participation in a series of separate, gender-segregated courses taught differently from the traditional courses.

Many universities, Concordia included. offer workshops and special sections of math courses for math-phobic students, which are usually women. The Women's Y offers courses demystifying the computer alongside courses in home repair for women. Graduates of these courses may, perhaps, continue to learn side-by-side with men in a more traditional computer classroom, no longer at a disadvantage.

Significantly, five years ago the emphasis in computer science classes shifted radically from BASIC programming to the use of applications software packages (WordPerfect, Lotus 1-2-3, dBase, Ventura). This philosophical departure severed the intimate connection between the computer and mathematical logic. To a small degree, it may also have "liberated" the computer from the gender belief system that categorized it as a masculine concern.

As has been attested by Sandra Harding and others, mathematics has long been an alien world for women. Cutting the

math/logic link has, in some schools, freed women to participate in the computer revolution without a high school advanced math prerequisite. The emphasis in applications software packages on data and text entry also provides a reassuring basis for women to build on -- for the keyboard is the primary medium for both data and text entry, and women have a long history of keyboarding competency.

Some of the women who enrol in an introductory word processing course at the high school or CEGEP level transfer to the computer science program shortly thereafter. Once these women have mastered the computer keyboard, they achieve a level of confidence in their computer skills that allows them to overcome their fears of venturing out of the traditionally feminine courses.

There are a number of ways teachers may address the problem of gender inequalities in a practical way within their own computer classrooms and computer labs. Experiential and co-operative learning models are being encouraged at the CEGEP level; peer tutoring and family groupings at the elementary level are being suggested as more "natural" methodologies for dealing with female students than the traditional lecture method. Both strategies can be imported into the computer classroom with little effort and provide alternatives for all

students, both male and female, with learning styles and strengths that do not fit the traditional lecture mode.

Changes in the workplace: Affirmative action programs in the United States have helped promote integration and success of blacks and other minorities in the workforce. In addition, they have helped recruit and employ ethnic minority teachers. Similar programs have been suggested by such bodies as the Canadian federal government and Quebec teachers' unions, yet have remained a theoretical possibility only. Regardless of one's position on affirmative action, it is difficult to argue with the positive impact female role models such as women computer teachers have on encouraging female students in non-traditional occupations. Such role models provide concrete evidence that women do succeed in male-dominated fields, many without denying their roles as wife and mother.

Government-sponsored programs like ACT (Access to Careers in Technology) offer unemployed women the opportunity to acquire training in non-traditional careers (for example, programming, drafting, CAD/CAM, truck driving) while continuing to pay their UIC benefits, childcare, and transportation costs. This initiative brings mature female students into the CEGEP computer lab where they can mix with younger students

and provide dramatic evidence that education, technology, and familial responsibilities are not incompatible.

ACT programs (Appendix B) are addressing the problem by increasing women's exposure to the new technologies and training future role models in these new fields. Women are encouraged to think of themselves in different roles from the stereotypical ones of secretary, clerk, nurse, daycare worker, and so on. Successful graduates of the ACT program have been highlighted in the press and demand for participation in the program is growing.

Statistics offered by the Bureau de la coordination a la condition feminine suggest "a high degree of satisfaction" among women engaged in non-traditional labour, and it is thought that by moving women into the non-traditional, non-clerical and non-secretarial computer jobs female wage discrimination may end.

The lack of observed overt differentiation at the kindergarten level between a) girls' and boys' success in manipulating the computer program, b) girls' and boys' success in naming the parts of the computer, c) girls' and boys' enthusiasm to use the computer, and d) girls' and boys' physical and verbal interactions with the computer; and the progressive, tolerant, and feminist attitudes revealed in

parents' answers to the Northview questionnaire (Appendix A) seem difficult to reconcile with research indicating that children anticipate that they will grow up to hold jobs within their appropriate sex stereotype by an early age (England and McCreary, 1987, 290) and with statistics revealing that one third of all employed women work in the clerical/secretarial pink-collar ghetto (Ferree 1987, 328). Even women who are promoted to management and administration positions earn only 54.9 percent of what men in the same positions earn and "very few women ever get to be top administrators or corporate executives" (Maris 1988, 174).

Despite the inequalities in the labour force, there are opportunities to develop a pragmatic implementation of educational policy for change through curriculum and classroom interaction patterns. Despite the view advanced by social structural theories and theories of gender differentiation, a symbolic interactionist interpretation of the socialization process allows for the possibility of creating change at the classroom level.

APPENDICES

APPENDIX A

Questionnaire Responses

Of thirty-nine questionnaires distributed, only nine were completed and returned. All of the questionnaires had been filled in by mothers. Only one was the parent of a kindergarten girl, the others were parents of kindergarten boys. This may, or may not, have to do with previous studies which have reported "greater parental encouragement" given to males for computer work (Chen 1986, 272).

As with the informal observational study, the value of the responses received is largely anecdotal. Obviously, the parents who responded to the questionnaire were those who were willing to give more than ten minutes of their time to thinking through the relationship of their own child with the computer, and the goals they thought the Northview computer program ought to fulfill. These, then, were articulate, "computer aware" parents who felt computer literacy was important for their children, and were able and willing to respond to the type of open-ended questions that required the respondent to be analytical and confident of her/his literacy.

Presumably, parents with negative attitudes toward computers, parents who were completely uninterested, and parents who could not write well in English did not respond to the questionnaire.

Parents gave their children's mean average age as six years, one month. All but one of the children had siblings: two had younger siblings and six had older siblings. Presumably, those who had older siblings had increased chances of having come into contact with a home computer.

Both the questionnaire answers and interviews with two "computer moms" reported that few of the children had had computer experience before kindergarten. In the two families that reported that they owned home computers, there were older children in the home. Where home computers are being used to do homework, presumably the family doesn't feel pressure to buy a computer until later in the school career:

> I was a mainframe programmer prior to my daughter
> being born, now I work utilizing a [personal
> computer] all day. I would like to have one in the
> home... I find it difficult when we don't have a
> computer at home -- like everything else, peer
> pressure at school makes a family feel they have to
> invest in this expensive item.

A few of the families that did not own computers mentioned that this was one of their future budgetary priorities. In a larger survey, it would be interesting to see whether

more families with older male children own home computers than families with older female children. From personal experience, most home computers are not bought for parental purposes, or to help children with schoolwork. Rather, more home computers are bought by parents in response to nagging by their sons because they want to be able to play computer games. Computer game afficionados are males between the ages of ten and fifteen, who graduate to interactive games (King's Quest, for example) on the personal computer from Atari and Nintendo-type arcade games. In this small questionnaire, the two families with home computers reported their location as "Dad's office" and "family room (in their Dad's house)." Research has shown that computers are often situated in "a father's work area or a son's room, which may be off-limits for daughters" (Sealfon 1986, 15).

From the questionnaire responses, it would seem as though the father is the most avid computer user. The two fathers who owned home computers were reported to use the computer ten hours per week; fifteen to twenty hours per week including game playing. Mother and siblings were reported to use their home computer one or two hours a week each. Four of the fathers were reported to use a computer at work, and three of the mothers.

In <u>The Second Self</u>, Sherry Turkel described her en-
counters with young children and electronic educational toys
like Little Professor and Speak and Spell. In the question-
naire responses, only three families mentioned that they had
such toys in their homes. They stated that these electronic
toys are very popular with their children of both sexes, at
all ages.

Children's most popular toys were said to be the follow-
ing (in no particular order):

Board games
Building games (Lego, for example)
Electronic toys (The Animator, Nintendo, and so on)
GI Joe, He-Man, Thundercat, Dino-Riders
Ponies, pony castle
Dinosaur books
Stuffed animals, dolls (the one "girl" response)
Racing cars
Cloth cape, homemade microphone
Arts and crafts
Soccer ball, hockey stick, bicycle

The close correspondence between gender and toys is ap-
parent -- the single obvious exception being the ponies and
pony castle listed by the parents of one boy. Electronic
games were only mentioned twice as being a child's favourite
toys. There did not seem to be any relationship between toys
and computer use.

All of the kindergarten children have an opportunity to
use the classroom computer, if they wish. Their names are

called out by the "computer mom" when it is their turn, but they are not compelled to use the computer. Parents responded that two of the children also used their friends' computers and one child was reported to have used a computer at the Northview lunch programme. One of the lunch monitors stated that the older boys (aged, approximately, ten and eleven) in the lunch programme physically monopolized the computer for their game playing, and the girls were unable to obtain time on the machine. This lends strength to Peggy Sealfon's protest:

> Another problem some girls report has been the aggressiveness from boys who physically capture computer time. When one 9-year-old girl was asked why she didn't use a computer at home very much, she responded: "My brother won't let me. He beats me up if I go near it." (Sealfon 1986, 14)

In fairness to the boys, one little girl almost crowded several boys off the chair in front of the computer in her determination to get to the keyboard and seize control of the game. Some of the boys seemed afraid of her. Other girls showed no timidity about loudly telling the boys that they were pressing the wrong key or moving too slowly.

In their responses, parents characterized their male kindergarten children as physically active and energetic, lending validity to the masculine stereotype. However, quite a few of the male children were described as artistic, for

example, "very imaginative and creative with play at home," "imaginative, quiet, quite shy, fairly artistic." Parents expressed pride, enthusiasm, and tenderness in the way they described their children of both sexes. The parents who took the time to respond to the survey felt enthusiastic and positive toward their children.

Presumably children who are very physically active and energetic might have difficulty sitting quietly in front of a computer for any length of time. The "computer moms" reported that this was the case for many of the boys. They tended to rush through the games, making more errors than the girls, because they were keen to zoom off and participate in another activity that they could see was going on in a different section of the open classroom. This might, or might not, be an argument for placing the computer in a quiet area off the larger classroom. A remote location may more easily be physically monopolized by male students.

Half of the kindergarteners were said by their parents to enjoy spending long periods of time alone, entertaining themselves. Six were said to enjoy making up or acting out imaginary stories. Fantasy and imagination play a large part in many of the interactive computer games that are, perhaps, a bridge into the computer world. One family reported that

their sons use the computer almost exclusively for inputting their own stories. Word processing has been credited for liberating the creative impulse in both adults and older children.[7]

Linda Hart, the "reading mom" volunteer for the early reading program, mentioned that there are only a couple of children that know how to read well in the kindergarten class -- one boy and one girl. Two surveyed families responded that their kindergarteners could read; both are boys. There is a great deal of latitude implied in "read." Reading could mean memorization, sounding-out, or fluent reading. The software used at Northview does not require reading, but it does encourage letter recognition and sight reading of simple words. The better the child is at recognizing the letters of the alphabet, the faster he/she can get through the game.

The "computer mom" makes a game of this: "Nancy got through the game in 22 tries. Can you beat her?" This is the only competitive element in the computer experience. It is completely extrinsic to the program and imposed by a woman. It is interesting that the "computer mom" injects the competitive element into what is obviously planned by the software

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[7]Based on interviews with Peter Henbury (John Abbott College) and John Goff (Lindsay Place High School), who both teach English, use the computer for student writing.

programmer <u>not</u> to be a competitive game. According to the sexual romantic viewpoint, this woman may have internalized male traits as a result of her involvement in the male domain of computer games.

Gender stereotypes might suggest that, faced with this kind of competition that involves rapid physical responses, girls might not do as well as boys. "Computer moms" did not find any difference between girls and boys in competitiveness but, because boys tended to rush through the game to move on to another physical activity, girls actually performed better than boys in informal, impromptu contests of this type.

"Computer moms" confirmed that neither boys nor girls avoided the computer. Both sexes were seen to be eager for their turn. "When's my turn?" is a common refrain. When there is new software, everyone hovers around the computer. Sometimes the "computer mom" has to shoo them away to give the current user a change. For every user, there were two, three, or more "hangers-on" waiting their turn and giving enthusiastic advice and instruction. Considering that most children had no previous computer experience, the "computer moms" were surprised how little initial fear the children brought to their first computer experience. They were also surprised at how quickly and intuitively (without overt instruction)

children of both sexes picked up computer skills and knowledge
(understanding how the REPEAT key works, using the spacebar
and RETURN key, and intuiting the logic behind the pro-
grammes).

When asked, "What do you think the children actually
learn from their computer experiences?" volunteers emphasize
"computer confidence." The children quickly progress from
tentative, unsure manipulation of random keys to confident,
spontaneous experimentation. At first, they tend to check,
with a glance or a question, with the "computer mom" to see
if it is alright to touch a certain key. After a few ses-
sions, most begin to take the computer for granted and stop
asking for approval. This is when they feel confident enough
to start experimenting and taking risks. One of the volun-
teers pointed out that, at this early stage, the computer is
still new, exciting, and poses a challenge. Her older
children find the computer boring.

Interestingly, there were two children in the first two
kindergarten classes observed who were reluctant to use the
computer. Both were girls. Of one child, the "computer mom"
said, "The child is weak in alphabetic skills. She is scared
to fail. Once she is persuaded to try, though, she's not
incredibly keen but does seem to enjoy it. She won't try to

experiment or ask for another game."

Families that responded to the questionnaire all watched some television every day. The mean average hours that the television was turned on each day was just under four. In a larger survey, some correlation between television-watching and computer use might be postulated and tested.

Questions related to computer software were not answered because most respondents did not have home computers.

Parental Opinions

The second part of the questionnaire asked parents to give their opinions on a variety of gender-related computer issues. Their responses were characterized by freedom from traditional sex stereotypes. Parents refuted the belief that "the sex of a child has anything to do with this subject," and supported the notion that the media were to blame for creating a strong link between boys and technological toys of all kinds: "(the media) promotes high-tech toys towards males."

The single girl whose parents responded to the questionnaire was depicted as "equally attracted to our computer (if not more) as my son." Both girls and boys were seen to be attracted to the computer because it poses a challenge, requires direct participation, and encourages problem-solving.

Problem-solving was not referred to as a male domain. One parent mentioned that children of both sexes "are impressed by the 'brains' or cleverness of these machines. They are amazed at what the computers can do, be it in a game of skill or even in a simple word processing program." The same parent added, "Basically, the same things (attract girls to computers that attract boys)... I think the little girls today, at least the ones around my house, seem to like the same things about the computer as the boys."

Four families were of the opinion that boys and girls are equally suited to computer use. One family "didn't know." Only two families expressed very slightly stereotyped opinions, one giving a slight edge to girls: "Probably (boys and girls) are about equal, although I do think that girls, on the whole, have more patience and can sit longer at any one thing." The other echoed the "different voice" perspective, "I think girls seem to prefer interaction with people instead of machines, but they are every bit as capable."

Families and volunteers alike tended to think that boys enjoy computer games like "Space Invaders" more than girls do. This lends support to the sexual romantic notion that the current state of the computer culture, with its emphasis on war games as a gateway into computer use, alienates girls:

however, the recent popularity of music and graphics software may change the "masculine" aura to something more creative and artistic (Chen 1986, 280). The idea of the computer as "big toy" was mentioned by the parent of one boy, supporting the suggestion that many home computers are bought to play computer games.

One parent thought that boys liked the computer games but girls were attracted to computers because "they can get the feeling of being businesslike and efficient." The empowering nature of computer success for women has been noted in the classroom and the literature. This comment also ties into the feminine stereotype that girls are more serious and responsible than boys.

Questionnaire responses were, generally, as follows: "Boys and girls are both attracted equally to computers. From what I've heard, the boys and the girls can't wait for their turn to come up to use the computer." One parent drew attention to the sexual rationalist belief that interest in the computer "depends more on the individual child, not being male or female."

A question inquiring why there have been more male computer programmers than female computer programmers led to the following pragmatic responses: "There have been more men

in the work force," "Probably because, by tradition, males have been more drawn to the 'science' type courses, where women seem to have been more attracted to the 'social' studies. Again, I think this is rapidly changing and will continue to do so now that boys and girls are having early exposure to computers through the schools and the homes. Also with more women going out to work, girls are going to start looking at more career-oriented schooling as opposed to 'interest education'." These responses indicate a belief that society is in a transitional phase as regards sex roles.

One mother blamed the school system for the lack of female programmers: "Girls are not encouraged to pursue math and sciences at school, therefore... fewer computer programmers." Another mother blamed the male-dominated business world as do the conflict theorists: "I believe some companies, given the choice, will hire a male over a female. Maybe there are a lot of female computer programmers looking for work." One mother echoes the commonly-held stereotype: "The males seem to get an early start with the game aspect and generally men are more technically inclined than women, so it helps." One woman completely disagreed with the statement: "I was a computer programmer and find it was a field that was definitely equally divided."

A link between computer success and school mathematics was supported by six of nine families: "I think being good in mathematics probably helps a lot in being successful on the computer." "Probably true -- mathematics, like computers and programs, involve problem-solving skills and logic." The strong belief (despite the irrelevance of math to most application software) in the link between mathematics and computers on the part of parents may convince female students to steer clear of computer courses in the same way as statistics show they steer clear of math courses.

Some families mentioned that a computer can make math more fun: "I think (the computer) helps my children deal with numbers. It makes it fun."

A link between computer success and reading was postulated by one parent.

As some respondents mentioned in the context of other questions, the "hard-sciences" = male domain, "social sciences" = female domain equation is firmly entrenched, though there was the conviction that this was changing: "Men had life-long career orientations when choosing courses, whereas 15-20 years ago most women chose a field of study that would allow them to be employable for 5-10 years until they had families. These above-mentioned ("hard science") courses used

to entail years of study and practice in order to achieve a level high enough to become an achiever in your field and I really think years ago women for the most part did not want to spend 5-10 years in university obtaining several degrees before even hitting the job market. Again, I think that over the past 10 years this has changed drastically, and more and more women are beginning to infiltrate these formerly male-dominated fields of study because more and more women are staying in the job force rather than staying at home."

Some mothers thought that the "social sciences" = women equation had some validity, but that parents and teachers were to blame for the lack of encouragement they give to girls: "women excel in the person-to-person type careers but there are multitudes who should be in the 'hard science programs' but are not getting the support or encouragement from 'old fashioned' parents and educators." "Men have been drawn to the 'hard sciences' mostly because women were not encouraged to go into these fields. Nursing, secretaries, etc., were a woman's profession. But I think that this is changing now, many women are doing jobs that were traditionally only for men." "(Women) are naturally drawn to them (hard sciences) more (now), but things are changing gradually." "In the old days, men expected women to be interested in certain fields

and if they did wander they were never given a chance so I feel the women in majority just went in the direction set for them."

This pervasive feeling that "times are changing and women are being drawn to the 'hard sciences' and getting into jobs that only men used to do" lends an optimistic feeling to most of the responses.

March 17, 1988

Dear Kindergarten Parent

Computer literacy is a "hot topic" in education these days. As a computer teacher at the Cegep level and as a parent of a Northview kindergarten child, I am interested in understanding the impact of the computer on the educational experience of our children.

Mr. Clark, the Principal of Northview Elementary School, has kindly given me his permission to observe Mrs. Poirier's kindergarten class as they interact with their classroom computer.

Enclosed with this letter you will find a brief questionnaire. If you wish to participate in this preliminary study, please fill out the questionnaire and return it, with your child, to Mrs. Poirier by the end of next week.

The information collected through observation and through the questionnaire will be used for a preliminary report for Concordia University's Department of Educational Studies.

Please note that it is not necessary to put your name on the survey. If you have any thoughts or concerns about your children and computers, I would enjoy hearing from you. Please write any additional comments on the back of the survey, or on a separate sheet of paper, or call me at home. My answering machine number is 695-6318.

Thank you for your help.

Sincerely

Susan Regan
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Pointe Claire, Quebec
H9R 3L9

COMPUTER QUESTIONNAIRE: KINDERGARTEN

If you wish to participate in the survey, please fill in the following questionnaire. It is not necessary to put your name on the questionnaire. All information will be kept strictly confidential. Please feel free to add any other information or your personal comments on the back of these sheets.

Thank you for your help.

1.   Is your kindergarten child male or female?

   _____

2.   How old is your kindergarten child, in years and months?

   _____

3.   List the age and sex of your kindergarten child's brothers and sisters.

   _____
   _____
   _____
   _____
   _____

4.   Do you have a computer at home?

   _____

5.   If you have a computer at home, list the family members who use it, even if it's only to play games. Next to each name, write the approximate numbers of hours they use the computer per week, on average.

   _____
   _____
   _____
   _____
   _____
   _____

6. Does your kindergarten child's father use a computer at work?

_____

Does your kindergarten child's mother use a computer at work?

_____

7. Is there an electronic educational toy in the house? (Examples: Speak and Spell, Little Professor, Cookie Counter.) If you have a toy like this in your house, which of your children uses this toy? (Please identify the child by age and sex: female age 8, for example.) Which of your children was most interested in this toy at age 5/6?

_____
_____
_____

8. How would you characterize your kindergartener's personal style: imaginative, physically active, quiet, shy, artistic, rambunctious, outgoing, etc. Please describe your kindergartner in two or three sentences.

_____
_____
_____

9. Does your kindergartner like to spend long periods of time alone, entertaining herself/himself?

_____
_____
_____

10. Does your kindergartner like to make up and/or act out imaginary stories?

_____
_____

11. Name three of your kindergarten child's current favourite toys.

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_____
_____

12. Does your kindergartner read yet?

_____

13. How many hours a day is your TV turned on (even when no one is watching)?

_____

_____

14. If there is a computer in the house, which software packages are used by your <u>kindergarten</u> child? Please list these software packages in order, beginning with the one your child uses the most.

_____

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15. If there is a computer in the house, what software packages do other members in the family use?

_____

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_____

_____

16. If there is a computer in the house, in which room is it situated? (Examples: family room, 11-year-old sister's room, dad's office.)

_____

_____

_____

17. If you don't have a computer, do any of your children use a friend's computer or a computer in a public library or other setting?

_____

_____

18. What do you think attracts <u>boys</u> to computers? Why?

_____

_____

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_____

19. What do you think attracts <u>girls</u> to computers? Why?

_____

_____

_____

_____

20. In your opinion, are boys or girls more suited to computer use? Why?

_____
_____
_____
_____

21. In your opinion, are boys or girls, by nature, more attracted to computers? Why?

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_____

22. There have been more male computer programmers than female computer programmers. Why do you think this is so?

_____
_____
_____
_____

23. In your opinion, how important is "computer literacy" for your children? Why?

_____
_____
_____
_____

24. Many people think that computer success is linked to success with school mathematics. What is your opinion?

_____
_____
_____
_____

25. Traditionally, men have been drawn to the "hard sciences" (math, engineering, physics, etc.) and women have not. Do you agree with this statement? Why or why not?

_____
_____
_____
_____

26. Who completed this questionnaire (mother, father, grandparent, etc.)?

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YOUR COMMENTS ARE WELCOME:

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THANK YOU FOR YOUR PARTICIPATION!

APPENDIX B

A.C.T.

(ACCESS TO CAREERS IN TECHNOLOGY)

AN EMPLOYMENT READINESS PROGRAM FOR WOMEN

John Abbott is offering a program for women looking for a new technical or scientific career. A.C.T. is a 15-week full-time program for women interested in pursuing careers in fields traditionally occupied by men. The program consists of three modules: the first is a two-week orientation to the problems, advantages and opportunities in non-traditional fields. The second module consists of a 10-week series of intensive, hands-on workshops to develop skills in a number of occupations currently taught at the collegial level. These, tentatively, will include: drafting, woodworking, metal working, electronics and computer programming. The third module covers job search, training opportunities and developing individual action plans.

Apart from classroom and lab training, the students will tour industrial sites and receive career information from guest speakers. A two-week industry apprenticeship is included.

Enrolment is limited to 15 women. Students are eligible for training allowance and government subsidies for day care and transportation. For an appointment and additional information call 457-3063.

For women who are interested in this program, registration with Canada Manpower should be done as soon as possible.

Course Begins: November 13, 1989   Christmas Break:
Course Ends: March 6, 1990   Dec. 25,1989 - Jan. 2,1990

INFORMATION SESSIONS

Wednesday, October 18, 1989   -   9:30 a.m.
Thursday, November 2, 1989   -   9:30 a.m.
Continuing Education Building

CENTRE FOR CONTINUING EDUCATION
JOHN ABBOTT COLLEGE
STE. ANNE DE BELLEVUE

1989

457-3063

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