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'WINNING WOMEN'

A STUDY OF THE DEVELOPMENT OF TECHNOLOGICAL COMPETENCE

AT AN ALL-GIRLS' SCHOOL

by

Carol Anne Crawford

B.A., McGill University, 1992

A THESIS SUBMITTED IN PARTIAL FULFILLMENT

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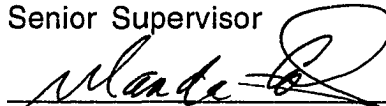
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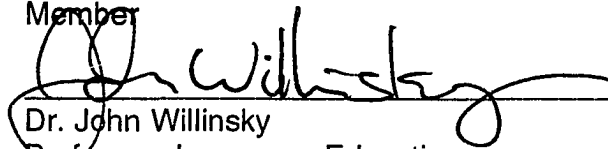
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ABSTRACT

The National Advisory Board on Science and Technology (NABST) in its report "Winning with Women in Trades, Technology, Science and Engineering" draws attention to the under-representation of women in post-secondary education and occupations relating to science and technology. The report stresses that the absence of women from such fields, weakens the economy which requires the skills of men *and* women to compete in the global market. NABST makes pedagogical recommendations to facilitate girls' success in science and technology and proposes that results of its recommendations may be measured by examining the number of women graduating from post-secondary science and technology programs and working in related fields.

This thesis explores how the definitions of success assumed by NABST presuppose limited goals which restrict the identification of, and possibilities for, women's competences with technologies. This focus is influenced by the work of Nancy Kaplan, Eva Farell and others who place significance on women's everyday practices with technologies and address how women find meaningful use in technologies outside of NABST's narrow parameters.

For the purpose of this thesis the instruction of, and engagement with, computer technology is considered in relation to NABST's educational recommendations and its predicted outcomes. In order to assess whether girls, exposed to such an educational foundation, will likely pursue education and careers in computer science and whether increasing the number of

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women in such fields is necessarily in women's best interests, I look to Fairfax, a private school for girls which offers computer science instruction closely reflecting NABST's proposed pedagogical environments. I conduct interviews with staff and students, observe computer science-related classes, and distribute comprehensive surveys.

This thesis argues that although many Fairfax students use computer technology extensively, they often do so in ways that cannot be identified as successful by NABST. Yet, rather than interpret this as a failure on the part of young women - a deficit in need of correction - this thesis takes seriously girls' reasons for not choosing such paths to "success". This work posits that the needs of a nation's economy may not necessarily correspond with the needs of that nation's population.

ACKNOWLEDGEMENTS

I would like to take this opportunity to thank the many supportive friends who were instrumental in allowing me the opportunity to complete this project.

First of all, to the staff and students at Fairfax School who invited me into their lives in the spring of 1998, I want to thank you for your generosity of time and enthusiasm. My gratitude goes to my supervisor Suzanne de Castell who continually pushed me to make my work the best that it could be, and who inspired me to look beyond the obvious. Thanks to Wanda Cassidy for her encouragement and for taking the time during such a busy time in her own life to be on my committee. To Robb, Kathryn, Laura, and Jude who provided the emotional support that kept me going when I just wanted to quit. And finally to my family, who despite constantly reminding me of how long it was taking to write 'this paper', are responsible for its creation more than anyone else.

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CHAPTER ONE

The National Advisory Board on Science and Technology: The Under-Representation of Women in Science and Technology.

> In a climate of significant national and global economic restructuring, it is difficult to predict accurately our future human resource requirements. It is therefore critically important that the nation's work-force attain and maintain a state of technological and scientific readiness that will enable Canadians to thrive in a global context. To ensure this readiness, it is essential that the potential resources in all sectors of the population are fully utilized. The potential contribution of women has been and still is undervalued and underutilized. - Executive Summary of Winning with Women in Trades, Technology, Science and Engineering[1]

> Women must have the education and technical literacy that will allow them access to decision-making and to meaningful work in the continually evolving technological society. But women will also have to survive as human beings, as creative, spontaneous and cheerful persons. And, as I said before, it is here that I worry. - Ursula Franklin[2]

In January 1993 the National Advisory Board on Science and Technology (NABST) presents its findings and recommendations to the Prime Minister of Canada in a report entitled, "Winning With Women in Trades, Technology, Science and Engineering". The Board announces that, according to national figures, "women are significantly under-represented in all scientific and technological fields."[3] "Measuring progress" through an examination of the number of women enrolled "in the scientific and technological fields, number of women science and technology graduates, number of women faculty members in these fields, and women's

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[1] NABST, 3.

[2] Franklin, 1985, 8.

[3] NABST, 2.

participation rate in scientific and technical occupations"[4] NABST concludes that significant changes need to be made so that women can achieve equitable outcomes in relation to science and technology.

Capitalizing on a Diversified Workforce

The long-term goal of the "Winning with Women" report is a "broad and inclusive attitude change, one which will recognize women as full and equal participants in all sectors of society, but particularly in areas of scientific and technological endeavour."[5] The implications of women's absence from these fields and occupations are grave, the Board maintains. If the trend continues girls and women "will continue to be confined to the poorer jobs" and Canada's economy will suffer as it "cannot afford to draw its technical skills so overwhelmingly from less than half the population."[6]

Maximizing a workforce's potential is necessary, according to NABST, so that ideas from every sector of the population are capitalized on to advance Canada's economy because, it is argued, "[i]nnovation thrives in a climate which nurtures diversity".[7] Women's participation in fields of science and technology will increase Canada's economic position because as the report later states, "the winners in this global marketplace will be those with innovative, state-of-the-art products...[and] until women are fully integrated as equal contributors in all sectors, and at all levels, society will suffer the loss of unique and significant female skills and attributes."[8]

"Laying the Foundation": Pedagogical Strategies

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[4] NABST, 4.

[5] NABST, 51.

[6] NABST, 1.

[7] NABST, 3.

[8] NABST, 19.

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NABST provides several recommendations for addressing the inequity between men's and women's participation levels with new technologies. One of the key strategies for achieving an increase in the number of women studying and working in scientific and technological trades and professions is through improving how sciences and technologies are taught in schools. This focus on scholastic improvements stems from the findings of the Qualitative Survey of Industry Attitudes which, "reported that for women the route to employment as technicians and technologists appears to be almost exclusively through the educational system."[9]

NABST reports that improving science and technology education can be, in part, achieved through a recognition of differences in learning styles. In fact, one of NABST's primary recommendations is that the "Social Sciences and Humanities Research Council...respond positively to funding requests for research on learning styles and their implications on the achievement of maximum learning potential by all students, including women."[10]

NABST maintains that there are "two very distinct learning styles [that] are readily identifiable."[11] One method that is preferred by the majority and the other is favoured only by a minority of the population. NABST argues that the latter style is predominantly used in the teaching of science and technology. This approach tends to be "individually competitive"; it adheres to a "greater hierarchical, impersonal style and an orientation to logic, justice and rights".[12] NABST contends that to use a teaching approach that only addresses the needs of a minority will chronically dissuade many people from gaining interest in fields that use such a method of teaching.

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[9] NABST, 16.
[10] NABST, 21.
[11] NABST, 20.
[12] NABST, 20.

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A better strategy, advises NABST, is to use a teaching style that reflects the needs of the *majority* of students, one that is "characterized by a greater concern with the relationships, or connections, to be found between theory, or concepts, and application. Cooperative learning situations...includ[ing] individual contributions, experiential learning, open communication and feedback".[13] In order to increase the achievements of girls and young women in scientific and technological disciplines, NABST goes further in its recommendations. It dedicates an entire section of its report to "Laying the Foundation", a strategy that specifically "addresses the socialization and education of girls and young women up to the end of secondary level education."[14] "Laying the Foundation" outlines seven strategies for "developing interests and maintaining high expectations of girls and young women in doing the science and mathematics which they will need as essentials for future careers."[15] Six of the seven strategies focus on the role of education and educators in a school-based environment. Strategies for increasing the participation of girls and young women in science and mathematics include improving self-esteem, addressing gender bias, stereotyping, and differences in classrooms, using teaching strategies that focus on the applicability of science and technology, providing more equitable career information, introducing girls and young women to role models in scientific trades, and developing extra-curricular programs to "ensure that girls and women develop self-confidence and competence in technology, mathematics, science and engineering in a collaborative environment."[16]

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[13] NABST, 20.
[14] NABST, 29.
[15] NABST, 29.
[16] NABST, 32.

NABST's idealized vision is one in which girls are strongly encouraged to succeed at engaging with science and new technologies at school. This positive educational environment is one that will allow girls and young women to succeed by pursuing further education and careers in the exciting and ever-expanding world of science and technology.[17]

Laying the Blame?: Advancing a "Deficit-Model" of Girls' Failure

"Winning With Women" is a valuable document in that it exposes the differences between women's and men's access to high-status technological career opportunities, and the above cited recommendations for improving curriculum are useful in addressing the role that school-based education plays in the propagation of such inequity. However, following from the work of Mary Bryson and Suzanne de Castell, I believe that NABST's study "paradigmatically focuse[s] on girls'/women's under-representation and under-achievement in science- and technology-related domains, typically presupposing and/or advancing a deficit model (of 'girls/women' and/or 'technology') to explicate why girls/women fail to thrive in such contexts."[18] NABST emphasizes "the need to encourage young women to *equip themselves* for careers in engineering, science and technology."[19] And although, "girls and young women *are capable* of doing excellent mathematics and science, *many drop these subjects* even before completing secondary school."[20] This is not to say that NABST *blames* young women for their representation in career and educational opportunities in science and

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[17] For research on differences between boys and girls in their use of computers refer to: Becker & Sterling, 1987; Clarke, 1985, 1987 & 1990; Clarke & Chambers, 1987; Chen, 1986; Culley, 1988; Hattie & Fitzgerald, 1987; Klein, 1990; Lockheed, 1985.

[18] Bryson and de Castell, 6.

[19] NABST, 1. Emphasis added.

[20] NABST, 7. Emphasis added

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technology,[21] but by measuring girls' and women's "success" with science and technology within limited categories of engagement and by contextualizing the importance of having more girls and women engaging with science and technology within an exclusively economic context, NABST, I argue, can only offer a limited understanding of the myriad of issues associated with gender inequities as they relate to science and technology.

In concert with Bryson's and de Castell's research project, "GenTech", my thesis "seeks to identify contexts and practices in which (a) inclusion is an explicit organizational goal, and (b) relations between girls/women and NIT [new information technologies] are, by design, orchestrated toward maximizing the likelihood of optimal outcomes" (6). By focusing on learning as a practice situated within a community of learners,[22] this thesis hopes to draw attention away from a "deficit-model" of girls' failure and toward an understanding of how the sociocultural context for learning can be "conducive to the equitable distribution of opportunities for the development of competence...[and] contribute to a better understanding of collective, (scaffolded, relational, interactive) rather than individual, attainments."[23]

Defining Success Within Limited Terms

However, in order better to understand how girls and women develop such proficiency, a further exploration of what is meant by "competence" and "success" is needed. I hope to explore how the definitions of "success" assumed in "Winning With Women" presuppose limited goals which in fact work to restrict the identification of, and possibilities for, girls' and women's competences with new technologies. I will argue that NABST's

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[21] NABST acknowledges that "social and cultural barriers still exist which negatively affect the attraction of women to, and the retention of women in, trades, technology, science and engineering." (2)

[22] Lave and Wenger, 1991.

[23] Bryson and de Castell, [WWW document], 6.

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approach is limited, due in part to two of its central presuppositions: that "success", in relation to women and technology, is solely defined as the equalization of men and women in technological careers and educational programs; and that its central justification for achieving such an "equalization" is in order to protect and advance the Canadian economy.

Creating a Winning Economy: Woman - The Untapped Resource

According to NABST, it appears that Canada's economic prosperity significantly depends on women's engagement in scientific and technological careers. The report cautions that,

> Western countries no longer boast growth economies...Future human resources requirements are difficult to predict accurately during this time of global restructuring...A well prepared and skilled work-force will, of necessity, require a strong technological and scientific literacy...In order to achieve this increase in both number and quality, it will be necessary to widen the net and make these professions attractive to a much larger proportion of the population.[24]

NABST warns its readers that, "The Conference Board of Canada anticipates shortages of engineers [and] software specialists...[and] what is of critical importance is the degree of scientific and technological readiness that exists in a nation's work-force...The country which adapts new technology with alacrity and inspiration will gain the markets."[25] Women, in this study, represent an up-tapped resource that just may be the key to Canada's future success in a global, and technologically-dependent, economy. NABST publishes a report that seeks to "[Win] *With* Women", however, the question remains: who or what is "winning" if an increase of women scientists and technicians is achieved. NABST does not produce a report entitled *"Winning*

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[24] NABST, 5.
[25] NABST, 5.

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Women" that addresses whether or not women themselves will "win" if they pursue such careers and education.

Although the improvement of instructional methods is, as mentioned earlier, important to NABST, it is so for the purpose of creating a "quality work-force" through the maximization of Canada's *entire* population. To "maximize" means "encouraging students of both genders" (sic)[26] in pursuing "the highest possible level of education and career attainment."[27] Presumably the "highest possible level" refers to careers based in science and technology.

Considering Value Beyond the Bottom Line

In this project, I will argue that NABST offers many constructive recommendations for improving how science and technology are taught to girls and women in school-based contexts, through teaching methods that rely on cooperation, applicability, the reduction of gender stereotyping and attention to increasing girls' self esteem. However, in order to assess the full effectiveness of such strategies, goals and measurements must consider value and significance beyond an economic and national context.

For the purpose of this project I worked with students at Fairfax[28], a private school for girls in Vancouver, British Columbia. Through observing computer science classes and student-directed/computer-dependent productions of the yearbook and the student newspaper and interviewing

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[26] I feel that there is a need to point out that NABST has assumed that it is possible to dichotomize the term "gender" into two unquestionable categories of male and female. To define gender in this way discounts the complexity and possibilities associated with gendered identity. See for example, Butler, 1993; Elam, 1994; and Wittig, 1990.

[27] NABST, 3.

[28] Pseudonyms are used for the name of the school, its students and teachers.

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Fairfax staff and students, I study "communities of practice"[29] that emerge in learning contexts in which gender equity is an identifiable goal.[30]

Also, in an attempt to come to a fuller understanding about Fairfax students' opinions of, and experiences with, computer technology a survey was distributed to 132 of the approximately 300 girls at the senior school. These surveys were created by Suzanne de Castell and Mary Bryson and form a part of *Gen Tech* "an applied research project whose mandate is to create conditions within which girls and women have maximum access to, and confidence in, a wide range of new information technologies."[31] The surveys are distributed in math classes to a cross section of Fairfax students in grades eight through twelve. Of the completed surveys, four are submitted from students enrolled in the Journalism class, eleven surveys are filled out by students taking Yearbook, ten respondents are currently registered in Susan Hill's grade eleven Computer Science class and eight are registered in Ms. Shin's grade eight Information Technology course. Eighty two surveys are returned[32] and the break down of responses by grade is as follows: grade eight: 34%; grade nine: 10%; grade ten: 21%; grade eleven: 23%; and grade twelve: 12%.

The survey is divided into 6 sections; the first two sections ask the student about herself and her family, for example, her age, her parent's levels' of education, what she plans to study, what kind of job she aspires to and so on. The third section relates to the student and school: her favorite courses, how she feels about school, and how well she feels she is doing in a variety of

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[29] Lave and Wenger, 1991.

[30] Bryson and de Castell, [WWW document], 7.

[31] Cited from the GenTech homepage: http://www.educ.sfu.ca/gentech/index.htm

[32] The low number of responses was likely due to the fact that the surveys were distributed on the days immediately preceding the spring break and some classes were not held.

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courses. "About Technology in Your School" is the next section that asks the student, in part, how many computers are in her school, whether she uses computers and how often, where she uses computers, how competent she feels with computer technology, how much she feels encouraged by her teachers to use computers, in what courses does she use the technology and how much she enjoys using computers. The fifth section inquires "About Technology in Your Home", asking whether or not the student has a computer at home, how often she uses the technology there, who she goes to for help when she runs into difficulty and other related questions. The final exercise requires that the student draw her impressions of a Computer Whiz: a person who is a computer expert as well as a Computer Whizn't: a person who "just can't learn to use computers."[33]

In addition to the Fairfax students, this survey was distributed to 519 students at a public co-ed high school in the Lower Mainland as a part of the GenTech research. The break down of responses by grade is as follows: grade eight: 23%; grade nine: 20%; grade ten: 25%; grade eleven: 17%; and grade twelve: 15%. At times in this thesis, I will refer to the results of this data in order to offer a comparison between the responses from the girls at Fairfax and those of their peers at the co-ed school. This will be a limited examination, with a focus primarily on issues concerning access, participation rates, confidence levels, and gendered perceptions of computer compentence. For a more comprehensive analysis of the survey results from both Fairfax and the co-ed public school please see http://www.educ.sfu.ca/gentech/index.htm

"Communities of Practice" at a Private All-Girls' School

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[33] For a copy of the complete survey, refer to the "Students' Uses of New Information Technologies" survey in Appendix A.

The decision to study a single-sex/private-school learning environment can be criticized by those who question the privilege that students occupying that social location receive. These are fair criticisms, given the relevance of class background when discussing career options generally and access to computer technology specifically; however, there are also specific benefits for researchers in looking at such a sociocultural learning context. Suzanne Silverman and Alice M. Pritchard, for example, conducted "a two-year research project looking at girls' participation in technology education in Connecticut schools."[34]   While observing classrooms, the researchers found that

> ...the boys monopolized the tools. In focus group interviews, girls complained that the boys always rushed off to get supplies and made fun of girls trying to use equipment, and the teachers sometimes let them get away with it. They described how the boys would sometimes criticize girls, resorting to stereotypes about girls' lack of technological skills...Girls who chose not to take technology education were often reluctant to take classes where they would be one of the few girls.[35]

What findings would Silverman and Pritchard have found with girls who did not share learning spaces with boys? What would an all-girls learning context reveal? What other questions would be raised?

I hope to observe the varying communities of practice emerging from two types of learning contexts: computer science classes, whereby students attend to learn computer skills *specifically*, as well as projects such as the computer-intensive yearbook and student newspaper, in which the primary intentions of the students are not to achieve computer competence, but to engage in activities and projects that interest them and are meaningful to their lives.

Redefining Success

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[34] Silverman and Pritchard, 1996, 1.
[35] Silverman and Pritchard, 1996, 5-6.

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Finally, this project hopes to examine what is meant by "success" in regard to girls'/women's competence with computer technology. How is success measured by Fairfax and by the students themselves? What are the goals of the curriculum and the goals of research like "Winning With Women" which seek to achieve an equitable relationship between women and computer technology? This project seeks to address Ursula Franklin's concern: that given the goal may be of teaching girls and women computer competence within a technologically advancing society, it must be asked whether such lessons are successful in teaching women to "survive as human beings, as creative, spontaneous and cheerful persons."[36]

Chapter Two explores the research context for this project: the school's setting, the computer science curriculum at Fairfax and how my sociocultural positioning as a researcher impacted on the findings of this work. Chapter Three introduces recommendations proposed by NABST and focuses more generally on learning styles in relation to computer instruction and the challenges of finding effective ways of teaching computer science to students. Chapters Four, Five and Six explore how educators at Fairfax School are "Laying the Foundation" in ways proposed in the "Winning With Women" report by providing an environment that encourages young women's success in relation to computers through philosophies of teaching, educational practices and the strength of the hidden curriculum at the school. Chapter Seven examines whether girls, who are exposed to NABST's recommended educational foundation, will express an interest in pursuing careers and post-secondary programs in computer science. And further, this chapter will examine whether increasing the number of women in such fields is necessarily in women's best interests.

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[36] Franklin, 1985, 8.

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The central question of this thesis is whether, even though NABST's long term goal of recognizing women as "full and equal participants" in the areas of science and technology is important, and although its recommendations for improving classroom practices warrant serious consideration. NABST's narrow conceptions of and measurements for success may serve to limit broader possibilities for how girls and women can recognize their engagement with new technologies as meaningful and effective.

Rather than defining women's success and legitimate participation with computer technology as the pursuit of both formal post-secondary education and career aspirations specific to computer science, it may be that "Winning With Women" would fare better as a means for change if it explored how women can *succeed* through varied uses of new technologies rather than focusing on how the nation can lose if women choose not to work in science and technology in ways that benefit the Canadian economy.

CHAPTER TWO

The Research Setting: Fairfax School for Girls

Fairfax School is a private all-girls school located in an affluent neighbourhood in Vancouver, British Columbia. Established in 1933, it is comprised of a Junior School, educating students from kindergarten to grade six and a Senior School for students in grade seven through grade 12.

The first time I saw the school was on February 12th, 1998.[37] It was my first visit to a private school and I was surprised that it was not a more formidable structure. The private schools of my imagination were ancient and lofty stone edifices with ivy thriving across their facades. As I approached Fairfax, however, I saw a cheerful yet unassuming red brick building with many windows. I later discovered that the Senior School was rebuilt in 1979 which helped to explain its contemporary style. The Senior School faced a quiet, tree-lined street and there were picnic tables on the lawn. At the back of the school there was a modest-sized field, a playground, the gym and music building and the Junior School.

As I walked inside the school I was greeted by Susan Hill, a teacher who teaches many of the computer studies courses at the Senior School and who was to be my Fairfax contact throughout the project. She took me on a tour of the Senior School and I was immediately struck by the intimacy and calm of my surroundings. Fairfax seemed to make a first impression that was markedly distinct from my own experiences in a large and noisy co-ed public school.

The walls were clean and adorned with students' art work, professionally framed and mounted. Laminated posters displaying pictures of individual Fairfax athletes and banners advertising upcoming events were

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[37] The following description was taken from my fieldnotes of February 12, 1998.

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posted throughout the school. Several lockers were decorated with wrapping paper in a celebration of birthdays and the carpeted hallways muffled the footsteps of those students who were walking in the halls.

Close to the school's main entrance was the Counselling Office. It was a modest-sized room with two interior offices that could be closed for privacy. There were many book shelves with publications and videotapes concerning girls' self-esteem, bullying, sexuality, career-planning and many materials on body-image and eating disorders. There were also promotional guides and calendars for universities around the world.

The school's library was a bright and comfortable room with several computer terminals, desks and an extensive magazine collection. Included in the collection were, "The BC Professional Engineer", "Internet World", "Multi-Media Schools", "Science World", "Odyssey: Adventures in Science", "Women's Sports", "Discover", and "PC Magazine".

Ms. Hill took me through various classrooms pointing out the computer and technology resources in each one. As we made our way to the computer lab I noticed a large volunteer display board with sign-up sheets attached encouraging students to participate in community events like the Vancouver Sun Run and the MS Walk. Beside the board was an easel with information about studying at Oxford University in the summer and below the board were old issues of various Fairfax publications including the student newspaper, The Gryphon. There were also copies of last year's yearbook.

Across from the board were the Administrators' offices and a large glass display case housing trophies recognizing Fairfax successes. As I neared the computer lab I noticed framed photographs of past graduating classes and another case of trophies. As we entered the computer room a class was being

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taught by Jenny Shin, the other computer science teacher. The lab was a plain rectangular room filled with 18 Mac 5200 Power PC's. There were 4 rows of computers - 2 rows of five and 2 rows of 4 - perpendicular to the front of the class. The teacher's desk was situated in the far corner of the front of the class, and it had two computers on it. With the configuration of the computer terminals most students sat with their backs to each other; the students in the middle two rows faced each other.

At the entrance of the class, by the door, there was a box asking for students' computer questions. The sign on the box read that questions would be answered in the next edition of The Gryphon. A bookshelf contained issues of computer magazines, and a compartmentalized shelf held all of the students' disks. There was a white wipe board that spanned almost the entire length of the front wall with computer manuals, old yearbooks, and other school supplies on the shelves below. The far wall had a bulletin board across its length with posters about computers including "1000 Years of Word Processing", "Computer Wimps", a picture of the inside of a hard drive, a photo negative sheet, a Josten's Yearbook calendar with timelines for the Yearbook, and other posters about the Internet. There was another bulletin board at the back of the class with posters about Yearbooks - including a series of how-to posters. The last wall was blank.

Ms. Hill pointed out the Lexmark Optra N laser printer, the colour printer, and a scanner. There were a few lockers in the back corner of the class where cameras and other valuable yearbook and computer supplies were stored.

Ms. Hill then took me up to the staff room where I was introduced as a woman "working on a project at SFU for her Masters on women and computers." As soon as this was said, several teachers told me, laughingly,

that I should not speak to them, as they used computers as rarely as possible. Ms. Hill and I walked back down to the computer lab again where she was about to teach the Grade 11 Computer Science class.

The Computer Science Curriculum at Fairfax: Computer Science and Information Technology

Computer technology figures prominently at Fairfax, and the teachers I speak with take great pride in the quality and the quantity of the technology available in both the Junior and the Senior Schools. Lynn Beaudoin, the Computer Coordinator at the Junior School informs me that there are 24 computers in the Junior School's computer lab serving its approximately 300 students. Students from grades one through six are welcome to come to school early to use the computers and each class receives approximately two to four 40 minute classes each week in the lab. Ms. Beaudoin says that since teachers are not always available during the early morning lab time, older students are often on hand to help the younger students when they run into difficulty. Much of the class work centres on word processing work, spelling and mouse-dexterity exercises, and drawing. On one visit to the Junior School lab I watch as students use ClarisWorks to import graphics into their word processing assignments. Ms. Beaudoin emphasizes that the young students are instructed to "use computers as tools" rather than being taught "computer programming".

In the Senior School students are required to take a grade eight Information Technology class and they then have the option of taking additional Information and Technology and/or Computer Science courses in grades nine and eleven. The semester I visit Fairfax School the Information Technology courses in grades eight, nine and eleven are taught by Jenny Shin and the Computer Science eleven course is taught by Susan Hill.

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The Information Technology courses taught by Ms. Shin involve instruction in information gathering and telecommunications tools such as the Internet, the World Wide Web, E-mail, and CD-Roms. Presentation tools such as word processing, spreadsheets, databases, social issues of information technology, managing a home computer, multimedia programs, and desktop publishing are also taught. Students are instructed with a mixture of direct instruction, group project work, and individual assignments. Projects are based in ClarisWorks and CD-Roms; and students are expected to create web sites, multimedia presentations and Quicktime movies. Students are also asked to maintain a binder for their class notes and hard copies of their assignments. Ms. Shin evaluates student performance on these assignments as well as on in-class tests.[38]

Susan Hill teaches grade eleven Computer Science. In that course students work with ClarisWorks (4.0) using such elements of the programme as word processing, draw and paint modules, and spreadsheets. Students are introduced to PageMaker and PhotoShop in order to explore desktop publishing and they are expected to become familiar with computer graphics, electronic camera work, video capture, and scanning. As in Ms. Shin's class, students are expected to keep notes in a binder and to submit all assignments on a disk for evaluation. Assignments include, collecting facts in a database, creating their own resumes and cover letters and creating a "Slide Show" presentation.

The Senior School's computer room is available to students before school, during recess, at lunch and after school and students are allowed to come in throughout the school day to quietly work on the computers even if

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[38] For a more detailed account of the computer science courses offered at Fairfax refer to the course descriptions attached in Appendix B.

other classes are using the lab. There are also a few computers available for students to use in the library. During my observations at the school during lunch and recess students typically use the computers to work on class assignments, to surf the Internet, and to use E-mail.[39]

The Computer Science Curriculum at Fairfax: Journalism and Yearbook

In addition to computer science classes and recreational activities, the computer room is also the central location for the production of the Fairfax student newspaper and its yearbook. Susan Hill is the instructor in charge of coordinating those projects, and courses are offered to students who wish to participate in those publications. The course outline for Journalism 11/12 states that the,

> focus of this course is to provide students with skills that will be used to produce the Fairfax School publication "The Gryphon". The modules of the journalism course are based on the operation of a real newspaper. You will be required to work with the editors to decide on the content and publishing dates. To enrich the course, there is the possibility that the class will hold a high school newspaper conference and if possible we may also have the opportunity to 'go on assignment'. You must be willing to commit to the extra time it takes to lay-out the paper on computer (usually on prearranged weekends.)[40]

There are four different course components listed on the Journalism outline. The first demands that students "be involved in all aspects of the newspaper including: news gathering, layout publishing, distribution, and advertising." The second component requires that students "discuss the role and responsibilities of the newspaper medium", including such topics as,

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[39]I visited Fairfax approximately 13 times between February 12, 1998 - March 15th, 1998 sitting in on Computer Science 11, Information Technology 8 & 11, Journalism, Yearbook, and on one occasion, Physics 12 and the Junior School's computer lab. I interviewed the two teachers (Susan Hill and Jenny Shin) who teach the Computer Science, Information Technology, Journalism and Yearbook courses, the Junior School Computer Coordinator, and 12 Fairfax students between grades 8 - 12.

[40] see "Journalism 11/12" outline in Appendix B

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"plagiarism, permission to reprint, libel, copyright, censorship, liability, ethics and style and content." The third element stipulates that students "understand the various writing styles a newspaper incorporates." And the fourth and final component of the course requires that students "learn other programmes in the school's computer lab including: word processing, scanning, the principles of photography, desktop publishing (PageMaker 5.0), electronic photography (Digital Camera), and graphic management (PhotoShop 4.0)." Students are informed on the course outline that their,

> grade will be assessed by evaluating the following components of the course: assimilation of the basic writing concepts, ability to use the computer to its fullest capacity, ability to meet deadlines, contributions to the newspaper, and cooperative behaviour in the class. You will be a part of the evaluation process. You will turn in a log of the work that you have done (published and unpublished) and participate in a cooperative evaluation process with the editors and myself [Susan Hill].[41]

The two editors are themselves students in the course who are selected earlier in the year by a collective of teachers and the previous year's Gryphon editors.

The Yearbook 11/12 course is also taught by Susan Hill and aims to provide students,

> with skills that will be used to produce the Fairfax publication, Reflections. Its purpose is to chronicle the year 1997/98. The work that you do will not necessarily be in the classroom. In order to chronicle effectively the life of the school in 1997/98, you will have to learn in detail about the life of the school, including the Junior School, the extra curricular activities, and the special events that happen in the school. It will mean extra work when deadlines come due and extra time during the last weeks of June as the last set of pages are sent off to the printers.

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[41] see "Journalism 11/12" outline in Appendix B

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You will be expected to meet all deadlines that have been agreed on by the members of the class.[42]

The course's outline is almost identical to that of the Journalism course and also involves a cooperative evaluation process. Susan Hill takes great pride in both publications and is eager to inform me that both have placed high in various competitions.

The Observational Process: Socio-Cultural Considerations

My visits to Fairfax School take place during the months of February and early March, 1998. I sit in on Jenny Shin's grade 8 and 9 Information Technology classes and Susan Hill's grade 11 Computer Science, Journalism and Yearbook classes. I usually sit at the back of the class to observe and take fieldnotes. I also interview both Ms. Hill and Ms. Shin as well as ten of the Senior School's approximately 300 students. I distribute over 100 surveys from Suzanne de Castell's and Mary Bryson's "GenTech" project and receive 82 completed surveys back.[43]

During my observations I attempt to record everything that could potentially be relevant for a project that endeavours to explore issues of gender equity in the instruction of computer technology. However with that being said, I am very much aware of the enormity and impossibility of that task. I am also cognizant of the constraints impacting my role as observer and the complexity inherent in the researcher-position: that is recognizing the researcher as an individual who embodies and reflects a particular socio-cultural perspective that will necessarily impact upon what she observes and what conclusions she draws. One cannot separate herself from the subjective process of observation, description, and interpretation and this is particularly acute when ethnographic methods are used as they are in the present study.

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[42] see "Yearbook 11/12" course outline in Appendix B.

[43] see "Students' Uses of New Information Technologies" survey in Appendix A.

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A researcher cannot observe without interpreting in some way what is visible.[44] Not only does a researcher's "preconceptions, biases, and motives" affect how she 'observes' an environment, but it also affects how that setting is described.[45]

It is not only the socio-cultural positioning of the researcher that requires recognition, but also required is an acknowledgment of the influence of the broader research context. The intended audience for a research document and the conventions of its practice(s) must be viewed through a reflective lens in order to recognize the complexity inherent in any activity that purports to describe a social activity or setting.

> How a field researcher writes about observed events is linked to often unacknowledged assumptions about whom he [sic] is writing for...In this sense, awareness of writing choices generates an appreciation of the *reflexivity* of ethnographic research. Reflexivity involves the recognition that an account of reality does not simply mirror reality but rather creates or constitutes as real in the first place whatever it describes. Thus 'the notion of reflexivity recognizes that texts do not simply and transparently report an independent order of reality. Rather, the texts themselves are implicated in the work of reality-construction'.[46]

Personal Perspective and its Impact on Research

Denise Frechet notes, "[since] scientists' theories, beliefs, and values determine what they can and cannot see, it is obviously important to know as much as possible about their point of view and motives."[47] I therefore feel that something needs to be said of my own socio cultural perspective in order to contextualize my interpretations and observations at Fairfax; my own

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[44] Hill Collins, 1991, 54.
[45] Van Maanen, 1988, 93.
[46] Emerson et. al., 1995, 44, 213.
[47] Frechet, 1991, 216.

educational experiences will necessarily influence how I perceive of that learning context and the conclusion I make.

I am a 28 year old Graduate student at Simon Fraser University, I am of Irish heritage, but I was born and raised in Canada. I attended a large, public, elementary school in Ottawa where I was enrolled, from the age of five, in a French Immersion program. I was labeled a poor 'C-/D' student and I remember spending a lot of time in the Guidance Counsellor's office listening to pontifications about why I should be held back from graduating into the next year.

I cannot remember a day when I did not dread going to school, I simply hated it. For high school I spent grades nine and ten in another large high school in downtown Ottawa, once again I struggled along in French Immersion and received mostly 'C's' . For grades 11, 12, and 13 my family moved to Burlington Ontario, a mid-sized suburban city where I attended a much smaller public school in an affluent and very white, neighbourhood. French Immersion was not offered so I went into an English educational environment and my grades went up to the B+/A- range. I enjoyed school much more at this point perhaps due in part to the fact that I could take more courses that interested me as I no longer had so many compulsory courses in French.

My experiences with computers began in grade 10 when I took an introductory computer programming course in high school. I do not remember retaining much information and as I recall I copied most assignments from my peers. In my first year of University I was required to take a science course so I chose another 'Introduction to Computers' course which focused on BASIC programming language, once again I do not remember much of that class either. In my last year of undergraduate work,

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one of my roommates had a PC and I used it once or twice to type essays for school. I still remember feeling quite nervous about making mistakes because I did not feel confident that I could get myself out of a jam if it was required and in fact I hand wrote the papers first and then simply typed the words in and sent the paper to the printer. Once in graduate school, I took a course that required that I use e-mail to correspond with my classmates. I was able to get through the basic steps of receiving and sending e-mail but it was not until I got a job where I needed to become proficient in PageMaker, Microsoft Word and even Web Page design that I felt comfortable with computers. However, to this day I do not own a computer - more of an economic decision than anything else.

Academic Boundaries: A Partial Perspective

There is no doubt that these experiences, and many others, influence how I observe and interpret what I see in the classrooms at Fairfax; that needs to be considered by both myself and by the reader as she engages with this text. It must also be understood that I am writing this document within the boundaries of academic discourse and location which necessarily frames and situates my work within a certain social context. When academic texts are read it must be considered that , "these documents do not appear from nowhere, are not objective 'facts', but have been created to maintain certain kinds of relations, particular forms of interaction."[48] Statements made within this thesis can only claim to present a partial perspective; one which is produced from a particular social location and time; this document does not presume to tell the 'whole' story of Fairfax.

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[48] McKenna, 1991, 124.

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As Van Maanen states, "a culture is not something that can be known once and for all...knowing a culture, even our own is a never-ending story."[49] It is this awareness and self-reflexivity that I seek to bring to this research process in order to encourage a contextualized understanding of all that I witness and describe. I cannot profess to 'know' the educational and social culture within the computer room at Fairfax, however, I hope that my descriptions and perspectives can add in some way to the research that currently exists and which will be developed regarding computer technology and gender equity.

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[49] Van Maanen, 1988, 119.

CHAPTER THREE

Achieving Equity Through Classroom Practice:
Challenges and Recommendations

The National Advisory Board on Science and Technology (NABST) advises educators to reflect on the teaching strategies they use when instructing science and technology in order to increase girls' participation in those fields. NABST advocates for communities of practice that encourage young women to succeed at science and technology subjects. NABST's fundamental recommendations for a school-based context can be broken down into three general areas: using cooperative learning techniques; "enhanc[ing] learning experiences of women students" by "imbed[ing] applied science topics in the curriculum so that students can see the relevance and value of...applied technology to their everyday lives";[50] and improving girls' self-esteem in relation to technology in part by addressing gender bias and stereotypes in the classroom, and by providing female role models in the sciences.[51] What follows in this paper is an examination of the instruction of computer skills at Fairfax School, as it relates to these three recommendations. This will allow for the opportunity to investigate the potential effectiveness of NABST's proposals in relation to school-based instruction of computer skills to women.

This chapter begins by exploring some general issues that emerge when an educator attempts to teach computer skills to a classroom of learners; specifically this chapter addresses the challenges involved in accommodating differences in student learning styles and preferences.

Learning Styles

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[50] NABST, 30
[51] NABST, 32

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Jenny Shin teaches many of the Information Technology courses at Fairfax. She has only been at the school for 7 months and she acknowledges the struggles she faces in teaching courses that are recent additions to the curriculum, especially when students favour diverse teaching styles and find themselves at different ability levels.

> *"I'm having a little bit of trouble with the discipline in the classroom and also organizing some of the activities, cause when you're learning how to teach you do learn about classroom management but you're not taught to figure out how long each activity will take. And there's a big gap; like if I have 17 students they're all at different ability levels - 17 ability levels in terms of their computer skills and in terms of their learning styles - so it's really difficult. So what I do to individualize each student is to go around the room constantly, just looking at things...And also these courses are like, I think people have been teaching them but somehow they stopped teaching so all three are brand new courses so it's not like I have things to rely on, no set curriculum so I'm just looking at the government guidelines and I'm just devising on my own, which I don't mind cause I can have more control but I wish there were more things that I could choose from rather than creating things from scratch."[52]*

Susan Hill, who has been teaching computer-related courses at Fairfax for ten years, also acknowledges the difficulties in teaching technology to a variety of students, despite her extensive experience.

> *"Info Tech is interesting because I haven't got a grip on people's learning styles as much as I do in other things. Some kids want to be really linear, they would really like notes and they really want to know step 1, step 2, step 3, step 4. And they stop dead in their tracks if you can't solve their problems for them right away. And other kids would really prefer it if you just kind of went for coffee while they had an hour and a half in the computer room*

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[52] Interview with Jenny Shin , March 15th, 1998.

[laughs] to do exactly what they want. So it's been fun developing."[53]

The challenge of effectively adapting computer science instruction to suit the learning needs of different individuals does not go by unnoticed by the students taking computer science at Fairfax. When asked what they would do to improve the instruction of computers at their school many students find themselves grappling with similar issues as their teachers. Many would appreciate working on practical activities while receiving individualized attention from their teachers so that they can acquire "hands-on" experience at their own pace, yet students also understand the impracticality of having such one-on-one attention in a school setting.

The Challenge of an Individualized Approach

I spoke to Fern (grade eleven) and Samira (grade ten), both of whom have taken computer courses outside of school because of their interest in computers. Fern is currently taking both the Journalism and the Computer Science 11 courses and after graduating from Fairfax she would like to go to university and ideally get into the film industry, although she admits that she will *"probably follow in my Dad's footsteps and go into marketing."* Samira is taking the Computer Science 11 course this semester, she is clear about her future: she wants to get her Bachelors of Computing Science at UBC so that she can eventually enroll in a Space Technology program. Both Fern and Samira say that they would like to see more "hands-on" computer instruction, however, Fern especially sees the potential dilemma identified by her two teachers:

> **Cailey:** *"Now, how do you think computers could be better taught here at Fairfax? Or how would you like to see the computer studies program improved?"*

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[53] Interview with Susan Hill, March 15th, 1998.

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> **Fern:** *"I think this year with Ms. Shin I kind of found myself teaching myself most of it. She kind of will do it herself and then expect you to have followed it, and you can't really, cause not everybody learns that way, so I think to have a teacher who is patient with each student which is kind of hard in a big school, like not that this is a big school, but it is a fairly large school for one person to have to teach everybody. But a little more hands-on experience would probably help."*
>
> **Cailey :** *"How about you Samira?"*
>
> **Samira:** *"Same as Fern I think with Ms. Shin you don't really like learn how to do stuff you have to teach yourself. But with Ms. Hill it's too much like look at the overhead and this is how you do it, but not enough hands-on do-it-yourself. So I think you need more hands-on experience."*[54]

Running Into Problems: The Ideal Time to Learn

Many other students I speak with say that they learn best when they can learn a new computer skill when, and only when, they run into a problem. They speak of the importance of being able to ask a question and receive a direct response while working on a computer task. None of the students that I speak with directly articulate a desire to see the direct, lecture style of teaching that Susan Hill identifies as being a preference for some students.

Selina, a 16 year old student who has been at Fairfax School for three years, took the Information Technology 11 course last year with Mr. Walker.

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[54] Interview with Fern, Devorah and Samira, March 11th, 1998. I included this portion of the interview with some hesitation as I did not wish to harm the reputation of any Fairfax teachers, however, I feel confident saying that any student's commentary on a teacher's performance represents an individual 'opinion'. And although opinions are important, (in fact Ms. Shin requested that I pass along any comments and suggestions that students made about her performance so that she could improve her teaching practices) they do not, by any means, represent a quantifiable indictment of a teacher's ability.

She is currently taking the Yearbook course. During a discussion of how much she enjoyed creating her web page for her class last year she says:

> *Selina*: *It's Mr. Walker   he's a very good, very very good teacher."*
>
> *Cailey*: *"What makes him a good teacher."*
>
> *Selina*: *"He just sets you free, he's like, 'I'll tell you the information, you do what you have to do', and it's not like restrictive, regulations are not set.   And I love it."*
>
> *Cailey*: *"So you don't need to do it a certain way?"*
>
> *Selina*: *"Yeah he just said, 'okay have it more than 3 pages, have links'.   He taught us how to do links and then he pretty much let us do whatever we wanted.   And that's the kind of teaching I like cause it's not, it's more of your own work, it kind of like art, it's more of your own work."*

Prathna, 17 and Adrienne, 16 are both enrolled in the Journalism class. Adrienne is one of the editors of the newspaper and Prathna coordinates the advertising.   Prathna has not taken any computer courses except for the required grade eight Computer Studies course and Adrienne has already taken Information Technology 11. They both emphasize the importance of being able to ask questions as they go along in their tasks, rather than listening to a teacher explain the technology in a lecture format.   They also point out the value of asking their friends for help because peers they argue, unlike teachers, can explain how to solve a particular problem without going into too much detail.

> *Cailey*: *"And do you like how computers are taught at Fairfax? Is that where you learn most of your computer skills or do you think that you also learn at home and other places?"*
>
> *Adrienne*: *"When I'm working at home, I kind of just use the stuff that I already know, I don't go and learn new things..."*

Prathna: "Cause if you get stuck you're stuck, you can't do anything then. But here I don't find, like what Ms. Hill teaches us it's not like a lot, she doesn't actually teach us anything you sort of do it and you learn when you come to a problem..."

Adrienne: "Then that's when you learn more because..."

Prathna: "You ask somebody, 'like how do you do this?' . Like you learn as you need to know the skill."

Adrienne: "like [when a teacher uses] the overhead to show you how to do stuff if you run into a problem then, and you don't understand, you don't want to stop her because it takes away from the whole class if not everyone is having that problem."

Cailey: "Have you learned a lot of computer stuff through The Gryphon, through doing the paper?"

Adrienne: "I think so"

Prathna: "I think I have more than anyone else because I didn't use computers at all before and like I knew basics, like some basics I learned in grade 7 and 8 but I didn't use it because I found it difficult and stuff and now I have to use it and like I've learned spreadsheets like databases all of this PageMaker all of these sorts of programs, like how to get stuff from one computer onto another without having to take disks and stuff like that, I learned a lot this year."

Cailey: "Do you rely on each other as well to teach you skills?"

Adrienne: "Definitely"

Prathna: "Oh yeah totally, I think that I rely on the other students in the class more than I rely on Ms. Hill cause..."

Adrienne: "Cause sometimes Ms Hill when you want to ask her something she'll kind of show you all of these different tricks, 'well this is how you do it easier, this is how you do it easier' but like 'no, I just want to know how to do it'"

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Prathna: *"'one way, just one way' or she'll come and she'll do it for you and she'll just like, she thinks that when she's doing it and you're watching her you're learning that way but you're not, they have to stop and explain. She'll go [really fast] 'click, click, click, click, click' and you're like 'okay there's a click in that direction and somewhere over there' and you have to start guessing."*

Cailey: "But your friends are better at doing it?"

Prathna: "Yeah your friends do it like slowly and they put it in really simple terms, like however they learned, however they were able to memorize it, that's how they tell you so you know it works that way."

Adrienne: "Yeah, yeah."[55]

Juggling the Needs of Students: An Exercise in Chaos

For an educator to attempt teaching students a broad range of computer skills in a time-sensitive and efficient way while also allowing all of the students in her class to go at their own pace can be a frustrating balancing act. The following description of a grade 11 Information Technology class demonstrates how challenging this strategy can be in a classroom context. This next excerpt from my fieldnotes describes a particularly trying situation when Jenny Shin aims to teach HyperStudio to a class of approximately 15 students.

Ms. Shin: "I would like people to put their computers to sleep please". Ms. Shin sits on the chair at the computer display terminal and continues: "HyperStudio is a large program so go to the Finder and make sure nothing else is running. If you go to Apple, under Application, if it's not there don't get confused go to Workstation. HyperStudio looks like this, press control tab to make an alias and drag it to Applications". [Ms. Shin is going through the process on the computer as she explains the steps out loud. Students can see what she is doing on an 'LCD' screen at the front of the class.]

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[55] Interview with Adrienne and Prathna, March 11, 1998.

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Megan: "Do you click on it first and then make an alias?"

Ms. Shin: "Yes". She proceeds going through the tools of the program "this is the Clicker, the Browser, these are all self-explanatory. Does anyone have any questions?"

Megan: "What's the circle?"

Ms. Shin: "Buttons"

[Students are asking questions at once and 3 or 4 students are talking, it's not clear if they are discussing the course, or socializing. Many students are talking quietly and others are still working on their computers. Ms. Shin is going through different instructions for the program. Some questions are being asked.]

Rhiannon: "How do we add animation and sound?"

Ms. Shin: "Just a minute"

June: "What does 'scrollable' mean?"

Ms. Shin: "This is the Scroll Bar"

June: "What's the difference between the Scroll Bar and scrollable?"

Ms. Shin: "Okay now this is important...these are Visible Buttons."

Sarita: "What's invisible?"

Ms. Shin: "These"

Sarita: "Can you make your own?"

Ms. Shin: "um...no, you can make different sizes".

[Several students are working on other work and E-mail during the lesson.]

Rhiannon: "If you want to play a song from a CD how do you do that?"

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June: "Yeah"

Ms. Shin: "Now you'll have to put the sound on your CD-ROM"

Rhiannon: "Where's that?"

Ms. Shin: "On the CD"

Rhiannon: "But I don't have my CD"

Ms. Shin: "Now today you're just starting to learn a complicated program, so don't get overwhelmed."

[Almost all of the students are working on their own, a few are looking at Ms. Shin. Beth walks in late because she had to write a test. She sits down at a computer, but she is not getting a HyperStudio screen, she looks to her neighbour, Jasjit, who is talking to someone else. She tries various things on her own but nothing works. She asks Jasjit once she is available; Jasjit grabs the mouse and starts trying to help out but nothing happens. Beth puts her hand up for half a minute, but Ms. Shin doesn't see/recognize it so she puts it down.

A couple of students have their hands up, but Ms. Shin is working with another student whose computer isn't working. She sends the student over to an unused computer.]

Monica: "But what do I do next time?"

Ms. Shin: "I'll try to install..."

June: "It says Error..."

Ms. Shin: "You need to go to a site with sound"

Rhiannon: "How do I send this?"

Megan: "Can we put a video clip in?"

[All of the students have begun working on their HyperStudio card assignment without being formally directed. There are many questions being asked aloud,

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and Ms. Shin is trying to get to everybody. A couple of students have their hands up.]

Jasjit: *"Beth and I are having the same problem"*

Ms. Shin: *[over her shoulder] "Have you checked the workstation."*

[Six students are working in pairs on computers.]

Ms. Shin: *"For those of you last week..."*

Rhiannon: *"Where do we find the sound?"*

Ms. Shin: *"Any web site, you can go to a free Sound Bite page"*

Amber: *"So if I have my own CD how do I..."*

Ms. Shin: *"Yeah I'll show you..." [She walks away to answer another question. Amber rolls her eyes and stops working on her assignment.*

One student has her hand up and Ms. Shin goes to her. Another student has her hand up] "um...Ms Shin?"

Ms. Shin: *"You need to re-format...[student indicates that she doesn't know how to do that] You don't know how to re-format?"*

Grace: *[she puts her hand up for several seconds, then she calls out her question from where she is seated] "The text isn't coming off"*

[Another hand goes up. Amber is now on the Yahoo search engine. Beth and her neighbour are working together on backgrounds for their assignments. Two students are swooning over an image on the screen.]

Grace: *"Um Ms. Shin? Wherever you are?"*

[Some students are working on their own.]

Grace: *[sighing to herself] "Oh what's wrong? Oh please work"*

Ms. Shin: "So make sure if you're using images from the net, that you E-mail to get their permission, this is a non-profit, you have to E-mail"

Shamilla: "How do you E-mail, how do you get their E-mail address?"

[Ms. Shin goes to help another student who has her hand up.]

Lisa: "When I went to download a big file it just froze. My computer just froze!"[56]

This classroom scene presents a graphic example of the difficulties of attempting to teach computer skills to a group while attempting to attend to individual needs. Ms. Shin's classes are by no means usually this chaotic, however elements of this particular example are prevalent in many situations of computer science instruction in the Information Technology courses. Trying to find a balance between the need to give an overview of a program from the front of the class (when students are not always aware of the relevance of the information) and allowing students to work through the program on their own (so that they can put the lesson into practice) often results in many questions being asked at once and many frustrated students.

The questions that students have and the behaviour they demonstrate are genuine reflections of their desire to learn and their preference for one-on-one teaching. Their questions and conduct also reinforce what the students express during interviews: that they want to be able to ask questions as they think of them and as they are relevant. It seems evident, however, that answering students' questions as they arise is not a luxury that a teacher, or the class as a whole, can afford to offer.

Learning to Learn

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[56] Fieldnotes, February 23rd, 1998.

Although Ms. Shin acknowledges the challenges of teaching students with a variety of learning styles, she is clear about her philosophy of teaching computer skills. Ms. Shin feels strongly that students need to 'learn how to learn', they need to figure things out for themselves without always being given the answer by a teacher. Her reasons are as follows.

> *"I'm teaching them, my basic philosophy is - which I've had partial success and part failure [laughs] - but I'm still idealistic about it in terms of my approach, because I became good with programming and HTML not because I took computer programming courses - I've never taken any computer science courses per se I just - like same thing with Ms. Hill, she was just keen she just wanted to learn and she wanted to use [computers] and that's how I became knowledgeable about certain programs. So what I'm doing with these girls, I want them to 'learn how to learn' how to teach themselves rather than being taught and being spoon fed. Certain things you have to teach cause then that will minimize a lot of frustration and a lot of confusion cause there are things that just have to be taught. But other things, like going to get help or support or some sort of solving problems I don't really give them the answers I'd rather have them find the answers on their own. Because when they graduate, the technology field is changing everyday and the way people use computers and like every year something is changing and what they're learning right now might not be relevant in two or three years, and definitely not relevant when they graduate. And so, right now they have to learn that they can learn and they can be their own teacher, how to get help and how to solve problems on their own. So I'm teaching them how to use the built-in help and using manuals and how to E-mail to the experts, how to go to web sites to ask about technical questions and some kids are really good at that, they're independent learners and they like to figure out on their own and they're really proud of solving. And some kids are really, they like to be spoon fed and they like to be lectured so I'm sort of juggling in between and it's not easy."[57]*

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[57] Interview with Jenny Shin, March 15th, 1998.

Ms. Hill also encourages her students to 'learn how to learn' - on their own as well as in groups. During one particular Computer Science 11 class, for example, Ms. Hill wants students to explore the functions relating to spreadsheets. She selects three different components of the spreadsheet program and asks students to arrange themselves in three different groups. After fifteen minutes, the groups are expected to explain to the rest of the class what they have discovered about the program. Ms. Hill justifies her reasoning behind this collaborative learning model to the students by relating its relevance to their futures as university students.

> *"I'm going to put you in groups of three, it's fine for me to teach you but one day at university you'll need to learn o n your own with a text book - which is the worst way to learn by the way - or you may have to wake up your roommate and ask her. So how should we divide up: Fiona you can do this."*[58]

Allowing students to learn how to resolve computer science problems on their own gives students the opportunity to work solutions out by themselves and with peers, with the hope that they will understand the reasoning inherent in the process more profoundly and will consequently retain it. This 'hands-off' approach can be frustrating of course, and it often seems easier for a teacher to step in and provide the answers. In this next example, Ms. Hill is asked by Fiona, a grade 11 student who often struggles in this class, for help when she gets stuck doing her Slide Show project. The results of this particular 'learning to learn' situation garners mixed results, however it allows Ms. Hill an opportunity to teach another lesson to her students, namely that she is confident in their abilities to solve complex computer problems.

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[58] Fieldnotes, February 24th, 1998.

During some one-on-one work with Maria, Ms. Hill notices that one of the students, Fiona, is sending an E-mail. Ms. Hill asks Fiona to stop E-mailing and quietly reprimands her for not working on her Slide Show. Fiona begins working on her Slide Show.

Several minutes later, Fiona begins talking aloud - "The computer's broken" - she says this several times. After making a few more similar comments Fiona calls for "Mrs. Hill" with a question. Ms. Hill goes over to find Fiona struggling with her Slide Show project. Ms. Hill gives Fiona some ideas for what may be going wrong with her work. Fiona does not appear to understand what Ms. Hill is suggesting and keeps asking her for help. [I get the sense that Ms. Hill is attempting to let Fiona figure things out on her own, by saying what should be done to correct the problem rather than doing it for her]. Ms. Hill leaves Fiona so that she has to do it herself without relying on Ms. Hill. Fiona attempts to follow Ms. Hill's directions, but when she runs into trouble, she again makes comments like "my computer's broken", and "what's gong on?" When Ms. Hill does not respond to these queries, Fiona again calls for "Mrs. Hill". Ms. Hill walks over very slowly and again suggests what she feels is the solution. This pattern repeats itself several times. Ms. Hill does not seem enthusiastic about providing the solution for Fiona. Eventually, Fiona begins to ask students around her about her problems with the application. Two students offer help and give her suggestions as to what she could try. When those suggestions don't work, Fiona calls for Ms. Hill and the other two students inform Ms. Hill that they don't know what is going on with Fiona's application either. Maria announces that something must be wrong with Fiona's computer. For the first time since Fiona's questions arose, Ms. Hill tries to solve the problem herself and when she is not successful, she turns to the class and asks if anyone knows the solution to the problem facing Fiona. Maria asks Ms. Hill if she knows the answer. Ms. Hill says "no, I don't I'm asking you guys". Eventually Ms. Hill recommends that Fiona delete the problem areas and start those sections again. Fiona says that she's concerned that this will take too much time. Ms. Hill says that it isn't

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that difficult to redo and she sits with Fiona and leads her
through the process.[59]

There are several things going on in the scenario with Fiona and her Slide Show project. One is that Ms. Hill attempts to give Fiona enough opportunity to solve the problem herself without too hastily calling for help. But once other students corroborate Fiona's difficulties, Ms. Hill is faced with the possibility that this is not a situation where Fiona is not trying hard enough, or trusting her ability enough. It is at this point that Ms. Hill tries to follow her own suggestions and discovers that she cannot solve the problem either, so she asks the rest of the class.

Looking to the students for guidance does several things: first, it allows students the opportunity to be computer science problem-solvers and it demonstrates to the students that their teacher believes in their ability enough to ask them for their suggestions. Second, it reveals to students that even the 'expert' teacher cannot always figure everything out and she must also struggle to find solutions to technical problems. And third, the teacher is promoting the idea that people should look to each other to figure out solutions to problems; in this way computer science need not be a solo-affair.

Ms. Hill does eventually provide hands-on help to Fiona and walks her through the final rebuilding of her assignment, this works to minimize the frustration that Fiona may feel after having struggled for so long with an exercise without being believed that her difficulties were genuine. However, that direct interference is the last resort for Ms. Hill; first she asks others in the class for their help.

NABST's Recommendations

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[59] Fieldnotes, February 12th, 1998.

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The educational setting provides challenges and opportunities for teachers in regard to instructing computer science in ways that are accessible and enjoyable to the majority of their students. According to NABST, educators should pay particular attention to how computer technology is taught and presented to their female students. Particularly useful, NABST maintains, is an adherence to: cooperative learning techniques, making technical education relevant to students' everyday lives, and breaking down gendered stereotyping as it relates to science and technology in part by improving girls' self-esteem with scientific and technological disciplines. The following three chapters will discuss the extent to which, and the ways in which, Fairfax School provides each of NABST's recommended learning environments for its students.

CHAPTER FOUR
COOPERATIVE LEARNING TECHNIQUES

Schooled Expectations

At the conclusion of the last chapter, we saw how Ms. Hill focuses on her class' ability to work together to solve a problem that Fiona experiences with her computer application. This focus on the group's ability to work together to solve a problem is a reflection of the many collaborative teaching strategies that Ms. Hill employs. Not only does she encourage group work in her computer science courses but she teaches two courses that totally rely on team work to accomplish their goals. Both the Journalism course and the Yearbook course are based on a team structure, both have a concrete group project to work toward, and both are dependent on computer technology to fulfill those ventures. Students in both of these courses are encouraged to work as a team, not as individuals when they work toward the completion of the newspaper and the yearbook. In our interview Ms. Hill remarks,

> *I use the philosophy with those two things, [the Gryphon and the Yearbook], I use two statements over and over again every year: 'seven brains one newspaper', 'fourteen brains one yearbook', and then the analogy I use of sport that 'the team is as strong as its weakest link' and 'a book is as good as its weakest pages' and 'the newspaper is as good as its weakest writing' so there's real team building and I think they get good business skills, and they get good commitment skills, and they get good ownership skills, and because they're good they get lots of positive feedback...If I have any skill, besides computer skills in teaching the courses it's being able to make a group work together from the years and years in the gymnasium.*[60]

It is Ms. Hill's belief that her extensive experience as a gym teacher and as head of the Athletic Department at Fairfax allow her to see the educational advantages of a group of students working toward one goal. Ms. Hill is not

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[60] Interview with Susan Hill, March 15th, 1998.

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alone in this belief; research suggests that the benefits of encouraging group cooperation go beyond coaching a team to a winning game, cooperative learning environments are seen by many to be ideal for classroom settings. Bruce Joyce and Marsha Weil in Models of Teaching state that,

> in classrooms organized so that students work in pairs and larger groups, tutor each other, and share rewards, there is greater mastery of material than with the common individual-study-cum-recitation pattern. Also, the shared responsibility and interaction produce more positive feelings toward tasks and others, generate better intergroup relations, and result in better self-images for students with histories of poor achievements.[61]

Joyce and Weil refer to David and Roger Johnson (1985, 1995), S. Kagan (1990), Robert Slavin (1983, 1990), and Shlomo Sharan (1990) who have all studied the benefits of cooperative learning strategies. Such strategies , they say, appear to be a "direct challenge to the principles that many schools have relied on to guide their use of tests and rewards for student achievement."[62] And their use certainly challenges the methods of teaching that NABST observes are predominantly used to teach computer studies.[63]

Cooperative Behaviour Beyond the Classroom

Cooperative teaching/learning methods are not only found in Ms. Hill's Journalism and Yearbook classes but the philosophy behind them are found and reinforced everywhere in the school. As mentioned earlier both Jenny Shin and Susan Hill utilize cooperative learning strategies in their Information Technology and Computer Science classes. However, cooperative learning occurs beyond the classroom walls as well, providing wide institutional support for these methods. Because students see others at

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[61] Joyce and Weil, 1996, 68.
[62] Joyce and Weil, 1996, 73.
[63] NABST, 20.

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Fairfax School working together to achieve a common goal, they are better able to see the utility of group work, and are more adept at participating in such efforts in their classrooms.

To illustrate this point, I highlight a section of my interview with Susan Hill when we speak of classroom management. Ms. Hill mentions that she has little difficulty with behaviour problems in her classes, because at Fairfax, they *"simply demand cooperative behaviour."*

> *Cailey: "How do you foster that sense of cooperative behaviour?"*
>
> *Ms. Hill: "It's always been there, it's inherent in the school."*
>
> *Cailey: "So if somebody does something terribly wrong, where's the accountability in terms of that, what reinforces that expectation?"*
>
> *Ms. Hill: "Okay, we've got two issues coming up. One is that the kids are not respecting where they eat food. So what we're going to have is a one hour talk about the problem in assembly, break into cross grades and talk about what rules would be reasonable and every teacher will take a small work group and then there's going to be consensus and refining and then we're going to work on it that way. And we have another one with theft. So we're going to use that same process and we've done it once already with bullying. So it works."*[64]

Fairfax students, by employing cooperative methods to determine their school's codes of conduct see the value, and come to expect the use of, cooperative determination practices within their learning community.

Cooperative Teachers

Teachers also model cooperative learning in the presence of students further reinforcing the benefit of such an approach. When Ms. Hill has difficulty with a computer problem she will often put her students "on hold"

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[64] Interview with Susan Hill, March 15th, 1998.

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and ask her "mentor" to come in to the class so they can work together to solve the problem.

> *Ms. Hill: I must tell you, Bob's been a good influence on me. Bob's been very good about teaching me all the basics about how Macintosh works, all that management stuff Bob Walker has taught me. I've had a good mentor."*

> *Cailey: "And has he been able to do that during class time or has that been..."*

> *Ms. Hill: "It only takes about five minutes, if ever I had a problem then we'd do trouble-shooting, he just didn't do it for me, he taught me how to do it so next time I could do it myself, it was on a needs-as basis and the school is so casual you know you just put the kids on hold..."[65]*

Cooperative Parents

Parents are also heavily involved in the life of the school and they, too, work cooperatively to make Fairfax the kind of school that they want for their children.

> *Cailey: "When I came to the school one day I noticed what I think were parents lining the entire street looking like parking patrol, what were they doing there?"*

> *Ms. Hill: "Yup, the parent traffic control"*

> *Cailey: "Is it anything to do with kids safely getting in and out of the school or is it..."*

> *Ms. Hill: "And traffic management; with St. Peters School and our school being so close together and with so many people being driven because they can't walk to school we have a horrendous traffic problem."*

> *Cailey: "How is the sense of community fostered at Fairfax? Is it the small size primarily?"*

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[65] Interview with Susan Hill, March 15th, 1998. It is interesting to note that Susan Hill, just like her students, appreciates the opportunity to learn computer skills one-on-one with a teacher and on an as-needs basis.

Ms. Hill: *"It's always been there, we're a Society, so we're a non-profit organization, so we have a Board of Governors with parents who are in the school. We depend on an awful lot of volunteer work to succeed. We have a market that makes what was it? I'd have to check the Gryphon, about $160,000, totally done by a group called the Parents' Auxiliary. We have all kinds of committees, fund raising committees, we have people who are part of the Vancouver Foundation, we raise a lot of money for scholarships and so parents help and they get invested in it. They raise money to fix the gym and then they're the one's dealing with the architects and working with the teachers to figure out what's best for everybody. So it's good. Parents who are spending that kind of money to send their kids to the school are investing more than money, so parent teacher interviews, or the freedom to phone and talk to teachers is a right.[66]*

Cooperative Behaviour Within the Classroom

The Gryphon and the Yearbook are publications that add to the Fairfax community. The Gryphon can be found throughout the school and is distributed to other private schools in the area. The Yearbook is an award-winning yearbook that documents the year at Fairfax in both the Junior and the Senior Schools. Students enroll in these classes for various reasons: they love to write, take photographs, attend and report on school events, and many comment on how their careers in business will benefit from the skills they develop in the class. Both classes rely heavily on cooperative learning. Each publication has two student editors and every student in the class is responsible for participating in production.

Journalism Class

My first day visiting the Journalism class I am surprised at how well students work as a team. Here is an excerpt from that class to provide some insight into how the class functions. This is the last class before the paper is being sent to the printers so the students are working to a tight deadline.

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[66] Interview with Susan Hill, March 15th, 1998.

*There are 7 students in this class. Ms. Hill explains to m e
that the students are working to a deadline and are doing
final editing on their stories and are preparing the layout
today. She informs me that during the last deadline, the
work required for the publication went beyond what the
class schedule allowed, so the class had to stay late after
school and Ms. Hill took them out for pizza for dinner.
They were at the school until 10:30 PM.*

*Before the class formally begins, Ms. Hill says to one of the
students, Prathna, that she is the reason Ms. Hill couldn't
get to sleep last night. Prathna looks surprised. Ms. Hill
explains that she was trying to find a font on her h o m e
computer that Prathna had used on one of her
assignments. Prathna laughs. Ms. Hill begins the class by
talking about an idea she has about an editorial story that
she thinks will be timely for the next edition. She says
that the Ross Rebagliatti story would be a good story to
report on. She says that Canada's, and an athlete's,
reputation have been tarnished, and although some say it
may be the fault of the athlete it is, in her opinion
arguable that it is the tester's responsibility since they did
not inform the snowboarder that he had tested positive
for traces of marijuana in November and December. Ms.
Hill argues that if the athlete had known this, he would
have realized that second hand smoke could affect a test
result. There is a brief discussion about the issue and then
Ms. Hill asks if students feel that this is a good idea for a n
editorial? Some students say that this is a good idea. Two
students start this story without any more input from Ms.
Hill. Fern gets on the Internet to do research and Lisa
begins to write.*

*Two students are working on following up on s o m e
potential advertisers. There is some social talk, but most
of the time is spent working on the paper. Occasionally,
Ms. Hill asks if something is getting done, but primarily
the students are working on their own. Ms. Hill proof
reads the pages once they are ready and she leaves the
classroom to do it so she can concentrate. The phone rings
in the class and Fern answers it. It is an advertiser. Fern
deals with the advertiser's question about whether or not
his ad, which he had couriered yesterday afternoon, has
been received by Fairfax. Every student is working on a
different task - the editorial story, ads, gluing pages, editing*

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typos etc. Students ask questions of each other - one asks another if what she has written is okay? She reads the article and says "this is so great you should do this for a living".

My attention is caught by Natalie who is working at her computer with a video camera hooked up to it. I go over and ask her what it is for. She says that she's getting a photo still from it. When Ms. Hill returns to the classroom, I quietly comment to her that I am impressed that the students have access and are using such technology. Ms. Hill responds loudly enough for the students to hear her, "we've got smart kids here, smarter than me".

The Ross Rebagliatti research has been finished by Fern, she has written down all of the details of the incident and passes them on to Lisa who is writing the story. At one point I look over to see how Lisa is doing on the story and Natalie is now sitting at Lisa's computer continuing the work. There is a bit of a scuffle over something [I didn't hear what] and Fern snaps "relax, just relax we all have our jobs to do - go and do what you need to do".

Fern is on the phone trying to track down the ad that was supposedly sent to Fairfax yesterday. She expresses her frustration in resolving the case of the missing ad, and another student suggests that she call the courier company in order to trace where it has gone. Fern says that she has never done that and asks the other student if she can do it. The other student doesn't move, so Fern calls.

I am given the task of proof reading some of the pages. The writing is impressive, and I don't find many typos - only three or four out of the four pages that I read. The phone rings and Lisa answers. It's the courier company calling back to say that K. Clarke signed for the ad last night at 5:03 PM. Ms. Hill enters the room and Lisa asks her if she has heard of this woman. Ms. Hill knows who this is and tells Fern where the ad is probably located. Fern comes back a few minutes later with the ad. The buzzer goes and a few students say that they have to go but most stay on into the lunch hour to finish up.[67]

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[67] Fieldnotes, February 12th, 1998.

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In the Journalism class, students have their own assignments to complete, but they do not appear to restrict themselves to their own tasks. Natalie helps Lisa write the Rebagliatti story, a student takes the time to proof read the work of another, students offer suggestions for how to track down an ad, Lisa takes a call for the missing ad even though Fern has been dealing with it and even I am called upon to help the class make the printer's deadline. The students do not need to be pushed to work to the deadline and Ms. Hill is rarely in the class; the motivation for getting the work done appears to come from the students.

Yearbook Class

The Yearbook class also works cooperatively toward putting together a high-tech publication. Just as with the Gryphon there are two student editors for the yearbook, Nicole and Chloe. In this next excerpt students again work together, building on each other's knowledge, to get the job done.

The class begins with Ms. Hill telling Nicole, one of the editors that no pictures were taken of last night's basketball game.

Nicole: "Why?"

Ms. Hill: Because there was no photographer there."

Nicole: "Oh."

Ms. Hill: "We'll have a quiet emergency meeting".

Several students are talking about a math test and the majority of the class is working on their yearbook assignments. A meeting takes place at Ms. Hill's desk with the two editors, presumably about the missed photos. [I hear later that this photographer has failed to meet several of her deadlines. The group decides that they will approach her and say that she is needed on another task which will automatically take her photography responsibilities away. Ms. Hill says that this student will still get the message but will not be directly accused of

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failing to fulfill her responsibilities. Ms. Hill also says that the editors will be the one's to confront the student as this is part of their job. She says to me that Fairfax is "preparing future CEO's".]

Four students are working on the wipe board.

Student 1 at her computer: *"I don't know how to do this...Chloe [co-editor]!"*

Student 2 at her computer: *"Do we work off of this?"* *[Chloe does something to the job they're doing.]*

Student 2: *"[laughs] Way to go Chloe now we have to..."*

Ms. Hill: *"Does everybody have work to do?"*

Student: *"Lots"*

Ms. Hill: *"Ask Ms. Shin to teach you how to take a picture on the video camera. You need to get a picture of the new P.E. teacher and the Australian students. Can I leave it with you to ask Ms. Shin to teach you how to take pictures on the video camera? Good"*

[A really quiet meeting is taking place between Ms. Hill and the editors. Two students are working on the Junior School pictures, another group of 2 are working on the same computer. Most are working at their own terminals.]

Ms. Hill: *"Oh you know what you need to find out, is how many teachers are retiring"*

Student: *"Would this be for this deadline?"*

Ms. Hill: *"Ask Nicole, she knows more than I do"*

Nicole: *"Yeah, it might as well be"*

Ms. Hill: *"Oh except, teachers don't have to declare they're retiring until March." Ms. Hill leaves the class to ask teachers if they are retiring.*

[Shauna and Preet are working side by side on separate computers.]

Preet: "Oh I don't get this"

Shauna: "Just move the lines out of the way"

Preet: "That'll still be there"

Shauna: "No"

[Different conversations are going on. Kathryn is sitting close to where I am and she has been writing on a word processing document. Chloe walks up behind her and sees what she is working on.]

Chloe: "Kathryn could you please stop writing your novel?"

Kathryn: "I'm waiting for [couldn't make it out, something that she needs to continue her yearbook work]

Chloe: "That's fine, I'll give you another page to do. This is a Yearbook class. You can help someone else, or I can give you another page, but stop writing your novel".

[Shauna and Preet, the two students who are working beside each other on two separate terminals are having difficulty with the text wrap function. Nicole comes over to help. "If you click on text unwrap it might work". She walks away. Ms. Hill returns to the class and sits down with a student.]

Shauna: "How do you get out of text wrap?"

Preet: "Element"

Nicole: [who happened to be close by]: "No, first you have to click that" [she leaves] Nicole's suggestion appears to work.

P&S: "Ooh"

Preet: "Wait it's still not working...oh you know why...okay now this better work. Nicole, it's still not working"

Nicole [comes back]: "Okay what's wrong"

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[It ends up that the text was white and Preet figures this out in front of Nicole before she has a chance to say what's wrong.]

Nicole: "Oh God"   *[She laughs and walks away.]*

Preet: "Give me a break I'm just learning" *[laughs]*

[Ms. Hill distributes the self-evaluation forms and says that she wants them back before the end of class.]

Ms. Hill: "Can I have your semi-attention.   I did my PhotoShop tutorial, it's complicated but it's fun.   Our whole cover will be PhotoShop.   Who would like to put in some extra time to learn a bit of the program for the division pages.   *[no one responds]* Could I get a crew of people *[hands rise now]* Shauna, Chloe, Nicole, Kathleen and one other.   It's hard to do it here in class cause it's so disruptive, so could we kick everyone out at lunch and be really exclusive cause we get the computer lab to ourselves *[laughs]*.   Can we set a day?" *[She asks each member if Tuesday would be okay.   Nicole hesitates,]*

Ms. Hill: "you've gotta come".

Nicole: "yeah."

Ms. Hill: "So Tuesday, I'm not going to teach you the whole program, only what you need".

[Ms. Hill sits with a student one-on-one at the student's computer.   Shauna and Preet are sitting at their desks side by side.   Shauna is giving Preet advice on PageMaker.   The class is quite quiet.]

Nicole: "Christine, do we have all the basketball pictures?"

Christine: "Yes"

Ms. Hill: *[concerned]* "Oh oh, somebody just printed...oh I did" *[laughs]*

Nicole: "It's already 2/3 into the year and we only have 1/3 of our ads.   What's up with that?"

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Preet: "Why is the writing overlapping?"

Shauna: "Just grab a corner and stretch it" [She says this while looking down at her thesaurus. She looks up.] "Just erase that and hide PageMaker and get that one" [The two are now looking at a word processing document and Shauna is leaning across the desk to help Preet with the content. Nicole is talking about deadlines with other students.]

Shauna: "Now save it"

Preet: "Do we have to save it as a text file"

Shauna: "It is, now go back to PageMaker and dump it" Shauna now goes back to her own computer to work.

Preet: "Why is this back to the one before we saved it? It's not there"

Shauna: "Hide PageMaker and close ClarisWorks...now try" [Shauna goes back to her own work.]

Preet: "No it's not here."

Shauna: "Found it"

Preet: "How did you find it? Was it just on the desktop?"

Shauna: "Yup"

Preet: "Okay, so now what do we do?"

Shauna: "Highlight that and go to the window, colour and you have to take the name"

Preet: "Signature"

Shauna: "Yup"

Preet: "Oh that's so cool! I'm so impressed, so that's it!"

Shauna: "Yeah we just increase the size"

Preet: "That's so cool, this is so exciting!"

[Shauna takes Preet's mouse and moves it while Preet types.]

Preet: "Do I just type?"

Shauna: "No, we want it to be..."

Preet: "...headline..."

Shauna: "...yeah headline grey".

Preet: "No just..."

Shauna: "...oh yeah."

Preet: "Is it okay like this?"

Shauna: "I don't know?"

Preet: "Chloe? Should...can we put the heading at the top?"

Chloe: "That's where it should be"

Preet: 'Has anyone used 'Enthusiastic'?"

Chloe: "Yes"

Preet: "'Exceptional'?...No?..Okay" *She begins to change the text from 'Enthusiastic' to 'Exceptional'.*

[Shauna explains to Preet how to do it and asks: "Do you want to do it?"

Preet asks how.]

Shauna: She does it herself while verbally explaining what she is doing to Preet. "It's too low, just move it up"

Preet: "Okay"

Shauna: "I'll be back" *She gets up and goes across the room.*

Preet: "Don't leave me"

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Kathryn: [having heard Preet's plea comes over to her desk] "Do you need help?"

Preet: "Yeah I'm having trouble aligning"

Kathryn: "Okay, I'll help you I'm not doing anything. What I find works best is to use headline grey..." She proceeds to sit down beside her and verbally walks her through the steps , while Preet does it. Preet asks Kathryn a question about what the purple line surrounding the page is?

Kathryn: "It's the end of the page. It's easier if you make it smaller. " Kathryn asks Ms. Hill a question about the layout.

Ms. Hill: "Nicole knows this stuff better than me" and she walks away.

Nicole overhears this comment and comes to help Kathryn.

Ms. Hill: "I'm still missing two evaluations"

Preet: "Yeah mine, I'm working"

[Ms. Hill comes over and works with Kathryn and Nicole. A student has her hand in the air, she doesn't call out she looks and sees Ms. Hill working with other students. She keeps watching for a break in Ms. Hill's attention. After some time has passed she calls out "Ms. Hill".]

Student: "Do we need pictures of cafeteria ladies?"

Ms. Hill: "No, I don't think so"

[Preet and Shauna begin to work on their evaluations. Selina and Kathryn are holding a camera.]

Kathryn: "Push it half way down and...oh how do I explain this?"

Selina: "Yeah yeah I have a camera like this at home" She points it at me to practice the focus. "oh okay"

Kathryn: "And take lots of grade 10's"

Selina: "Yeah Okay"

[Ms. Hill notices Nicole sitting down on a chair in the back of the class, she is talking with another student.]

Ms. Hill: *"And poor Nicole with nothing to do"*

Nicole: *[to the other student] "Is she talking about me?" [She smiles and gets up and is asked a question by another student.]*

[Chloe is discussing with a student, how she feels that a person's caption is sarcastic. The student who wrote it says that she feels that it is funny. They ask other students in the class what they think.]

[Shauna is now sitting at Preet's computer. A student who is interested in using the computer over the lunch hour (Barbara, a grade 9 student) asks Shauna if she can use the computer after she is finished with it. I didn't hear Shauna's answer but Barbara says "thanks". Preet and Shauna are absorbed in their work and Barbara is standing right behind them. Ms. Hill announces that it is time to clean up the room.]

Preet: *"That was fun, I know how to use that now!"*

Barbara: *"Are you done?"*

Shauna: *'Yeah". She begins to get up.*

Barbara: *[sounding relieved] "Oh praise thee, thank you very much"*[68]

What can be seen from the above excerpt is a community of learners who are relying on each other and are supportive of one another. At times, students speak harshly to each other as Chloe did with Kathryn, but there does not appear to be any 'acting out' or disruptive behaviour. Students, like Preet and Shauna work closely with each other to solve a computer problem - not once did they ask Ms Hill for any help, they only asked each other and

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[68] Fieldnotes, February 20th, 1998.

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other students in the class. At one point Kathryn offers to help Preet without being directly asked. When one student does ask Ms. Hill a question she refers the question to Nicole. The goal is the completion of the Yearbook and it benefits everyone to have every student proficient with the technology.

The Benefits of Working Together

Students who work together in a cooperative learning environment, like that of the Journalism or the Yearbook class identify many advantages in such a setting. Devorah, one of the Gryphon editors, identifies the benefits of working in an environment where people bring different strengths to the project and help each other out. Devorah decides to take the Journalism course because she likes writing but she appreciates the computer skills that her co-editor Adrienne brings to the paper. Together, she says, they make a good team.

> *Cailey: "What made you decide to take the Gryphon course?"*
>
> *Devorah: "I took it because I have an interest in writing, that's my main focus and I think, well both Adrienne and I are the editors and I think that we work well together, because Adrienne is very competent when it comes to using any of the computer programmes and I'm learning, I can handle it, but for me it's more the writing, editing, layout, the look of the paper so it wasn't so much based on the computer side of it, but it's interesting too, I've learned a lot about that."*[69]

Devorah's co-editor Adrienne agrees that they make a good editorial team, but the ultimate team in her view is the entire class, as a group. For Adrienne, the production of the Gryphon is not like other courses, individual achievements are secondary to the broader collaborative work and purpose of publishing a newspaper.

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[69] Interview with Fern, Devorah and Samira, March 11, 1998.

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Cailey: "How do you find being an editor when all of your friends are in the class? Is that kind of strange?"

Adrienne: "Not really. At the beginning I think it was, just because I wasn't sure how to handle the authority or whatever that I was supposedly supposed to have. But I think as the year went on and we got to know each other better and now we know how each other works and stuff, so now it's not so much Devorah and I as the editors because we look through all the stuff and correct things, that's about where it ends, because everyone works together."

Prathna: "Yeah, like I wouldn't say that you guys like, they don't take over any of the decision-making or anything like that."

Adrienne: "Like last week I was away for a basketball trip and I missed Sunday's layout day and Ms. Hill was kind of, I think she was a little concerned, like she didn't tell me this she told my coach this, that I had been missing so many Journalism classes because of basketball but I didn't think that it was such a big deal because it's not like everyone in the class, like it can't function without one of the editors there. Like everyone can pick it up and work, even if they have to do a little extra work it's not like everything is going to fall apart if one of the editors isn't there."

Prathna: "Yeah, it doesn't really matter who's away cause someone can always pick it up and keep going."

Cailey: "What's the biggest thing you're learning through doing the Gryphon?"

Adrienne: "Well, communication even though it breaks down sometimes and working as a group towards like one thing, like there's no exceptions with the paper, it has to come out and it has to be a certain way."[70]

Susan Hill believes that such collaborative projects teach students valuable skills for the working world. She contends that she is preparing

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[70] Interview with Fern, Devorah, and Samira, March 11th, 1998.

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students for the responsibilities required of them in the collaborative nature of the work force.

> *Ms. Hill: "When I discuss with parents the effect that these courses have had, I'll often have parents, especially editors' parents, come back and say that their daughters have changed dramatically during the course of the year about accepting responsibility and taking ownership of what they're doing. And, they find it a real growth experience, I have it on occasion from other students as well...I make them deal with every aspect of it, Prathna does more of the advertising than the others do but the others have to get their share of advertising and they have to deal with the public. Everybody has to take pictures at one time or another, they're certainly aware of every aspect of the book. And I think they get good business skills, and they get good commitment skills, and they get good ownership skills, and because they're good they get lots of positive feedback."[71]*

Potential Limitations

Despite the gains students may receive from cooperative projects such as increased motivation, greater positive feelings toward the task, better intergroup relations, better self-images and improvements in taking responsibility and ownership over their work[72], there are reservations that such cooperative projects are not beneficial for all classroom assignments as they do not require, and one cannot ensure, that every student participates equally. Jenny Shin raises concerns about group work in her classes because it can be difficult to monitor whether each student is contributing equally and learning effectively.

> *Cailey: "Do you encourage them to work together and ask each other questions?"*

> *Ms. Shin: "Yeah, because the ability level is so varied, but certain projects, I learned the hard way, certain projects I*

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[71] Interview with Susan Hill, March 15th, 1998.
[72] Joyce and Weil, 1996, 68.

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*don't really recommend group projects and partners.
Some projects work really well like newsletters and
desktop publishing but Web Page and other things, clever
learning can be quite deceptive it looks like they're
working together but it's not always 50% and 50%, there's
always one person who tends to dominate her ideas, going
faster and the other person is happy to watch and she's not
learning much. So I have both collaborative projects and
individual projects."*[73]

Accountable Cooperation

The potential for inequity and ineffectiveness in cooperative work is a
concern shared by Ms. Hill which is why it so important to her that
collaborative projects have individualized accountability structured into
them. Ms. Hill has tried to arrange accountability into the Gryphon and the
Yearbook courses in order to prevent an inequitable distribution of work. She
explains her methods to me during one classroom visit.

*Ms. Hill says that she begins the course by "team building"
and she stresses that having the students self-evaluate
keeps them on task. Ms. Hill explains that a student fills
out an evaluation form and gives herself a grade, Ms. Hill
and the editors then look at the grade and discuss whether
it is a fair mark and then Ms. Hill and the editors sit down
with the student to discuss how she did in the course. Ms.
Hill remarks that although students may not give
themselves the exact mark that Ms. Hill and the editors
would give them, they almost always accurately place
themselves in relation to the others in the class.*

*A couple of students are playing different CD's, but at low
levels. A student asks that they turn the music down, and
the students comply without saying a word. Ms. Hill
explains that although the students are delegating and
controlling much of the process, she does provide what
she calls a "safety net" by setting expectations and asking if
certain tasks are being done to ensure that everything is
covered. She says that she doesn't use the "discovery"
method of teaching which allows students to self-direct
and find out for themselves how to get things done.*

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[73] Interview with Jenny Shin, March 15th, 1998.

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Ms. Hill says that having the students set the deadlines as a team ensures that there is a personal investment in getting things done by that time, or if it is not done there is little complaining if they have to come in on a weekend or after school.[74]

We discuss the effectiveness of both the self-evaluation methods and the strategy of asking students to set their own deadlines during our interview.

> *And you know what? It's absolutely successful. It's successful to this extent: I never get a parent coming to see me on parent's day, they just don't drop in and do it cause it's just so integral to the students' lives, the kids never whine and complain that they deserve more, that if I were to sit down with just my intuitive skills about who works hardest and who works least and put my class in a hierarchical form when the kids assign themselves their own marks they put themselves in exactly that same hierarchy form. And so my pertinent question is what mark would you give yourself in knowing what everyone else in the room accomplished. And they hate that question. But they're dead on. I would say marks are truly secondary, they're not taking the course to get a good mark and the marks are high in that course. The philosophy being that the papers and the yearbooks are all award-winning and gee if the rest of the world acknowledges they were A-class papers then certainly the kids in the class must be A-class students.*
>
> *Cailey: "What do you think are the benefits or cons to having them set the deadlines for the publications and being basically in charge of that."*
>
> *Ms. Hill: "No cons, everything is a benefit. They know their timetables and they workloads better than I do, they know when teachers are dumping tests and everything. So they're doing it in their downtime. So if I can remember to do it [set deadlines] early enough then it becomes a priority in their lives then they know they can't get out of it. They take ownership of that time and that commitment when they set their own times and dates. So*

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[74] Fieldnotes, February 12th, 1998.

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it works out really really well. And the joy of those two courses is, a teacher says 'you have a history project due on such and such a date' and they go 'yeah but the dog ate my homework and my grandmother died' and all these stories, they never miss these deadlines because we're dependent on the outside world for both these deadlines. We've got to go to College Printers and if we miss our time then the Globe and Mail will go to press and we won't. And if we miss the Josten's deadline our book is going to come in two weeks late or they're going to extra bill us. So there's no if's and's or but's about meeting those deadlines."[75]

Cooperative Learning at Fairfax

Whether one agrees with the benefits of cooperative learning it is apparent that Fairfax School provides an environment of cooperative group work both inside and outside of the classroom. The foregoing fieldnotes and interview examples reveal how computer technology is taught at Fairfax through cooperative teaching methods, particularly in regard to the production of the yearbook and the newspaper. So the teaching strategy NABST recommends for the instruction of new technologies appears to be very much like the one used at Fairfax School, as students are encouraged to work together to solve technical problems and to produce technically-rich publications.

As NABST suggests, the use of more directive and hierarchical teaching methods are less appreciated by many students. Rather, students expressed desires to have more hands-on experience and the freedom to ask questions as they arise, which are readily fulfilled by collaborative learning methods. The students at Fairfax School that I spoke with and even the teachers express a desire to learn in a way in concert with the recommendations suggested by NABST: a teaching strategy that is

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[75] Interview with Susan Hill, March 15th, 1998.

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"characterized by...individual contributions, experiential learning, open communication and feedback."[76]

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[76] NABST, 20.

CHAPTER FIVE

The Relevance and Value of Computer Science to Students' Everyday Lives

According to NABST, the Canadian economy will benefit from more women studying and working in the fields of science and technology. In order to satisfy this "need", NABST's second recommendation is that educators use teaching styles that emphasize the relevance and applicability of science and technology "to [students'] everyday lives and [to demonstrate] how the use of scientific and technical knowledge can be used to satisfy human needs".[77]

Jenny Shin is a teacher who believes in the importance of such a strategy, believing that to teach computer science in a way that is relevant to students' everyday lives enriches the dimensions of their learning, however, she experiences a "tension" when she captures students' attention by appealing to their, not always 'educational', interests.

> *Ms. Shin: They were talking about all these music groups, and I don't watch a lot of TV, I'm not into all this popular music and I felt so old, cause they were talking about Tupac and Notorious BIG and I thought 'I don't know I've never heard of them - I know of Madonna' [laughs]. And they think that's passé so gradually I'm learning the lingo and getting on the same wave length, so now if I do a lesson on the Internet and if I mention Leonardo di Capprio they go [pay attention], 'oh, Ms. Shin!'. But I'm always torn because it's always teaching, teaching is always this struggle between these two tensions: you want to make it relevant and yet you want to be educational. Cause I want them to use the Internet for their research and their homework and yet I want them to be interested. But if I go 'okay let's visit this frog dissection site' they'll be like this [bored/falling asleep]. So I've been experimenting this year. So one class I said 'okay you're going to do your Web Page on something you like - it could be a favourite TV show or music group or favourite movie star'. And*

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[77] NABST, 30.

then the other class, I have two classes of grade 8's, so for the other class I said, the other condition was that 'it has to be educational and informative' and they were like 'oh, okay' [kind of upset]. But they did a good job too, they did Beluga whales and their favourite pets and Henry the 8th, but the first group got more out of it. Cause they had Backstreet Boys, their web page was like 5 different pages with like 10 links [sounds excited] and this group was like 'Henry the 8th' [sounds bored] with this picture and no links, 'and he has these wives' and blah, blah, blah. And they weren't really as engaged."

Cailey: "They weren't engaging with the technology cause they were working so hard to get the understanding down of Henry the 8th, instead of the technology".

Ms. Shin: "Yeah, but there's always this tension you know cause you want to have them enjoy and have fun, cause that's where real learning happens, on the other hand...but I don't know I'm just trying to make it really relevant by saying 'okay this is what's happening and have you watched this, there's a big trial going on between Microsoft and...Bill Gates is saying that's freedom of speech and the government is trying to regulate so that he can't give all the goodies and bells and whistles, but if you talk to the Canadian guy, the Corel draw guy he says he was really hurt by Microsoft because he changed the operating systems, it's fascinating!' So I'm going to try to make it relevant."[78]

Personal Interests: From Aliens and Anime to Madonna

Many of the students I interview mention how their involvement with computers centres around their personal interests whether they are deemed by Ms. Shin to be educational or not. One student, Barbara a grade nine self-identified "computer geek" says that everything she does with computers, from PageMaker to PhotoShop centres around her interest in the Internet. She says that she enjoys the Internet because she can be herself, she can explore her interests in Anime and Wicca, and she's good at it.

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[78] Interview with Jenny Shin, March 15th, 1998.

Cailey: "Now is that your favourite part about computers? - The Internet? Or what other things do you like doing with them?"

Amanda: "I like Adobe PhotoShop."

Barbara: "Oh yeah, I don't have that program but I've got Corel PhotoShop and that's pretty good too cause I can make all these really cool little fractal icons for my web page. It's all tied into the Internet. I don't know what attracts me to it, it just does I mean it's a place where I can express myself and I don't have to worry about someone who's going to come over and say, 'I don't like what you're doing, stop it'. Cause the Internet is free, I mean the government can't really control it. I can make whatever page I want, I can do whatever I want for the first time I can do something and I'm good at it. Like I'm not good at many things, but the Internet I am."

Cailey: "So what's on your web page?"

Barbara: "Which one?"

Cailey: "You have different Web Pages so..."

Barbara: "I have over 23 Web Pages"

Cailey: "23! Wow, and what are your pages about? Some of them?"

Barbara: "Sailor Moon, Anime, my religion - which is like not many people do it and it's like I haven't found...I've found one site about it and that's the Wiccan home page."

Cailey: "Oh Wicca, there's only one site on Wicca?"

Barbara: "Um no, only one site on my branch of Wicca."[79]

Samira, the tenth grade student who recommends, earlier in this project, that there should be more hands-on experience in the Fairfax computer program says that her interest in computers comes from outer space.

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[79] Interview with Barbara and Amanda, March 1998.

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Cailey: "And how do you like learning computer technology..."

Samira: "I find it fun, cause I'm like really interested in it and I know it's going to affect my profession and stuff so like any little thing I can learn I'm interested."

Cailey: "How did you get interested in wanting to get into space technology?"

Samira: "Well I'm into aliens and UFO's [laughs] and that really interests me so...yeah I can go to space or space technology and you should know how to use computers I'm assuming."

Cailey: "So did everything you learn about computers come from your experiences in a classroom or did you teach yourself, or did your friends teach you?"

Samira: "Kind of both, I taught myself how to do a little bit of programming, and at school I learned how to use different programs."[80]

Selina the 16 year old who raves about Mr. Walker speaks of her sister during our interview. She is in grade three and attends the Junior School .

Cailey: "[Your sister] must be using some computers too, cause I saw the lab in the Junior School?"

Selina: "Yeah she is. She knows as much as I do with Web Sites, she's like, 'have you visited this web site?'. I'm like, 'no, no'". [laughs]"

Cailey: "Oh really, grade 3. Which web sites does she visit?"

Selina: "like Spice Girls".

Cailey: "What Web Sites do you visit? What types of sites?"

Selina: "Music, my favourite stars, I visit Madonna sites. I've made a Madonna Web Page."

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[80] Interview with Fern, Devorah and Samira, March 11, 1998.

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Cailey: *"You've made a web page?"*

Selina: *"Yeah, last year [in Information Technology 11]."*[81]

It would be interesting to determine if Selina's sister would be as interested in the Internet and her computer at home if she were only allowed to visit sites like the frog dissection site mentioned by Ms. Shin, and whether Selina would have enjoyed creating her Web Page if it had to be on Henry the 8th rather than Madonna.

Future Endeavours

Celebrities, aliens and Anime are not the only reasons Fairfax students cite for wanting to learn computer skills. Students also point to their concern for their future careers for why they are interested in learning more about computers. Maria measures the value of the computer program at Fairfax by its applicability to her future.

> *"But all in all the computer program is pretty good, in that I'm actually applying some of the skills that I'm learning. Not yet now, but I'm pretty sure that I will be applying some of the stuff that I'm learning to the things that I'll be doing in the future."*[82]

Selina describes her reasons for taking the Yearbook course in terms of her future career aspirations.

> *"I took it because it's just good to have, so is Journalism, Gryphon or Yearbook is good to have because I want to go into Law and I want to do a lot of things, I either want to go into Economics & do business or go into Business Law/Economic Law so I was thinking well everything is going to be on computers anyways so why not learn a little bit more. And I have a Mac and an IBM at home so it's easier for me I can work on either.*[83]

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[81] Interview with Selina, March 11, 1998.

[82] Interview with Fiona and Maria. March, 1998.

[83] Interview with Selina, March 11th, 1998.

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When Selina is asked how she would improve the computer science program at Fairfax she suggests teaching on IBM's as they are more relevant to the work world.

> *"Maybe, teach us a lot about IBM's as well, because I know that IBM's are out there a lot more than Macintoshes. Yeah, sure they might have them at schools, but that's where it stops. I mean I'm a rare person that owns a Macintosh. If I have to go out working on computers, I would love to know more about IBM's. It's so much more difficult, although I really really really like Macintoshes I prefer them so much more. When I took Info Tech I went out and I bought a laptop Macintosh, I went and bought it. That's how much I liked it, they're so much easier instead of, it's so confusing working on an IBM you have to know all those codes."* [84]

Despite the fact that Selina prefers Macintoshes to IBM's she would rather be taught on the more challenging machine because IBM's are more relevant to her future. As NABST suggests, it appears that these students are motivated to learn about, and use computers, when they provide relevance and are related to their own lives and interests.

Repetitive Relevance

One of the benefits of the Journalism and the Yearbook classes is that they balance the tension that Ms. Shin describes effectively. Students take both courses, not so much because they want to learn computer skills, but because they are interested in working on the student newspaper and/or yearbook. The instruction of computer skills is seemingly incidental to the larger goal of creating a quality publication. As Devorah mentions earlier she takes the Gryphon course because she wants to get involved in writing and editing the paper, however she has to learn computer skills in order to fulfill those interests.

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[84] Interview with Selina, March 11th, 1998.

Susan Hill, who has taught the Journalism and the Yearbook courses as well as the Computer Science and Information Technology courses feels that those who learn computer skills through the more practical classes have an edge over those who learn through more conventional means due to the repetition of computer tasks required for the publications.

Cailey: "How do you like teaching the Info Tech versus the Yearbook or Gryphon or English courses even?"

Ms. Hill: "The courses I'm teaching now, I have been teaching for a number of years and the interesting comparison is teaching PageMaker in a course situation where kids are being introduced to its power and what it can do [i.e. the Info Tech class] and then letting it be a tool in the other classes [Gryphon and the Yearbook]. And at the end, the kids in the computer-generated course can use it next year more and more because they've had to repeat the tasks so many times. The other kids got a lot more theory and a lot more understanding of its power and what it could do and produced a project. They will come back a year later because they're class Presidents and they want to do dance tickets or something like that and they know what program to use and they give it a kick at the can and they're basically right but they get screwed up."

Cailey: "So you think the Journalism/Yearbook students are the one's who have a clearer understanding of all of the power of the program."

Ms. Hill: "Yup, because they're using it over and over and over again. And what I tend to do is just literally throw them off the deep end with the first paper. The Gryphon the first day we do layout is on a Sunday. They're each laying out a spread, two pages. It started at nine and finished at seven and the corrections took about 3 or 4 hours. The last one we did they stayed at school and started at 2 and finished at 6. And the same as the other classes last year's class, the last one they did in the year they came in at 10 and were out by 1 so, you know they learn a lot. And during the course of the year in the beginning I do a lot of the more technical stuff, mostly formatting if they want numbers and indents and things like that I just come and do their articles for them. And

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*about half way through the year I show them how to do
tabs and indents and other things."*[85]

Ms. Hill believes that to repeat computer tasks over and over again, in
order to accomplish a tangible goal, enables students to better retain the
knowledge they have put into practice.   It is this repetition of tasks that
contributes to Selina's feeling that the Yearbook is hard "work" but when she
sees the applicability of her effort it becomes much more 'fun".

> *Cailey: "So what did you prefer in terms of learning styles
> between the Yearbook and Info Tech 11."*
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> *Selina: "Info Tech 11, it's different things, like you learn
> how to do HTML Web Pages, you learn how to do
> HyperCard, you learn so many things. And when you
> come to Yearbook it's just one thing over and over or
> programming the computer. Like at the beginning of the
> year we programmed PageMaker on all of the computers,
> like newly installed so we all had to program that and we
> also had to make the disks like when you erase them and
> stuff like that. It was just like 'work', it wasn't 'fun', but
> then when you get into it when you get into like doing the
> page when you see the pictures it's like really fun."*[86]

The Importance of Practice

Devorah, a student in the Journalism class, feels that being "thrown off
the deep end" as Susan Hill puts it, is an effective way to learn computer
technology. For Devorah, being able to put computer skills into practice in an
effort to achieve a goal is a better way to learn than to sit and watch someone
else go through the steps in a formalized context.

> *"The Gryphon, it's not just a course in which you learn
> different skills, you actually have to apply them and you
> have deadlines to meet.   So I took this course in
> September [laughs] it was like 'okay get to work and do
> this' and I was like, 'I don't know how to deal with this
> programme' but I can't think of how I was taught, I'm*

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[85] Interview with Susan Hill, March 15th, 1998.
[86] Interview with Selina, March 11th, 1998.

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always learning everyday but I was just sort of thrown into it from the beginning but in a way that's a really good way to learn because it's just, you know you're doing everything from the beginning, you're not just sitting there watching someone else do it."[87]

Devorah cannot even think of how she learns her computer skills, she remarks that she just picks them up by being immersed in the activity as practice. Devorah indicates that she is not interested in computers and it is perhaps doubtful that she will ever choose to take a more computer-specific course like Information Technology 11, however because of her interest in writing, she is afforded the opportunity of working intensively with computers.

One of Devorah's interests is in fashion design. I ask her if she has tried out any design software?

> *Devorah: "I haven't tried out any software I mean everything is just by hand. Well I have just a little bit of experience with the Gryphon, basically scanning pictures that I've already drawn and making some changes on the computer. I've learned a little bit about that, and I've tried some software just like painting or drawing on the computer and I do a little bit of that but mostly by hand."*

> *Cailey: "And who do you ask, in terms of learning those kinds of things, do you sort of play around with the computer yourself and try to figure out that stuff?"*

> *Devorah: "Well, in terms of using the scanner and things like that and changing around what I've already drawn by hand, well Mrs. Hill taught me a lot of that stuff and that was mostly cause I draw some of the pictures that are in the Gryphon otherwise I just kind of play around."*[88]

Through her access to computers in the Journalism course and with the assistance of Ms Hill, Devorah has some opportunity to discover ways in

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[87] Interview with Fern, Devorah and Samira, March 11th, 1998.
[88] Interview with Fern, Devorah and Samira, March 11th, 1998.

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which computers may be relevant to her interest in fashion design. Although Devorah acknowledges that she is *"definitely more of an artistic person that I am a science-oriented person"*[89] she has spent much of her time this year on computers in order to co-edit the Gryphon.

'Well is it Fun?': Selecting Courses Based on Interest

Fiona also demonstrates the opportunities that courses like the Journalism and the Yearbook courses provide. She has an interest in taking the Yearbook course next year because working on a yearbook appeals to her, but she does not see herself as a competent computer user. During our interview she tells me,

> *Fiona: "I'm really bad at computers."*

> *Cailey: "No I don't think that at all. Do you have a computer at home?"*

> *Fiona: "Yeah, I have an IBM it's Windows 95 but it's really like, I'm totally lost on it half of the time...I'm really bad at the sciences I don't like them at all, and math I'm not so great at, but I love the arts, but there's not much you can really do with arts, so I want to learn how to use the computer cause pretty much everything now is done on computers."*

> *Cailey: "Now, do you know why you don't like science or math and computer stuff? Do you have feelings as to why that is?"*

> *Fiona: "I'm not good at it and for me it doesn't logically make sense and I don't really care much about the molecules floating around in the air or how my cells work. I care more about, like I love Social Studies it's like my favourite block, I love to read, and if I could do anything I'd just read constantly. And math, if I know how to do it and I'm sitting there and I'm doing it I'm getting it done and I'm understanding it then I'm totally fine with it, I like it. But there's so many times when I*

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[89] Interview with Fern, Devorah and Samira, March 11th, 1998.

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don't understand it and it's hard for me that it's just like
'oh no'".[90]

Toward the end of the interview I ask Fiona if she would ever consider taking the Journalism or the Yearbook course. In a way, I expected her to be hesitant toward taking them because of her lack of confidence with computers and I was thinking of how those courses are so heavily dependent on computer technology.

Cailey: "Would you ever take the Gryphon class or the Yearbook?"

Fiona: "I don't think I'd do the Gryphon but I'm really thinking about the Yearbook."

Cailey: "Why's that?"

Fiona: "I don't know, it sounds like a lot of fun. A lot of work too but Gryphon, I don't know I'm just not into the whole newspaper thing. I don't think I'd do the Gryphon but I'm really thinking about the Yearbook."[91]

For Fiona, the decision of whether or not to take those courses is not influenced by the well known fact that they both rely heavily on computer technology, rather, she decides on the basis of whether working on a *yearbook* would be fun, or whether she is interested in working on a newspaper. Her hesitancy with math, computers or science does not factor into her decision to take either course even though she would have to work on computers intensively for both classes.

Developing Computer Competence Through the Back Door

Prathna, a Journalism student, did not take the course because of an interest in computers. Like Devorah she acknowledges that she did not know much about computers when she first started the course, however she

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[90] Interview with Fiona and Maria, March, 1998.
[91] Interview with Fiona and Maria, March, 1998.

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attributes her current computer competence to the fact that she is *required* to use the computer to fulfill her assignments for the newspaper.

> **Cailey:** *"Have you learned a lot of computer stuff through Gryphon, through doing the paper?"*
>
> **Prathna:** *"I think I have more than anyone else because I didn't use computers at all before and like I knew basics, like some basics I learned in grade 7 and 8 but I didn't use it because I found it difficult and stuff and now I have to use it and like I've learned spreadsheets like databases all of this PageMaker all these sorts of programs, like how to get stuff from one computer onto another without having to take disks and stuff like that, I learned a lot this year."*[92]

Prathna found computers "difficult" before taking the Journalism course, but because she has needed to use spreadsheets and PageMaker she has learned how to use those tools in ways that are relevant to her work at the paper. What is interesting is *why* she chose to take a course that is so dependent on computers when she admits to not knowing much about the technology at the time of enrollment. It would seem from our interviews that, like Devorah and Fiona, her interest stemmed from her desire to work on a student paper rather than from an interest in learning certain computer programs and applications.

Providing students with the opportunity to learn computer skills by working on projects that are relevant and important to them, appears then, to be an effective way of attracting students otherwise uninterested in science and technology to computer use. Whether a student decides to surf the Internet and create Web Pages because she likes Sailor Moon or Madonna, aspire to a degree in Computer Science because of an interest in aliens, become more interested in a class lesson because a teen idol's name is mentioned in passing, take a computer class because of a concern about her

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[92] Interview with Adrienne and Prathna, March 11th, 1998.

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future career, or use computers to publish a school paper because of a passion for writing, what seems clear is that offering students the opportunity to combine computer technology with their relevant interests reaps many benefits. To this extent, then, Fairfax teachers do as NABST suggests: they "embed applied science topics in the curriculum so that students can see the relevance and value of mathematics and applied technology to their everyday lives"[93], and this approach *lays the foundation* for cultivating students' interests and increasing their access to new technologies.

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[93] NABST, 30.

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CHAPTER SIX

Reducing Gender and Technological Stereotying

Self Esteem and the Single-Sex Learning Environment

The importance of improving girls' self-esteem in relation to technology in part by addressing gender bias and stereotypes in the classroom and by providing female role models in the sciences is a third recommendation proposed by NABST.[94] Researchers Suzanne Silverman and Alice M. Pritchard who investigate girls' participation in technology education in a two-year study concur with this recommendation. Silverman and Pritchard state that "schools must put a high priority on hiring more female technology teachers, who can be important role models for girls interested in technology", they also suggest that "technology education teachers...meet together and discuss gender equity" and they say that teachers need to discuss "guidelines and ground rules on acceptable behaviour for both boys and girls to ensure that girls play an equal role in the classroom and are not forced to take stereotypical roles; [so that] boys are not allowed to take over."[95]

The inequity and sexism reported from mixed-sexed learning environments inspired me to seek out an educational context where girls did not need to compete with boys to access technology. I wanted to conduct research in a setting where girls were the sole participants with the computer technology found in a school. I hoped to discover learning contexts where girls, like boys, were "allowed to take over" the tools. I also hoped that educators at an all-girls school may have had experience in discussing and engaging with issues of gender equity in relation to education so that there

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[94] NABST, 32
[95] Silverman and Pritchard, 1996, 7.

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was the possibility of conducting research in a educational-setting where there was a conscious commitment to reducing stereotyping.[96]

As the reduction of gender stereotyping is one of the main recommendations proposed by NABST, I ask Ms. Hill if such concerns are ever raised at Fairfax?

Ms. Hill: "Yes"

Cailey: "Where does that kind of discussion happen?"

Ms. Hill: "Professional Development for the teachers I guess. A couple of years ago it was really visited and a lot of materials were brought in for everybody to become aware of girls' learning in an all-girls environment and how statistics show that they are not second class citizens. There were videos for us to watch and studies for us to watch and anecdotal stories of girls who had graduated from all-girls schools and I think the information is in that girls learning in a single-sex environment doesn't hurt [laughs]."

Cailey: "What do you think are some of the benefits?"

Ms. Hill: "Self esteem more than anything. They really have no problems seeing themselves because of their gender."[97]

Reflections on All-Girls' Educational Settings

Both teachers and students at Fairfax, especially those who have taught or studied at co-ed schools, are cognizant of the benefits of a single-sex environment. Samira, the student who one day would like to study Space Technology, has only studied in an all-girls setting for a year and a half.

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[96] For research discussing the benefits of a same-sex learning environment please refer, for example, to Carpenter & Hayden, 1987; Clarke, 1985 & 1987; Harvey & Stables, 1986; Gwizdala & Steinback, 1990; Lee & Bryk, 1986; Lee & Marks, 1990; Morgan, 1986; Riordan, 1985; Sadker & Sadker, 1994; Smith, 1984; and Stables, 1990.

[97] Interview with Susan Hill, March 15th, 1998.

When asked how the presence of boys would affect the climate at Fairfax she has this to say:

> *"I went to public school until grade 8 and I think that having boys in our classes - that would kind of change it. Cause they can tend to be immature and disrupt the class and if you have a question some people might be too afraid to ask it cause the guys might make fun of you. I think that in an all-girls school, like you don't have anything to worry about because you know no one will make fun of you."*[98]

When we discuss whether she feels women are encouraged to go into fields like computer science she speaks of the lack of support that women receive when they articulate their technological goals.

> *Samira: "I think that there are a lot women in the computer field but I think that they're not as encouraged as much as guys are, like in public school if a girl said, 'oh I want to go into computer technology', everyone looks at her and says, 'oh you're not going to succeed or anything' but if a guy were to say that it would be like, 'oh yeah, you're going to make a lot of money' it's like people's attitudes they need to realize that women can do what men can do."*

> *Cailey: "Do you think most of the students at Fairfax understand that?"*

> *Samira: "Not really, this is like sheltered and I think things that go on in public schools like we're not even aware of, a lot of things outside we don't even realize cause we're like this little small school sheltered and you know."*[99]

Samira says that in public school - in a mixed-sexed setting - girls are not encouraged to aspire to a computer science career, while in a same-sexed setting such as Fairfax, Samira implies that students *"don't even realize"* that such discouragement exists. In fact, according to the *Students' Uses of New*

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[98] Interview with Fern, Devorah and Samira, March 11th, 1998.

[99] Interview with Fern, Devorah and Samira, March 11th, 1998.

Information Technologies survey results 50% of Fairfax respondents say that their teachers encourage them *"a lot"* to use a computer to do schoolwork compared while only 15.61% of students from the co-ed public school express that sentiment. And while 47% of Fairfax students say that their teachers do not encourage them *"much"* and *"at all"*, 86% of the public school students feel that way.

Inquisitive Women as Attention-Getting Sluts

Prathna also has experience with a co-ed environment as an exchange student in an Australian mixed-sexed school. She notices distinct differences between her Fairfax experience and what she encountered in Australia.

> *Prathna: "If you brought [boys] into Fairfax, and put them in Fairfax's environment it wouldn't affect the class at all they would probably, they probably wouldn't even get noticed in a computer class. They'd sort of sit in a corner and we'd take over the computers and be like, 'wait your turn'. But if you're going to a co-ed school it's really different like through my experience and stuff. Girls don't do anything, they just sort of sit there and they're quiet. It's sort of like it's their job to just sit there and be quiet and watch the guys and the guys do everything. And they tend to learn more and like, even you could probably say that their marks probably reflect that too like girls don't get higher marks and guys do in the sciences and computers because they're the one's who get the computers, because they're the one's who are interacting and learning stuff and girls are just sort of sitting there like they're not sort of, they don't belong in that field."*

> *Cailey: "And this is when you were an exchange student in Australia?"*

> *Prathna: "Yeah, when I was on exchange at a school in Australia, that's what I found. I went in, and even in a regular classroom like discussions and stuff like that, when I was contributing something all of a sudden all of the girls stopped and looked at you and they had this look of 'oh slut she's trying to get their attention' and the guys sort of went like, 'what?! She has something to say?!'*

Cailey: "How did they deal with you after class, did they ever ask you about it, or treat you differently?"

Prathna: "Their sort of view was that 'oh Canadians are really forward and confident' and stuff, and the guys always grouped it like, 'Canadian girls are confident and forward' and they liked that because they hadn't had that before and Australian girls were like, 'oh, they're like all sluts and attention-getters' they didn't look at it as individual people or your experiences, they looked at it from what country you were from. But I think that if I had been Australian or if I wasn't there as an exchange student, just a new student, they wouldn't have been as receptive as they were cause they knew, 'oh she's there and it's different but she's going to be gone in 6 weeks.' So they could deal with it."[100]

Prathna faces a hostile learning environment when she speaks her mind in a class where boys are present. Although this took place in Australia, Fairfax has had similar experiences when boys used, on occasion, to share the Junior School's computer lab with the girls. Lynn Beaudoin, the Computer Coordinator at the Junior School talks about the atmosphere in the lab when boys and girls shared the space.

[Ms. Beaudoin recalls a time when boys from St. George's were allowed to share the Junior School's computer lab with the girls. She says that there is a "different spirit" with the boys there. She says that the boys are "chauvinist and they think that they know it all" and without them present girls are better able to be the "experts".][101]

Innate Differences?

Ms. Shin who has taught computer studies in a co-ed setting feels that there are definitely differences between boys and girls and their relationships to technology, and although she feels that these differences are almost innate, she does express her appreciation for being at a school where girls have the

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[100] Interview with Adrienne and Prathna, March 11th, 1998.

[101] Fieldnotes, February 26th, 1998.

opportunity to excel with computers. Ms. Shin describes her experiences at a private school in London, England:

> *Ms. Shin: [I was] teaching from kindergarten to grade 4 - computers - and we had Apple 2E Computers and I was interested in, and I didn't do research on it, but there was a definite difference between the boys and the girls. When I would do Logo, the boys will say [in an excited voice] 'Yes, oh yes! Let's do Logo!' But the girls were saying [in a whiny voice], 'oh no, no'. There was something about Logo that would..."*

> *Cailey: "What's Logo?"*

> *Ms. Shin: "Logo is a programming language for children and it's a, you can draw, you can program it like left, right."*

> *Cailey: "That's right, and there's a thing with a turtle that goes across the screen"*

> *Ms. Shin: "Yes, and you can make flowers and you can make moving images and that was a big thing at MIT."*

> *Cailey: "But the girls weren't terribly interested?"*

> *Ms. Shin: "Girls weren't really...they wanted to do PrintShop and they wanted to do writing and they wanted to do reading language arts programs. PrintShop is like KidPics like drawing they loved doing those, but they didn't really like... But I was really surprised that there was a big difference, yet it was just almost natural."*

> *Cailey: "Cause they were so young, you wonder where does that come from?"*

> *Ms. Shin: "Yes."[102]*

A little later on in our interview she expresses the pleasure she experiences teaching in a same-sex environment:

> *"But I do enjoy being in an all-girls environment where girls get to play all the leadership roles and I like the size*

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[102] Interview with Jenny Shin, March 15th, 1998.

*because everybody knows everybody. And the set-up is
really good, the facilities are excellent and if I want to buy
something I don't have any money problems so I'm quite
happy.* "[103]

Later on in the interview she again mentions the benefits of a single-sex setting:

*Ms. Shin: "But basically I'm glad these kids are at an all-girls school and they're enthusiastic and this computer
room is always busy."*

*Cailey: "Do you get the sense that they feel confident about
their ability and they'll try..."*

Ms. Shin: "Oh, yeah, yeah"

*Cailey: "And they don't just sit there and say 'I don't want
to...'"*

*Ms. Shin: "Yeah, and you know a lot of their mothers use
computers at home like some nurses and occupational
therapists and dentists and they have to check into their
patient files. It's a good role model that their mothers are
using [computers]."* [104]

Role Models

Students at Fairfax School witness many positive and strong women role models. In 1996/97, there were 45 teachers, administrators and support staff at the Senior School and only 10 were male. And of those 10, only three taught in the areas of math and science. At the beginning of the 1997/98 year Jenny Shin was hired to teach computer studies so currently all of the computer education courses are taught by women.[105]

Susan Hill believes in the influence of role models in the lives of Fairfax students, however she does not specify their gender.

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[103] Interview with Jenny Shin, March 15th, 1998.

[104] Interview with Jenny Shin, March 15th, 1998.

[105] Last year Bob Walker taught the Information Technology 11 course.

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Cailey: "Do you think that there are a lot of girls who are interested in computers, but don't necessarily want to go into Computer Science specifically, that they want to use them more as tools, but not go into the programming aspect of it?"

Ms. Hill: "Yeah, I think it's going to take awhile, I think girls will start doing it. We had a Career Day yesterday and there was a computer guy talking about the future in computers. You know it's just starting, my way of thinking is getting the teachers to trust computers. And if the teachers are hooked on computers your enthusiasm is contagious. And you know when you're teaching in a population of teachers where very few of them are young. And I will tell you that our younger teachers, I don't know how much they know? It would be fun to see how much more they know than our older teachers. For example, our art teacher has bought a scanner and a [could not hear] and a copy of PhotoShop and is doing computer generated art. You know, and courses we don't offer at all what if a student saw graphic technology on the computers and just adored that kind of work as a freelancer and pursued those kind of careers for herself I'm not sure some of them wouldn't want it?"[106]

For Ms. Hill, inspiring an enthusiastic atmosphere around computer technology and being able to offer students access to various uses of the technology would most likely encourage more computer use in the Fairfax School environment.[107] It is not only Ms. Hill who believes in the benefit of encouraging students to use computer technology in a variety of ways. Jones and Clarke discovered in their study, *"Diversity as a Determinate of Attitudes: A Possible Explanation of the Apparent Advantage of Single-Sex Settings"* that "diversity of computing experience was the strongest predictor of high

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[106] Interview with Ms. Hill, March 15th, 1998.

[107] However, it could be argued that inviting a *woman* to Career Day, rather than a "guy", to speak of the future of computers may be a more effective way of encouraging Fairfax students to envision themselves in computer fields.

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school girls' attitudes toward computers."[108]   Further, Clarke and Jones believe that,

> a wide variety of computing experiences can lead to the development of more positive attitudes toward computing and has a greater impact on computing attitudes than does the amount of experience, [therefore] the best way to use the available computing class time is to expose girls to a diverse set of experiences.[109]

It appears that Fairfax offers students the option of using computers in a broad range of uses. Not only can students access a wide range of skills through computer science classes,[110] the Journalism class, and the Yearbook course, but students responding to the survey convey that they have used computers in a broad range of classes. In Science class, 65% of Fairfax students say that computers are used either *"occasionally"* or *"frequently"*, while only 12% of the students from the co-ed school identify a similar experience. 80% of Fairfax students use computers either *"occasionally"* or *"frequently"* in English class, compared to 26% of the students in the co-ed school. And although neither Fairfax or students from the co-ed school appear to use computers in Math class that much, 67.8% of Fairfax students still report that they use computers in Math either *"occasionally"* or *"only once or twice"*, while only 12.16% of students from the co-ed school use them to this extent in Math.[111]

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[108] Jones & Clarke, 1995, 51.

[109] Jones & Clarke, 1995, 60.

[110] It is interesting to note that 88% of Fairfax students who respond to the survey say that they are taking, or have taken, a computer science course. This is in comparison to 52% of the student respondents from the co-ed school.

[111] It is not clear why Fairfax students use computers more than their public school counterparts, it could be argued that the teachers at Fairfax are more inclined to use computers, that they are individually more comfortable with the technology. But this could also be a structural problem: that there is simply a better ratio of students to computers at the smaller, privately-funded Fairfax. It may also be argued that the same-sex environment is the reason for such different participation rates but Signorella, Frieze, and Hershey caution that a broader lens must be used when looking at students in a single-sex learning environment because "same-sex and coed school students may differ on dimensions other than the sex composition of

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'The Moral Life of Fairfax School'

In order for girls to begin perceiving of themselves as competent computer users it is necessary, recommends NABST, to foster the development of a healthy self esteem both in relation to computers specifically and to themselves more generally. In addition to the positive elements a single-sex learning environment offers, I observed three central ways that teachers at Fairfax promote their students' self esteem: by blurring boundaries between the teacher and the student, by providing extensive positive reinforcement, and by demonstrating care toward the girls both inside and outside of the computer lab.

To perceive of these three strategies in a prescriptive manner - that is for a teacher to simply 'adopt' such practices - is difficult as they are so integral to the general atmosphere at Fairfax. Not only is there a sense of cooperation and community at the school as mentioned earlier, but girls' competence in every aspect of the school's culture appears to be encouraged and assumed. This implicit message comes though in the "hidden curriculum" of the school. As Philip W. Jackson et. al. suggest,

> *...our schools do much more than pass along requisite knowledge to the students attending them...They also influence the way those students look upon themselves and others...They contribute to the growth and character and, in some instances, they may even be a factor in its corruption...Moreover, and here is the important point, they do much of it without the full awareness and thoughtful engagement of those in charge."* [112]

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the school. For example, Marsh (1989) suggested that 'intelligence, prior academic achievement, motivation, and social class' (p. 71) are all factors on which students from single-sex schools may differ from those in integrated environments." (600). For examples of research emphasizing the importance of socio-economic factors on single-sex learning environments refer to: Smith, 1984; Riordan, 1985; and Young and Fraser, 1992.

[112] Jackson et. al., 1993, xii.

It is this potential "lack of awareness and thoughtful engagement" that make implementing NABST's third recommendation into practice so complicated: it is difficult to simply ask teachers to bolster girls' self-esteem as many actions that promote or impoverish self-worth are unconscious. But Philip W. Jackson, Robert E. Boostrom and David T. Hansen, in their study *The Moral Life of Schools Project,* took on the task of discovering how, concretely, subtle messages are communicated to students by investigating "the ways in which moral considerations permeate the everyday life of schools and classrooms."[113] The researchers conducted a two-and-a-half year study extensively observing 18 classrooms in the Mid Western, United States[114] to draw educators' attention toward the understanding and recognition of the "myriad events and features of moral consequence that they may presently be overlooking within their own schools and classrooms."[115] By placing importance on the subtle moral instruction taking place during everyday classroom activities these researchers shift the discussion of morality away from deliberate moral instruction (which the researchers believe is "episodic and self-contained"[116]) and toward, "the unintentional outcomes of schooling, the ones teacher and administrators seldom plan in advance."[117] These everyday practices, the researchers believe "are of greater moral significance - that is, more likely to have enduring effects - than those that are intended and consciously sought [because] many of the unintended influences are in operation *all or most of the time*"[118]

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[113] Jackson et. al., 1993, xiv.
[114] Jackson et. al., 1993, xiv.
[115] Jackson et. al., 1993, xii.
[116] Jackson et. al., 1993, 44.
[117] Jackson et. al., 1993, 44.
[118] Jackson et. al., 1993, 44.

Jackson et. al. point to seemingly every aspect of the school context from the rules and regulations governing a classroom, to curricular substructure and commonly held pedagogical assumptions, to the expressive quality within a classroom. This last point is by the researchers' own admission, "limitless" as "everything that teachers and students say and do together, every activity in which they engage, every physical object within the room, and even the environment as a whole can be scrutinized expressively [for moral significance] if the observer chooses to do so."[119]

What follows is an examination of several subtle everyday practices that take place at Fairfax which I feel influence the moral lessons affecting students' self-esteem.

Blurred Boundaries

Susan Hill often uses classroom practices that blur the distinction between teacher and student. This blurring, as I see it, allows students to see themselves as authority figures in charge of important outcomes. Ms. Hill's decisions regarding the curricular and evaluation structures of her Yearbook and Journalism courses are cases in point. The structure of the curriculum, that is, how the curriculum is organized, is an important influence on students' self-perception because students, "are required to incorporate as knowledge" a structure that "becomes part of the lesson."[120]

Student Responsibility over the Pedagogical Process

When Ms. Hill asks her students to set deadlines she is granting them ownership over the pedagogical process and over their own work. Asking students to take the responsibility of setting reasonable deadlines and expecting them to work to those goals sends a message that they are

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[119] Jackson et. al., 1993, 33.
[120] Jackson et. al., 1993, 14.

competent enough and mature enough to be trusted with a task that is typically a teachers' responsibility.[121]

> *Cailey: "What do you think are the benefits or cons to having them set the deadlines for the publications and being basically in charge of that."*

> *Ms. Hill: "No cons, everything is a benefit. They know their timetables and their workloads better than I do, they know when teachers are dumping tests and everything. So they're doing it in their downtime. So if I can remember to do it [set deadlines] early enough then it becomes a priority in their lives then they know they can't get out of it. They take ownership of that time and that commitment when they set their own times and dates. So it works out really really well. And the joy of those two courses is, a teacher says 'you have a history project due on such and such a date' and they go 'yeah but the dog ate my homework and my grandmother died' and all these stories, but they never miss these deadlines because we're dependent on the outside world for both these deadlines. We've got to go to College Printers and if we miss our time then the Globe and Mail will go to press and we won't. And if we miss the Josten's deadline our book is going to come in two weeks late or they're going to extra bill us. So there's no if's and's or but's about meeting those deadlines."[122]*

The fact that Ms. Hill asks students to work on projects that are dependent on the "outside world" reinforces the perspective that she believes in her students to accomplish work where there are real consequences to missed expectations - for instance extra billing or missed printing deadlines.

Student as Expert

Ms. Hill also blurs the distinction between the typical teacher-as-expert and student-as-learner dichotomy by exposing the many times when students

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[121] The following excerpt was cited in Chapter Three in discussing how Ms. Hill structured student accountability into cooperative learning practices, however, it is pertinent to refer to it once again for the purpose of discussing how Ms. Hill blurs the distinction between herself as "teacher" and those in her classes as "students".

[122] Interview with Susan Hill, March 15th, 1998.

teach her something she did not know. On one memorable occasion Ms. Hill sits down with Maria who was absent from the previous class to review the ClarisWorks Slide Show application.

> *One student, Maria has been away to the Philippines, so Ms. Hill goes over to her desk and works one-on-one with her to review what she has missed while she was gone. I go over as well. Ms. Hill goes through a bit of a tutorial on the ClarisWorks Slide Show program, asking Maria how to do certain functions. Maria knows much of what Ms. Hill is reviewing and a running joke develops between the student and the teacher. Ms. Hill keeps saying, "Oh here's something you won't know..." and then asks Maria a question. When Maria knows the answer (which is most of the time) Ms. Hill laughs and then vows to find something that Maria doesn't know. When Maria does not know the answer to a question, Ms. Hill says: "you don't know this?! Thank God I can teach you something you don't know!" While this one-on-one work is going on, I look around to find all of the students working quietly on their work. They seem very focused. Ms. Hill asks Maria to highlight a piece of text. Maria uses a short cut with the control and shift keys which Ms. Hill didn't know was possible. She asks Maria to show her what she did. Ms. Hill laughs and says "you've taught me something I didn't know!".*
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> *An hour or so later, as students are leaving class, Bob Walker walks in, he is the Computer Technology Coordinator for the Senior School as well as the Grade 12 Physics teacher. Ms. Hill says to Bob: "Hey Bob, Maria taught me something I didn't know!" Mr. Walker asks Maria what it is and Maria explains the short cut for the highlighting function. Mr. Walker tells Maria that he will try that the next time he uses the program.[123]*

This example is typical of what occurs in Susan Hill's classes. What is interesting in this scenario is that Ms. Hill's conviction of the value of Maria' computer knowledge is so genuine, to the point that she remembers to mention the trick that Maria teaches her to another teacher more than an

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[123] Fieldnotes, February 12th, 1998.

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hour later. Ms. Hill could have gone through the one-on-one review (which is itself indicative of the care she takes with her students) quite quickly, just enough to ensure that Maria knows how to use the program, but instead she takes the time and makes the decision to remark on the knowledge that Maria already has and then praises her for knowing it. Ms. Hill keeps saying in a mock-worried voice that she needs to find something to teach Maria - the worry it seems is that Maria is already so competent with the technology that Ms. Hill is left with nothing to teach. Again, the student is herself a kind of teacher and when she teaches Ms. Hill something that Ms. Hill does not know, the teacher acknowledges becoming a student herself.

Providing an Educational Safety Net

In the Yearbook class the two student editors are essentially in charge of delegating tasks and checking up on other students' work. During my first visit to the class it is apparent that although Ms. Hill does provide, as she says a "safety net" for students, she does not perform the traditional teacher role.

This class is larger at 14 students. Ms. Hill begins the class by announcing that she has noticed that many students leave the classroom during the class providing her with no reason, she says that she fears people are using the freedom of the class structure to leave to do their own personal stuff. She asks that if students need to leave the class to do work on Yearbook-related work then they need to let her know why and when they are leaving. While Ms. Hill is making this speech, students are already working on their tasks.

The students who are the editor and the co-editor of the Yearbook (Nicole and Chloe) are delegating tasks to students while Ms. Hill is speaking to me about the class. She tells me that this course is often more chaotic than her other classes. A student from another class enters the class and asks Ms. Hill if she can use a computer, Ms. Hill lets her use the computer at the teacher's desk.

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The students appear to be very organized and confident in delegating tasks to one another. One student is up at the wipe board writing down tasks that need to be done while the co-editor is calling out the name of the person in charge of each task. One student is working on teacher's photos, she is coding them into the computer. Four or five other students are selecting pictures to go into the book. Others are working on PageMaker on the pages that they are responsible for. The students working in groups are on task, and there doesn't appear to be much talk about anything other than the work being done. They are very focused. A student drops a piece of paper and another student picks it up for her.

The students are busy at work. The editor walks around the class answering any questions students have. No one is goofing off and when Ms. Hill leaves the room there is no change in behaviour or noise level.

Ms. Hill is asked by a student what to write as a header for the second page of kindergarten pictures. They are going to start each section with the class name and then a word to describe success. The student asks Ms. Hill whether she should write a header for the second page of kindergarten kids or if it is assumed from the first page. Without saying anything, Ms. Hill stands up and says: "It's time for an executive decision" The class becomes quiet. Ms. Hill explains the question to the class and asks for input. Members of the class call out their opinions. When several similar views are heard - that they only need to put titles on the first page Ms. Hill asks the class if that seems like a good idea. There is agreement and the student has her answer.[124]

Ms. Hill begins this particular class by establishing some ground rules: the students are allowed to leave the class to work on the Yearbook but they have to tell her that they are going. As Ms. Hill speaks to me for almost the entire class the students are motivated enough to work on the book without any encouragement from their teacher. Students delegate, they organize responsibility lists, they work on their tasks and they answer each others'

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[124] Fieldnotes, February 12th, 1998.

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questions. When a question is asked of the teacher she does not even attempt to provide a solution she immediately stands up to ask the class what they think is the best way of going about it. She acts as a facilitator to achieve consensus and then she steps back again. And even in the middle of this class when an outside student needs to use a computer, Ms. Hill allows her permission to use the computer on the *teacher's* desk. The boundaries between the Fairfax students and the teacher are again blurred: students delegate, organize, use the teacher's computer and make the decisions.

Emphasizing Good Mistakes

Ms. Hill also uses the strategy of humility when teaching her students. She acknowledges when she makes a mistake with the technology, not in a self-deprecating way but more with the understanding that it is okay to make a mistake. When a student has difficulty with the toner in the printer Ms. Hill shouts out: *"It's our fault. Mr. Walker and I just shook the cartridge instead of replacing it"*. She will also turn her mistakes into "good mistakes" if they shed light on an aspect of a computer program.

When Ms. Hill teaches spreadsheets in grade 8 she uses an assignment whereby students take stock of their wardrobe. They input the different types of clothes that they own, along with their costs and they program the spreadsheet to calculate how many socks (for example) they own, how much they (or their parents have) spent on clothes and so on. In this next excerpt, Ms. Hill is teaching her grade 11 students more extensive spreadsheet functions but she bases the lesson on the task they did in grade 8: the wardrobe assignment. With Maria sitting at the computer display terminal Ms. Hill goes through the various functions of the spreadsheet, but when she makes a mistake she does not shy away from acknowledging it, she tries to incorporate it into the lesson; it becomes a "good mistake".

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In this example Ms. Hill provides positive reinforcement to students, she quietly disciplines a student for working on her homework from another class and she downplays her own knowledge of advanced math - in a sense she questions the need to know math in order to understand computer technology.[125]

With the wardrobe assignment on the board, Ms. Hill goes over how text can be placed in cells. She problem-solves how to centre - her original idea of how to centre doesn't work - Maria figures it out on the terminal. She goes over the shortcuts for 'Justifying' and asks students if they remember how to do it from their grade 8 experience? Carol does. Ms. Hill says: "Oh you remembered! Thanks Carol that's right. Here's something you don't know" She shows the class how to put colour into certain cells to make them stand out. The class expresses that this is a good function. "I didn't think that you knew that. Now here's the problem, here's what we don't like about this." Ms. Hill attempts to demonstrate a flaw with this particular program: that when you shift a coloured row down, the colour stays behind with the new cell information, rather than moving down with the appropriate cell. However, when she tries to demonstrate this it actually works properly. She says: "Oh wait...the grey moved with it when you added a column. Oh they've improved it, great." Most students are looking at the front of class, Natalie looks board or tired. Fern is now working on a spreadsheet on her own terminal and occasionally looks up".

"What would happen if you highlighted these 3 columns?" Ms. Hill looks over at Fiona who is working on homework from another class. Ms. Hill walks casually over to Fiona's desk, and says guessing: "You're working on French?" Ms. Hill turns over the text book, "nope, Spanish [laughs] close enough. Let's do the right thing". This exchange is fairly quiet and between the two of them. It takes me a second to even figure out what is going on. Ms. Hill goes straight back to the lesson: "here's the next

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[125] It is interesting to note that, in this exercise, Ms. Hill is connecting the instruction of a computer skill - the instruction of spreadsheets - to a topic of relevance to students' everyday lives - their personal wardrobe.

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thing I want you to do - to understand. Highlight casual clothes, now where is it?..."

Student: "It calculated"

Ms. Hill: "Did you see it? You guys are so fast. Now here's something that used to confuse you".

She goes over the '=' function. With Maria doing mouse control, Ms. Hill shows the students all of the different math functions available in the program. "Now I'd need a Ph.D. in math, I have no idea what all of these are - there's calculus and algebra. These are very powerful calculators." She asks Maria to remove formulas from the screen.

Ms. Hill: "Alright, your mother says you are going to get new socks for your birthday - exciting" Maria adds the number 20 to the amount of socks line.

Fiona: "Socks don't cost $5.!"

Various students: "They're nice socks", "Designer socks".
Ms. Hill explains relative vs. absolute functioning. She explains a fast way to do spreadsheet functions "because time is money in the work force". She tries to do something and it doesn't work "oh shoot - good good mistake, look what happened...you need to click out every time."[126]

Positive Feedback

As can be seen from previous scenarios, it is important to Ms. Hill that she give positive feedback to students for jobs well done. She will take up class time in order to reward students for the work they accomplish. When students from the Journalism course publish a broad sheet called the "Yorkshire Pudding" she makes sure to inform them of the positive comments she has heard from others in the school.

Ms. Hill: "I've heard good things from people on the Yorkshire Pudding. Did you hear feedback? And there

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[126] Fieldnotes, February 20th, 1998.

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aren't many here, they went home where we wanted them to go. People said they liked the cartoons and the top ten lists, people read the paper like us [the fun stuff first]. There were comments about the intelligence of the content."

Devorah says that she heard from people that they liked her editorial "and the filler of what ticks us off". A discussion ensues about that piece. Fern says that after they wrote that filler, someone forgot to signal in the car in front of her [one of the pet peeves listed in the piece]. Ms. Hill tells a personal story about a car that raced out to get in front of her car and then slowed right down as if to check for addresses on the houses. Students begin speaking at once about their pet peeves.

Ms. Hill tells the class that a letter of apology and a refund need to be sent to Mr. Jordan because of a problem with the quality of his ad. Devorah asks if there is any way to lock the ad in place in order to avoid the same mistake in the future? Ms. Hill says that there is new software but it is expensive and it crashes a lot, "but yes that's a great idea."

Ms. Hill: "Well congratulations, I've heard great things."

Student: "Mrs. Smith said that you wouldn't let any of the staff leave the staff room until they took one".

Ms. Hill: "Well that's a slight exaggeration"[127]

Although Ms. Hill says that it is a "slight exaggeration" that she forces teachers to take a copy of the publication before leaving the staff room it is clear to students that she cares about the work that they do.[128] When Ms. Hill reports on the positive feedback that she hears from those outside of the class she reinforces the perspective that the work that Fairfax students do is recognized and valued as "great".

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[127] Fieldnotes, February 20th, 1998.

[128] I personally do not find it hard to believe that Ms. Hill may have encouraged teachers to take a copy of the Yorkshire Pudding when in the staff room, as I did witness her going through the halls asking teachers if they had read their copies of the Gryphon.

Ms. Hill even interrupts Ms. Shin's class to applaud students for the quality of their computer-generated assignments that they handed in for her course in the previous semester.

> *"Ladies can I have your attention please...Congratulations on your PageMaker assignments they blew my mind. I ran the gamut of emotions, I was jealous of your sense of design, many of you. Everyone passed the course. The test on the whole was very good. You taught me a couple of things, perfectly good options I never would have thought of. If you want to come and see me tomorrow to get your final mark please come and see me. Thank you very much". The students applaud.*[129]

Not only does Ms. Hill take time out to congratulate the students on their assignments, but she again blurs the distinction between herself as the teacher and the students. She tells them that she is envious of their ability, acknowledging that she herself does not have certain talents that some of the students possess. She also emphasizes that the students taught her ways of doing computer tasks that she would not have thought of, this is important because instead of penalizing them for not doing certain tasks in the manner in which they were taught she applauds them for their ingenuity and says that they were "perfectly good options".

A Caring Environment

Ms. Hill's interaction with her students go beyond the instruction of computer skills, she goes out of her way to be involved with them as people. As she walks down the hallway she congratulates a student on her performance in a basketball game, she pops her head in on student-organized events to see how they are going, and in her spare time she goes to sporting events to cheer on the Fairfax team. I ask her if being interested in students' lives outside of her classroom is something that she does consciously?

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[129] Fieldnotes, February 23rd, 1998.

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"No, that's my nature and years and years of being Athletic Director. I can't tell you that I go to the Debating Championships when the kids are going, but I feel I should be involved, I expect the kids to be integrated in what they're doing above and beyond, it's not just the course. And it's not that I have to, that's my nature to be that way. Sometimes when I don't want to go I do."[130]

When walking in to Ms. Shin's class she sees a member of the basketball team that narrowly lost their game the night before,

"Nice game Sharon. You were almost there. Congratulations. I e-mailed Mr. P [the coach] and said that you [the team] just didn't quit!"[131]

Taking the Time, Making the Effort

Ms. Hill also encourages students to succeed with computers in her spare time. If Ms. Hill sees a student struggling in the computer room, even if she is not taking a class with her, she will take an interest in her work and help her out. When Ms. Hill wants to teach Nicole, the Yearbook editor, how to use PhotoShop she asks two students whom she does not know if they want to join in on the workshop. Barbara and Amanda enthusiastically say that they would "love to." Extending an invitation to these two girls gives them the opportunity and access to improve their computer knowledge. This sits in stark contrast with Samira's comments about her computer lab in her public school:

Samira: "In public school most people don't know where the computer lab is!"

Cailey: "Yeah?"

Samira: "Like in grade 8 it was my first year in a big school and I'm like, 'where's the computer lab'. I didn't even know where the computer lab was until the last month of

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[130] Interview with Susan Hill, March 15th, 1998.
[131] Fieldnotes, February 23rd, 1998.

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school, and like 'oh there it is' but there's like limited access to it."[132]

Caring enough to provide girls with access to computers and computer skills outside of class time does a lot to encourage them to view themselves as worthy of computer instruction. And just feeling comfortable enough to walk into a computer lab, or knowing where the lab is located, goes a long way to making sure that girls are in the lab to receive such impromptu lessons like the PhotoShop tutorial provided by Ms. Hill. If Barbara and Amanda had not been in the room because they did not feel comfortable they would not have been invited to join in on the workshop, and they would not have received that information. How many girls in the school Samira describes miss out on such opportunities?

A conditional response to this question may be found through examining the differences in the results between students at Fairfax and the students at the co-ed school when answering the following question on the survey: "At your school, which of the following is true about free-time use of computers by students?" Fairfax students overwhelming feel that *"any student can get permission to use computers in free time"*, in fact 96.3% of respondents feel this way. 2.5%, that is two Fairfax students, believe that *"only certain students can get permission to use computers in free time"*, and 1.2%, one student, *"does not know"* the answer to this question. Students from the co-ed school do not think that, or in the case of the majority of respondents, do not *know* if, they have access to computers in their free time. Only 22.2% believe that *"any student can get permission to use computers in free time"*; 8.48% of respondents feel that *"only certain students can get permission"*; 19.2% say that *"students are not allowed to use computers in*

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[132] Interview with Fern, Devorah and Samira, March 11th, 1998.

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free time"[133] and a startling 50.1% *"do not know"* the answer to that question. It is unclear what the policy is at the co-ed school for student access to computer use in free time, but whether this is a real or perceived restriction it is clear that 77.78% of respondents are not using computers in their free time.

Who Uses the Computer Room Anyway?

Two of the questions asked on the survey that caused the greatest confusion to Fairfax students were: "What kinds of students are the most competent computer users at your school?" and "What kinds of students use computers at your school the most?". One of the intentions of asking these questions at co-ed public schools is to discover if students will write gender-specific responses. However in an all-girls school students have difficulty understanding how to answer these questions.

> *Cailey: "Were there questions [on the survey] that stuck out or seemed strange to ask?"*

> *Devorah: "Well there were a few questions about 'what students' or 'what type of student enjoys using the computers the most' or..."*

> *Samira: "yeah"*

> *Devorah: "...or is the best at working with the programs' and I was just like, 'I don't know?'. I guess I could answer 'the people who spend the most time on the computer are all the kids who love the Internet or Hot Mail and everything and those are the people that I see using those programs' otherwise I have no idea. In our school everyone uses them I think."*

> *Cailey: "[to Samira] "Did that strike you as an odd questions too?"*

> *Samira: "Yeah like everyone uses it so like you don't really know what kind or 'type' of people use it."*

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[133] No Fairfax students answered the question in that way.

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Samira and Devorah are not the only students who feel this way, leaving this question open-ended on the survey proves an interesting exercise: students provide a variety of "kinds of students [who] use computers...the most". In addition to categories such as 'people who need them for school tasks' which represents 17.8% of the responses, and 'Internet enthusiasts' representing 14.4% of responses, *'everybody'* is clearly the most popular category in response to this question. The majority of Fairfax students - 38.9% - believe that *'everybody'* at Fairfax uses computers the most.

Although it sounds awkward to suggest that *everybody* uses computers *the most*, Fairfax students do not appear to be far off the mark. A staggering 93% of respondents say that they use a computer at school, and 74% use them *"daily"* or *"once every few days"*. In comparison with the co-ed school results the numbers are impressive. At the co-ed school only 62% of girls surveyed say that they use computers at school, and further, only 49% respond that they use their school's computers *"daily"* or *"once every few days"*. In fact, 24% of the female students from the co-ed school state that they *"never"* or *"almost never"* use computers at school compared to only 6% of Fairfax students.[134]

However, it is not only in the classroom that Fairfax students access and become practiced with computers. When asked if there is a computer in their home, 100% of Fairfax students respond affirmatively. Further, 37% of those students have their *own* computer at home. And when asked how often they typically use their home computers 81.71% say that they use a computer at home either *"daily"* (52.44%) or *"every few days"* (29.27%). This

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[134] Results for the boys at the co-ed school for these questions are as follows: 69% say that they use computers at school. 57% use computers at school *"daily"* or *"once every few days"* and 26% say that they *"never"* or *"almost never"* use computers at school. It is interesting to note that the girls at Fairfax use computers on a more regular basis at school than the boys at the co-ed school.

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amount of access at home must have some impact on the comfort levels and the confidence levels of Fairfax students with computer technology.[135]

Envisioning Computer Competence

So what does it mean for the young women attending Fairfax to attend a school which appears to provide a great deal of access and encouragement for girls to use and become proficient with computers, and further that they live in homes where they can also access this technology? How does such access impact upon their perceptions of their own computer competence and computer competence in general especially as such competence relates to gender?

On the survey students are asked to draw pictures of a "Computer Whiz" and a "Computer Whizn't", the first is a person who is extremely competent with computers and the second is a person who does not know how use them. Some students found themselves at odds over what to draw as a representation of computer competence or incompetence.

> *Selina: "I liked the end drawing, the drawing was really really weird to think about. [For the Computer Whiz] I drew a typical person with glasses, the person who would be, who would have the knowledge to work a computer. The other person [the Computer Whizn't] was some popular girl. And I was just thinking that, but our whole grade we all use computers."*

> *Cailey: "So basically your drawing of this Computer Whiz isn't necessarily what is out there at Fairfax"*

> *Selina: "No, no not at all."*

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[135] It would appear that students at the co-ed school also have significant access to computers in their homes: 90% of male students and 87% of female students have computers in their homes. More students from the co-ed school indicate that they have *"their own computers at home"* than do Fairfax: 46.2% of female students and 60.4% of male students say that they have their own computers at home. However, it is worth noting that although they have more access to their own computers at home students from the co-ed school appear to use the machines less often than their Fairfax counterparts: 64.78% say that they use a computer at home either *"daily"* (46.30%) or *"once every few days"* (18.48%).

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Fern expresses similar views as Selina.

> *Fern: "The last page with the drawing, I think everybody had the same opinion. We went, 'do we stereotype it? Or do we put what we think about it? Or...' so me personally I went for the 'what am I thinking' and put the same person and said 'I don't think a person should be judged on the way they look'. But I know Lisa who's you know, relaxed, a jokester did the stereotypical thing and she made a joke out of it. So I think a lot people were like 'whoa, what are we? Are we this stereotypical?'"*

The images drawn by students in the surveys are categorized by Gen Tech researchers[136] and myself[137] in three ways: "Male", "Female", and "Indeterminate".[138] The Computer Whizzes drawn by Fairfax students are 'gendered' in the following way: 54% are male, 40% are female and the gender of 6% of the drawings cannot be determined. The Computer Whizzes as presented by students from the co-ed school are classified as follows: 61% are male,[139] 15% are female,[140] and 24% are indeterminate.[141] Although 25% more of the Fairfax Whizzes are identified as female, the majority of Fairfax students draw male computer experts - only 17% fewer than the students from the co-ed school.

According to 28% of Fairfax students' Computer Whizn'ts are depicted as male, 51% represent Whizn'ts as female and 21% do not identify the

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[136] Gen Tech researchers analyzed the surveys from the co-ed school.

[137] I analyzed the surveys from Fairfax school.

[138] It should be stated that to categorize images in such terms as "male", "female" and "indeterminate" is highly questionable. For one particular researcher to define what she understands to be "female", "male" or "indeterminate" should be called into question, as understanding gender as clear-cut terms is highly problematic. However, for the purpose of this exercise, the categories of "male" and "female" are understood by relying on Western notions of 'conventional' gender markers in addition to verifying the intended gender, when possible, to the name the student gave her image - names were often, but not always, gendered.

[139] 56% of girls and 62% of boys at the co-ed school drew male computer whizzes.

[140] 23%% of girls and 8% of boys at the co-ed school drew female computer whizzes.

[141] 21%% of girls and 17% of boys at the co-ed school drew indeterminate computer whizzes.

Whizn't as either male or female. An interesting point to consider is that 47% of students from the co-ed school portray their Whizn'ts as male[142] - that is 19% more of the students attending the co-ed school view a Whizn't as male. Females represent 28% of the Whizn'ts for students from the co-ed school[143] - that is 23% fewer co-ed students view Whizn'ts as female. And 25% of co-ed students represent Whizn't gender as indeterminate.[144] In all, the differences between the two groups of students do not appear to be significant, and in some cases the drawings from the Fairfax students are startling in their engendered identities.

In drawing a Computer Whiz, one Fairfax student draws a picture which appears to connect computer competence with being *inappropriately* gendered. "Ferdinand", at the age of 13, not only displays 'typical' signs of 'geekness' - plaid pants, glasses, bow tie and suspenders - but he appears to lack awareness of his own gender, making the *accidental* announcement: *"Someday I shall become Queen of the playground...KING! KING! I mean!"*[145] Ferdinand, the Computer Whiz, momentarily forgets what gender he is (or at any rate, forgets how he is supposed to articulate his understanding of it). Ferdinand accidentally announces his desire to be a Queen and then quickly 'recovers' by pronouncing the 'proper/appropriate' aspiration - King!

The Computer Whiz for another student is a woman named "Helen", upon first glance Helen appears to be a depiction of a rather average woman and I must admit when I saw her I was encouraged to see a female computer Whiz depicted. However upon closer examination, the words beside Helen work to ensure that the anticipated viewer not mistake Helen as a positive or

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[142] 29% of girls and 27% of boys at the co-ed school drew male computer whizn'ts.
[143] 45% of girls and 50% of boys at the co-ed school drew female computer whizn'ts.
[144] 26% of girls and 23% of boys at the co-ed school drew indeterminate computer whizn'ts.
[145] Student 52.

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rather, an 'attractive' representation. The student cautions: *"look at her strange body proportions"* and Helen herself says: *"Yes, I am 47"*.[146] The Fairfax student wants the viewer to interpret Computer Whiz Helen 'properly', as an older woman with "strange body proportions".

In depicting a Computer Whizn't one Fairfax student draws a picture of "Brittany" who has big blond pony tails and is wearing a tank top, Brittany informs the viewer that: *"Duh, my head's too small for my body!"*[147] Connecting computer competence, or lack of competence with looks and popularity comes through in the comments of the student who depicts her Whizn't in only words writing: *"Someone who is a real slacker, doesn't get good grades and is disliked and unpopular and ugly."*[148]

Stereotypical Representations of Computer Competence

However, when reading the comments made by students like Fern and Selina, the drawing exercise may not be an accurate or complete reflection of how students, from both Fairfax and the co-ed school, understand computer competence. Several students at Fairfax use the exercise to express how it is based on stereotypical assumptions. One student writes: *"I couldn't draw to save my life. And I don't think there's a stereotype for Whiz and Whizn'ts."*[149] Another student draws identical pictures for both her Whiz and Whizn't - smiling, cheering females with their hands up in the air the Whiz has a heart on her shirt with *"computers"* written inside of it and the Whizn't has the word *"computers"* on her shirt with a slash through it.[150] A

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[146] Student 53.
[147] Student 53.
[148] Student 49.
[149] Student 69.
[150] Student 56.

third student writes: *"This is so stereotypical, they could both look the same, with any age and any name!"*[151]

Although the drawing exercise does not provide any clear answers for how Fairfax students view those who are competent with computers and those who are not, what *can* be said is that students at Fairfax School, like most of us have complicated relationships with, and perceptions of, computer technology and computer competence. And although they may be taught to be competent computer users they still live in a society that perceives technological competence as a male-identified attribute. Selina's earlier comments come to mind at this point:

Selina found herself drawing a stereotypical representation of both computer competence and incompetence while at the same time realizing that this did not particularly reflect what she experiences at Fairfax. This disjuncture points out to the fact that forming straightforward conclusions from the drawing exercise is a complicated task. However, what is clear is that students at both the co-ed school and Fairfax do perceive of computer competence with a corresponding set of social markers and often those markers are gendered.

However, despite the number of *depictions* of computer competence as a male-identified attribute, many Fairfax students demonstrate a high level of confidence in their own ability with computers.[152] Indeed, in some cases, students at Fairfax believe that girls are in fact better at computer use than boys.

> *Cailey: "So what do you think of all of this talk of girls not being interested in computers that..."*

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[151] Student 74.
[152] As will be discussed in Chapter 7.

Amanda: "That is so stupid, that is so stupid! I don't know of any guys who are on the Internet"

Barbara: "Pardon my language but that is total BS!"

Amanda: "I don't know, okay besides my brother, and my brother is so stupid all he does on the Internet is collect pictures of Calvin and Hobbes and I'm like 'why would you want to do that?'"

Barbara: "And there are a heck of a lot more guys out there looking at porn web sites than there are girls, and I must admit that we are using the capabilities of the Internet much better than they are..."

Amanda: "Yes!"

Barbara: "And their hormones and testosterone make them impatient and my dad is sitting there saying [frustrated voice] 'why won't this damn thing work' and he's ready to kill the computer. I'm like 'patience is most important'."

Amanda: "I don't know any guys my age who do anything on the computer."

Whether Barbara and Amanda's pronouncements are accurate or not, whether it is true that boys do not "do anything on the computer" is debatable, however, what is clear is that their perception that girls like themselves are making good use of technology is an encouraging one.

Summing Up

In sum then, the Fairfax learning environment appears to effectively reflect NABST's recommendations for school-based technology instruction. Fairfax students indicate that working together collaboratively allows them the opportunity to learn from one another in ways that are more effective and enjoyable than being instructed through a traditional teacher/student lecture format. Fairfax students who work on projects that are relevant to their lives and interests appear to be motivated to engage with computer

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technology more intensively than they would in more conventional computer science classes, and learning from female teachers in a single sex environment that actively encourages young women to see their potential as competent computer users instills a confidence in Fairfax students in their own technological ability. Fairfax students also appear to have a great deal of access to computers, both at school and in their homes and they feel encouraged by their teachers to use computers as part of their daily activities while in class and during their free time at school. However, whether NABST's recommendations for pedagogy will result in the success predicted in the "Winning with Women" report will be the topic of the next section.

Do these young women demonstrate a desire, at this point in their lives, to embark on careers in computer science following from the 'foundation laid' by their education at Fairfax School?

CHAPTER SEVEN

Predicted Outcomes and Meaningful Engagement

Based upon nearly two months of observations, interviews, informal discussions and survey results, I feel confident in stating that Fairfax's instruction of computer technology accords well with the recommendations that NABST sets forth: the use of cooperative learning environments, a focus on educational exercises that concentrate less on abstract computer theory and more on demonstrating how a computer can be used as a tool to forward the needs and interests of students, a dedication to improving self-esteem by minimizing gender bias and stereotyping in the classroom, and the provision of positive women role models. Fairfax students appear to benefit greatly from this climate as can be witnessed by their positive attitudes towards and highly competent uses of computer technology. The question that remains is whether the use of such strategies will necessarily result in the outcomes desired by NABST: that the implementation of such teaching strategies will increase the likelihood of girls choosing educational programs and careers in science and technology fields.

It must be acknowledged that it is, of course impossible to determine with certainty whether the predicted outcomes of the "Winning With Women" study will occur in the case of Fairfax School, since it is impossible to predict the future career paths of its current students. There is no way of determining at this point, if these young women will choose to enroll in post secondary computer science courses or choose careers in computer science fields. However, it may be possible to gain greater insight into such questions by exploring the ways in which these students currently envision their futures in relation to computer technology, and by investigating the factors

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that are influencing the decisions these students foresee making in regard to their future educational and professional lives.

The Importance of Exposure

For Ms. Hill and Ms. Shin it is important that girls recognize the many possibilities offered by careers in computer science. Ms. Hill believes that the field of computer science is *"cutting edge"* and many opportunities are available to young women who wish to pursue such a career. Ms. Hill states, *"I guess if I was a Life Skills teacher I would try to encourage [girls to enroll in computer studies programs] because I think there's going to be more careers in computer studies than other fields."*[153] However when Ms. Hill is asked if she "think[s] it is important to get more girls into computer science in post-secondary" she answers,

> *Ms. Hill: "No"*
>
> *Cailey: "Why not?"*
>
> *Ms. Hill: "I think it's more important that the kids get exposed to careers in it and if they like it they should go that way."*[154]

When Ms. Shin is asked the same question she responds similarly,

> *Ms. Shin: "I think it's important to push for, I wouldn't really agree to force them or to push them, but encouragement is important and exposure and access. I think that's very important and there are programs, there was a book called the Neuter Computer[155] so a lot of software makers are trying to have girls as the heroes and also ethnic minorities and they're trying to be sort of gender neutral so it is good and there are programs, Carmen Sandiego is a really successful program and the hero is a woman and she goes around the world to find villains which is unusual."*

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[153] Interview with Susan Hill, March 15th, 1998.

[154] Interview with Susan Hill, March 15th, 1998.

[155] Sanders and Stone, 1986.

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Cailey: "Do you think those programs will help girls to get into the programming side [of computer use] or do you think it will just encourage them to use the computer?"

Ms. Shin: "It won't hurt, I would rather have the woman as the hero than a boy, but exposure is more important and also just having encouragement and also as a society building an image of a woman who is not afraid to be good at computers. But the parents are all very supportive and open-minded so at this school I don't have any trouble but probably when you go to the lower income students and children, there is a bigger gap."[156]

The Computer as a Tool

Although Ms. Shin states that there is not much *"trouble"* with the amount of encouragement provided to Fairfax students, she and Ms. Hill both acknowledge the difficulty they experience in interesting the majority of their students in engaging with computers beyond their utility as tools. Ms. Shin explains,

"I did try to teach how the Internet works you know the servers and all the phone wire and I had this graphic and they weren't really interested and I was really surprised that they weren't because you know I don't know?...I did show a video right before Christmas break, David Suzuki "Nature of Things" and it's about the future of computers and it talks about Pentium micro processors but they all know that they don't want to get into the deep details of it. Cause I said 'now why was this guy - the Pentium CEO - named The Person of the Year by Time magazine'. And they said 'oh yeah, yeah my dad told me' but they don't really want to know what the chip is and what revolution it made but all of their PC computers at home have the sticker that says 'Pentium Inside' but nobody came to me to get more information on Pentium processors."[157]

Ms. Hill also finds it a challenge to interest her students in appreciating a computer beyond its value as a tool.

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[156] Interview with Jenny Shin, March 15th, 1998.
[157] Interview with Jenny Shin, March 15th, 1998.

Ms. Hill: "I don't think that they've taken that quantum leap to the fact that they can teach a machine to do what they think it should be able to do. It's a tool, ready-made programs that they are using to do what it wants for them. When they're frustrated I don't know because ClarisWorks doesn't do this and PageMaker does do that, they don't see that they could possibly become the person that could rewrite ClarisWorks to do that if they wanted. You know? I don't think they perceive that. They're not fascinated by it, and I have taken them on the tour of the hard drive and things like that, you see them glaze over. You remember that day when I did the thing on the server and..." [158]

Cailey: "Yeah"

Ms. Hill: "You know I thought if you understand that, then you know where you're files are going when you 'save'." [159]

This disinterest and/or inconceivability of becoming interested in a computer beyond its use as a tool appears to be reflected in the results of the survey that was distributed to Fairfax students. When asked "if you could work in any field you wanted, what kind of job would you choose?" of the 82 students who responded only 4 students identified a computer science related field as an ideal career path. Of those four, the specific careers cited were: "Graphic Artist/Designing ads", "Web Page Designer", "Owner of Microsoft or at least a Programmer there" and "Computer Science". The majority of responses cited futures in medicine and the second most cited answers involved the arts and humanities.

This apparent lack of interest could be a reflection of Ms. Hill's understanding that the students lack confidence and awareness that they

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[158] Ms. Hill had attempted to explain to students how and why it was possible to retrieve information from the Network and save it to their own computers. She drew diagrams on the wipe board and made analogies to explain to students the technical reasons behind the task.
[159] Interview with Susan Hill, March 15th, 1998.

have the potential to *"teach a machine to do what [they] think it should be able to do."*[160] Perhaps these figures would change if, as Ms Shin states, girls were encouraged to see themselves as competent computer users and *"society buil[t] an image of a woman who is not afraid to be good at computers."*[161] NABST thinks so; as already noted, the Board believes that encouraging young women to see their own potential, to develop self-confidence, in relation to computer science is the key to "laying the foundation" necessary for increasing women's participation rates in computer science fields.

A Lack of Confidence?

However, identifying girls' lack of confidence in relation to computers as a determinant for their lack of desire in pursuing computer science professions is perhaps an unwarranted assumption, based at best on correlation, than it might at first appear. For although the Fairfax students who responded to the *"Students' Uses of New Information Technologies"* surveys do not demonstrate a desire to pursue careers in computer science, neither do they acknowledge any correlative lack of confidence with the technology.

In the surveys, Fairfax students are asked,

"Which of these best describes how competent you feel about using a computers to do schoolwork?:

a)   I'm hopeless with computers
b)   I worry about whether it will work
c)   I'm confident that it will turn out fine
d)   I'm pretty sure I can do it"

Of the 82 respondents, 49%, indicate that they *"feel confident that it will turn out fine"*, a further 48% are *"pretty sure [they] can do it"*. Only two

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160 Interview with Susan Hill, March 15th, 1998.
161 Interview with Jenny Shin, March 15th, 1998.

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students (2%) say that they *"worry about whether it will work"* and only one student (1%) says that she is *"hopeless with computers"*.[162]

If one concludes from the survey results that Fairfax students do not anticipate, at this time, pursuing studies or careers in computer science fields, then perhaps a useful course of investigation at this point would be to shift attention away from the assumption that these students' lack of confidence with computer technology is the reason for their choices and toward a strategy of listening to and considering more seriously the reasons these students *do* cite for their preference of certain career aspirations over others.[163]

Listening More Carefully

There are Fairfax students who express an interest in pursuing careers in computer science, as mentioned in Chapter Four. Both Samira and Barbara indicate that their interests lie in computing science, Samira because of her interest in Space Technology and Barbara because of her love for the Internet and Web Page Design. There are nonetheless students who enjoy computers and use them regularly but who express a hesitancy for pursuing such careers.

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[162]These survey results are not of course exhaustive; the sample of respondents represents 82 students out of approximately 300, however, the results do raise a few questions about the purported causal connection between "competence" and "career choices". Results from the co-ed school for these questions are as follows: 44.7% of boys and 27.7% of girls say that they *"feel confident that it will turn out fine"*; 41.2% of boys and 52.3% of girls indicate that they are *"pretty sure [they] can do it"*; 7.2% of boys and 13% of girls say that they *"worry about whether it will work"*; and 6.9% of boys and 7% of girls say that they are *"hopeless with computers."* According to these results, the students at Fairfax appear to be more confident than both the boys and the girls studying in the co-ed environment.

[163] Fairfax students present an interesting case for such an investigation: not only does their educational environment reflect the optimal conditions as outlined and recommended by NABST, these private school students come predominantly from privileged class backgrounds. The benefits for students who come from economic privilege include (but by no means are limited to) considerable access to computer technology specifically (as can be seen in Chapter 5) and access to a broad range of educational and career options more generally. In other words, these students are not likely to stay away from certain careers due to economic or social barriers to access.

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Amanda, who is Barbara's *"computer buddy"* and close friend *"really started doing stuff with computers in grade 3 in the computer lab at Fairfax."*[164] She is highly proficient with many computer programs and is an active web designer and maintainer. She says that she is interested in receiving financial compensation for her web design work, although she enjoys the work so much she would even be willing to pay someone just so she can gain experience.

> *Amanda: "I wish people would pay me, like I go to church whenever I feel like it and I heard that they were doing a web site, a UBC guy was going to build their web site. And I was like, 'please let me do it for you, I'm so desperate for money I'll do it for less'. Well he's doing it for free. 'I'll pay you!' [laughs]"*[165]

However, although she is extremely interested in computers, unlike her friend Barbara, she is not sure that she would pursue a career in computer programming.

> *Cailey: "So what do you two want to do in the future?"*
>
> *Barbara: "Computer programming, I'm so going to...I hear Waterloo is a good University for computers I just want to go computers, yes! The next Bill Gates"*
>
> *Amanda: "I'm not too sure that I want to go into computer programming. My uncle he's kind of young, he's like 32 and a lot of his friends were computer programmers and a lot of their stuff got so obsolete, all their stuff got so obsolete in two years. Yeah, I'm not sure that I would actually want to be a programmer right, I might want to design logos or something. I want to do something with computers, if it's only for recreation...I don't know cause I don't really know what I want to do?"*[166]

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[164]Interview with Barbara and Amanda, March 1998.

[165] Interview with Barbara and Amanda, March 1998.

[166] Interview with Barbara and Amanda, March 1998.

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There is really no telling if Amanda or Barbara will or will not pursue a career in computer science, however, their reasonings behind their decisions are interesting.

Amanda is clear that it is not her lack of interest or confidence that currently dissuades her from pursuing a career in computer science; she will do *"something with computers [even] if it's only for recreation"*: rather, it is her knowledge that the computer industry can be unstable as computer innovation can change so rapidly that one's work can be made obsolete.

Selina is similarly cautious when the question of a future in a computer science career is raised.

> *Cailey: "Now would you ever consider going into Computer Science?"*
>
> *Selina: "I've considered it a couple of times but..."*
>
> *Cailey: "Yeah?"*
>
> *Selina: "Yeah [skeptically], I just don't know...I keep thinking that there's going to be another invention going to take over the computer, going to be bigger than the computer, what would be the point of me taking computers? Like technology is moving so fast, that I have no idea what's going to happen. I'm just trying to leave everything open."*
>
> *Cailey: "Any other reasons why you wouldn't go into it?"*
>
> *Selina: "I like to work with people, I don't like to stare at a computer 24-7[167], even one hour and Yearbook is annoying, I mean I come out drained I'm like, 'I can't go to another class', it's really tedious work, it 's hard...I'm a very person...I'm a people person, I like to talk to people..."[168]*

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[167] "24" hours a day / "7" days a week.
[168] Interview with Selina March 11, 1998.

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In addition to being cautious about the stability of a career in computer science Selina is also hesitant to pursue such a goal because she does not believe that she would enjoy that kind of work. Her experience in classes where computers are taught have been *"tedious"* and she is a *"people person"* and is not sure that she would be interested in working so intensively with computers.

A lack of interest is what keeps Devorah from wanting to pursue computer science in University.

> *I definitely want to study, like use computers as tools for whatever I'm doing, like even for design it's always an interesting aspect of design but it's not something I'm interested in enough to want to go into it as a career...I think that, in terms of the girls at this school, I think that we all have sufficient skills to go out and learn more about computers. If anyone graduated from this school they wouldn't be starting from square one, if they suddenly wanted to learn about computer technology, so we're definitely capable...but I don't know I think that the fact that we have the skills is important and that's the first step."*[169]

Pursuing a Future Worth Having

Whether a student is 'interested' in a specific career, whether she 'enjoys' the work is important to Fairfax students when they consider what career field they would like most to explore. As stated earlier, students are asked in the surveys, *"If you could work in any field you wanted, what kind of job would you choose?"* they are then asked *"why?"* The top three responses are: because it *"interests"* them, because they believe they will *"love/like/enjoy"* it, and thirdly because it sounds like *"fun"*. It could be argued that these descriptors are too general to be of use, that they reflect a lack of thoughtfulness on the part of the students: *why* does something

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[169] Interview with Fern, Samira and Devorah, March 11, 1998.

interest them? Why will they *like* having a particular career? There is surely some truth to such a claim, however, what remains clear is that students, if given the choice would, unlike NABST's presumptions, base their decision to pursue a particular career on criteria such as enjoyment and interest, rather than on the amelioration of their country's economic prosperity or on any "socially reformist" desire to equalize the number of women and men in scientific and technological fields.

At Fairfax, although 30.4% of survey respondents say that *they "really enjoy using computers to do do school tasks"*, the majority - 57.3% - indicate that *"using computers to do school work is okay - no big deal."*[170]

Fern who will *"probably consider"*[171] going into computer science in University feels that the important question to ask in terms of increasing women's participation rates in computer science is whether or not a woman *"wants"* to go into that profession.

> *Cailey: "What do you think about all of the talk about how girls and women just aren't participating with computer technology that much and that...they're not encouraged to engage with computer technology and therefore they're going to miss out on a lot of the big paying jobs?"*
>
> *Fern: "I think maybe it's about women's attitudes in general, what does the one person want to go into...I just think it's like their attitudes toward 'do we really want to go into computers? Do we want to sit at a desk all day?' That kind of thing."*[172]

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[170] The rest of the Fairfax results are as follows: 7.3% of respondents say that *they "think using computers is boring, but it's a useful way to do certain tasks"*. 2.4% say that *they "generally dislike using computers to do schoolwork"* and a further 2.4% say that they *"do not use computers at school."* The results for the co-ed school are as follows: 34.4% of boys and 19% of girls say that they *"really enjoy using computers to do school tasks"*; 36.6% of boys and 48.9% of girls indicate that *"using computers is okay - no big deal"*; 9.5% of boys and 14.6% of girls say that they *"think using computers is boring, but it's a useful way to do certain tasks"*; 4.9% of boys and 7.2% of girls say that they *"generally dislike using computers to do schoolwork"*; and 14.1% of boys and 10.3% of girls say say that they *"do not use computers at school."*

[171] Interview with Fern, Devorah and Samira, March 11th, 1998.

[172] Interview with Fern, Devorah and Samira, March 11th, 1998.

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Although NABST believes that attracting more women into technological careers "will result in major benefits for the Canadian economy and Canadian society"[173] Fairfax students like Amanda, Selina, Devorah and Fern are more concerned with whether they will enjoy their futures in their chosen careers. And although it can not be expected that any young woman will base her dreams and aspirations on the economic amelioration of her country, research like NABST's should pay closer attention to 'why' such careers are not viewed by women as enjoyable pursuits. As Karen Coyle relates,

> A woman says to me: "My daughters love science, and they use computers, but they just aren't interested in technology."
> Try this one: "My daughter is an excellent driver, but she has no interest in internal combustion."
> We're supposed to use computers, not worship them. There will be those fascinated with the machine qua machine, but we have no reason to assume that to be a superior approach.[174]

In a Woman's Best Interest

It appears that, at this point in their lives, the majority of Fairfax students I speak with and survey realize the benefits and relevance of computer technology, but are not yet convinced that it is necessarily in their own best interests to pursue related careers. It can perhaps be argued that these young women may miss out on many opportunities because of their lack of interest in formally studying and working in computer science. And certainly the absence of women from jobs where new technologies and scientific advances are created and implemented is a concern shared by many researchers (Benston, 1988; Kirkup, 1992; Kramarae, 1988; Perry and Greber, 1991; Regan Shade, 1994; Smith and Balka, 1988; Turkle and Papert, 1990; and Zimmerman, 1987). Accordingly, the under-representation of women in

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[173] NABST, 3.
[174] Coyle, 1996, 42.

fields of science and technology, they argue, must be rectified so that women's needs and interests may be reflected.

> Decisions about science and technology affect our lives and we must be involved if we are ever to have our interests represented in those decisions. We can't afford to ignore or refuse to participate in its decision-making because of technophobia, math anxiety, or political purity.[175]

However, it does not appear that Fairfax students are unprepared for a technologically advancing society, nor do their reasons for 'avoiding' computer science careers appear to stem from any kind of "technophobia, math anxiety, or political purity."

What is interesting to note is that this line of reasoning - urging that an increase in the number of women in scientific and technological careers be achieved - misses out on many other forms of technology-related participation, and may indeed serve to diminish the significance of women's current practices with technologies. It also reflects a narrow consideration for understanding women's decisions not to choose studies and careers centered on new technologies.[176]

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[175] Smith and Balka, 1988, 83.

[176] Research by Nancy Kaplan and Eva Farell addresses these considerations by focusing on adolescent women who "love" being active with electronic communication. Kaplan and Farell conclude that their work challenges notions that all women are "computer reticent". They ask, "why women seek electronic spaces, what they articulate as their aims, expectations, and desires, how women make their electronic communication practices meaningful to themselves." Although Kaplan and Farell acknowledge "gender imbalances within networking culture" they approach the situation by examining the contexts whereby women are choosing to engage with computer technology, asking women who use computers why they enjoy participating with the technology, rather than addressing this gender imbalance by focusing on how women are *not* participating. By placing significance on women's current practices with computer technology, and by listening to the women themselves, I would argue that Kaplan and Farell open themselves up to discovering much more about the reasons why women both engage and resist computer technology. Other work that addresses how women and men find meaningful use in technologies outside of the parameters provided by NABST include: Buckley, 1991; Penley, 1991; Perry and Greber, 1990; Processed World Collective, 1991; Ross, 1994; Regan Shade, 1994; Schulman, 1988; Smith and Balka, 1988; Rose, 1994; and The VNS Matrix.

According to NABST's "Winning With Women in Trades, Technology, Science and Engineering" report, Fairfax students are not currently on track to becoming women who will facilitate the growth and success of Canada's economy in the computer industry. According to NABST's narrow "key indicators [for] measur[ing] progress in achieving...desired changes"[177] the Fairfax students I observed, spoke with and surveyed are not demonstrating the kind of progress NABST, for instance, seeks to develop in regard to their relationships with computer technology. They do not report a desire to enroll in computer science-oriented post-secondary education, they are not currently heading toward computer science faculty positions, nor are they indicating a wish to embark on careers in computer science specifically. Although this could change (Fairfax students may indeed decide at some future time to head in such directions) it is instructive to recognize that NABST's conceptions, criteria, and standards for measurement do not allow for the conclusion that these young women *do* have "winning" and effective attitudes and relationships with computer technology, so that their considerable levels of competence and styles of engagement will not, in NABST's terms, contribute towards Canada's possession of "a first-class technologically and scientifically skilled work-force."[178]

"Counting Women In"

I would argue that Fairfax students have profited from their computer science education but that they do so in ways that may potentially fall outside of the immediate needs of the Canadian economy as perceived by organizations like NABST. Perhaps the "needs" of a nation's economy are

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[177] NABST, 4.
[178] NABST, 4.

not necessarily in concert with the needs of that nation's population. Perhaps in circumstances where Canada "wins with women", women themselves do not experience a similar victory. During World War II when Canada's economy required women to join its workforce it stressed goals very similar to those NABST is now citing, yet when the war was over, when the economic need was over, women were again pushed to the side lines.[179] It is difficult to remain optimistic and trusting of a report like "Winning with Women" when it echoes a familiar battle cry - 'Women: Your Country Needs You!'

The students at Fairfax appear to be similarly skeptical: 'Why should we', they ask 'place our futures in such unstable careers?' 'Why should we choose careers that we do not enjoy?' I saw and spoke with many Fairfax students who enjoy computer technology, who spend much time on computers, who are confident with their ability with computers, and who see the potential of such machines in their everyday lives. But I also saw and spoke with young women who are hesitant of aligning their future careers so closely with these machines and the fields associated with their use, and rather than identifying such hesitancy as a deficit these young women suffer from, it should perhaps be understood that these students are engaging critically with a scientific movement that has not always placed women's best interests first.

NABST's Contribution

As mentioned earlier, NABST does provide many significant and positive recommendations when it "lays the foundation" for improving technology education for women. Changes to the teaching of computer

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[179] For a discussion on the effects of the ending of the W.W.II on American women workers see May, Elaine Tyler., 1996, 140.

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competence in school-based settings need to be considered and NABST does a good job in specifying how this might be accomplished. Curriculum that relies on collaborative learning appears to benefit students by encouraging them to look to each other for answers and explanations. Many Fairfax students state that they prefer learning computer skills from friends and peers rather than teachers because their friends teach them in ways that are accessible and effective.

Emphasizing the relevance of computer technology to students' interests is another successful strategy proposed by NABST. Making the connection between computers and students' everyday lives can attract students to computer-use by providing motivation and incentive for exploring the possibilities offered by these machines.

Increasing girls' self esteem in relation to science and technology is another of NABST's useful recommendations. Encouraging young women to see their potential as competent computer users and providing them with access to female role models, computer equipment and non-stereotyped instruction go a long way toward breaking down the gendered biases that prevent women from fully envisioning themselves as potential computer users. Instilling a sense of confidence and high expectations for young women can reduce the effects of a society that minimizes women's ability with computer technology.

Falling Short: Failing at Success

However, despite these positive contributions made by NABST in "Winning with Women in Trades, Technology, Science and Engineering" the report falls short, I argue, in its goals and measurements for success. By recognizing an effective relationship between women and technology only in terms of women's participation in careers and formal education in science

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and technology, this report misses out on the tremendous impact that women can experience from, and contribute to, the diverse application and uses of computer science. Rather than understanding success through the viability of the economy this report might be more helpful to women if it were to use alternative measurements for success, indicators that aspire to a future where women, in their relationships with science and technology are encouraged to "survive as human beings, as creative, spontaneous and cheerful persons."[180] Following from Karen Coyle, I believe that,

> we have to teach our younger generation of women that they are free to explore computers in their own way and to draw their own conclusions about the usefulness of these machines.[181]

Exploring Meaning Through a Broader Perspective

Women and girls should be granted every opportunity to pursue careers and education in the computer science field, and NABST's recommendations for improving curriculum are positive steps in that they encourage young women to see potential in such occupations. However, women must also be encouraged to envision a broader range of possibilities for meaningful engagement with new technologies, possibilities that may perhaps fall outside of the strict confines of Computer Science development and industry. If such participation is not counted as significant then women will be no closer than at any other point in history, toward defining for themselves how they wish to live meaningful lives in a "continually evolving technological society".[182] To limit the significance of women's participation with computers within narrow parameters, parameters defined and shaped by this society's traditionally gender-inequitable institutions,

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[180] Franklin, Ursula., 1985, 8.

[181] Coyle, 1996, 54.

[182] Franklin, Ursula., 1985, 8.

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raises the question of how women will ever be able "to have [their] interests represented"[183] in the development of new technologies.

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[183] Smith and Balka, 1988, 83.

Secondary Students' Uses of New Information Technologies

(Study Supported by the Social Sciences and Humanities Research Council of Canada)

We are asking Fairfax School students to tell us how they use new information technologies - such as computers, video cameras, or CD-ROMs - and what they think about technology-related issues. This is not a test, and there are no right or wrong answers- only the answer that best fits **YOU**. Our research about how students use technologies will only be helpful to people who plan how technologies are made available to students if we can receive careful and accurate responses to these questions.

Your responses will be kept confidential. University researchers will be the only people to look at the questionnaires, and they will not see the page with your name.

When we have analyzed the results, we will come back to your school and tell you and your teachers about our results, and what we think the results tell us about students, schools, and new technologies.

Thank you for helping us in this research project.

About YOU

Name: _____

Student #_____

Date of Birth ____(day)____(month)____(year)

What grade are you in: _____

How many years have you attended Fairfax School? _____

Where did you attend school previously to Fairfax? _____

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About Your Family

1. Your Place of Birth (city and country): _____

1a) Your immediate family consists of: _____

_____

1b) The following family members currently live with you: _____

_____

2. Your Mother's highest level of education attained? (tick one)
☐   elementary
☐   high school
☐   college/university
☐   postgraduate M.A. or Ph.D.
☐   other _____

3. Your Mother's job _____

4. Your Mother's Place of Birth (country) _____

5. Your Father's highest level of education attained? (tick one)
☐   elementary
☐   high school
☐   college/university
☐   postgraduate M.A. or Ph.D.
☐   other _____

6. Your Father's job _____

7. Your Father's Place of Birth (country) _____

8. How long have you lived in Canada? (tick one)
☐   Less than 1 year   ☐   7-10 years
☐   1-3 years   ☐   4-6 years
☐   11-15 years   ☐   All my life

9. What languages can you: Speak and Understand?

_____

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10. What languages can you: Read and Write?

_____

11. What is the first language you learned to speak? _____

12. After High School, YOU plan to: (tick one)

☐   look for a job   ☐   start non-academic training e.g., apprenticeship

☐   go to college   ☐   go to university

☐   don't know

☐   Other (describe) _____

12 a) In what field(s) do you plan to work/study?

_____

13. WHEN did you first use a computer?
(tick one)

☐   Before I attended any school

☐   I was enrolled in elementary school

☐   I was enrolled in secondary school

14. WHERE did you first use a computer?
(tick one)

☐   In elementary school   ☐   At home

☐   In secondary school   ☐   At a friend's home

☐   At a relative's home   ☐   At work

                                          ☐   Other (specify):_____

15. If YOU could have any job you wanted, what job would you choose?

_____

16. Why would YOU want that kind of job?

_____

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About YOU AT School

17. My favorite courses are in: (tick one)

☐ Math   ☐ English

☐ Science   ☐ Social Studies

☐ Technology Education   ☐ Media Production

☐ Computer Studies   ☐ Fine Arts or Music or Theatre

☐ Modern Languages   ☐ Physical Education

☐ Home Economics   ☐ Other (please specify)_____

18. Which of these courses are electives?

_____

19. Have you ever: (tick one, or more than one)

☐ Failed a grade   ☐ I have not failed or skipped a grade

☐ Skipped a grade

20. YOU prefer: (tick one)

☐ Academic courses   ☐ No preferences

☐ Practical skills (hands on) courses

21. Will you do a Career Preparation Work Experience placement <u>this year</u>? (tick one)

☐ Yes   ☐ No

22. If "Yes": You will do your work experience placement in: (tick one)

☐ Business   ☐ Metalwork

☐ Mechanics   ☐ Culinary Arts/Food Service

☐ Media   ☐ Construction

☐ Theatre   ☐ Tourism

☐ Graphics   ☐ Electronics

☐ Other (please specify)_____

23. If "No": You will <u>probably</u> do your work experience placement in: (tick one)

☐ Business   ☐ Metalwork

☐ Mechanics   ☐ Culinary Arts/Food Service

☐ Media   ☐ Construction

☐ Theatre   ☐ Tourism

☐ Graphics   ☐ Electronics

☐ Other (please specify)_____

☐ I really don't know yet

24. How do YOU feel about school (usually!)

```
---1-------------2---------------3---------------4--------------5---
love it      enjoy        OK        don't enjoy   dislike it
```

25. Compared to others in your current grade, your marks in <u>Science</u> are: (tick one)

```
---1-------------2---------------3---------------4--------------5---
excellent    high       average      lower       poor
```

26. Compared to others in your current grade, your marks in <u>English</u> are: (tick one)

```
---1-------------2---------------3---------------4--------------5----
excellent    high       average      lower       poor
```

27. Compared to others in your current grade, your marks in <u>Math</u> are: (tick one)

```
---1-------------2---------------3---------------4--------------5---
excellent    high       average      lower       poor
```

28. Overall, your <u>average marks</u> last year were: (tick one)

```
---1------------2---------------3---------------4--------------5---
excellent    high       average      lower       poor
```

About Technology in Your School

29. Approximately how many computers do YOU think there are in your school (approximately) that students can use? (tick one)

☐ none ☐ 51-100
☐ 1-25 ☐ 26-50
☐ More than 100 ☐ I have absolutely no idea

30. Where are student-accessible computers located? (tick one, or more than one)

☐ Classrooms ☐ Graphics lab
☐ Library ☐ Computer lab
☐ Don't know
☐ Other (specify) _____

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31. At school, do <u>YOU</u> use a computer?

☐ Yes ☐ No

32. At school, where do <u>you</u> use a computer:

☐ Classrooms ☐ Library
☐ Graphics lab ☐ Computer lab
☐ Don't know ☐ Other (specify)_____

33. What kinds of computer/s do you use at school?
(tick one, or more than one)

☐ Macintosh ☐ PC
☐ I don't use computers at school ☐ I don't know

34. What is the atmosphere like around the computers in your
school? (tick one, or more than one)

☐ Noisy ☐ Welcoming
☐ Competitive ☐ Exciting
☐ Hostile ☐ Lonely
☐ I feel left out

35. What kinds of students use computers at your school the most?

_____

36. At school, <u>how often</u> do YOU typically use computers?
(tick one)

☐ Daily ☐ Once a week
☐ Once every few days ☐ Once a month
☐ Almost never ☐ Never

37. What kinds of student are the most competent computer-users at your school?

_____

38. Which of these <u>best describes</u> how YOU feel about using a computer to do schoolwork?
(tick one)

☐ I do not use computers at school.
☐ I generally dislike using a computer to do schoolwork.
☐ I think using computers is boring, but it's a useful way to do certain tasks
☐ Using computers is okay- no big deal.
☐ I really enjoy using computers to do school tasks.

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39. Which of these <u>best describes</u> how <u>competent</u> you feel about using a computer to do schoolwork? (tick one)

☐   I'm hopeless with computers.

☐   I worry about whether it will work.

☐   I'm pretty sure I can do it.

☐   I'm really confident that it will turn out fine

40. Do you think that, in your school, competence with technologies like computers makes you (tick one)

☐   More popular   ☐   Less popular

☐   Doesn't make any difference

41. Which of these <u>best describes</u> how much you feel encouraged by your teachers to use a computer to do schoolwork? (tick one)

☐   A lot   ☐   Not much

☐   Not at all   ☐   Discouraged

42. Which of these <u>best describes</u> how much you feel encouraged by your teachers to enroll in Computer Studies courses? (tick one)

☐   A lot   ☐   Not much

☐   Not at all   ☐   Discouraged

43. Suppose you are using a computer to do schoolwork. How do you most likely see yourself? (tick one)

☐   I picture myself alone at the computer.

☐   I picture myself with one friend, together at the computer.

☐   I picture myself with more than one friend, together at the computer.

☐   I just can't picture myself using a computer to do schoolwork.

44. AT SCHOOL, how often do you use the following:

	Once every few days	Once a week	Once a month	Almost Never	Never	Never, I have no access at school
CD-ROM:						
Printer:						
Scanner:						
The Internet:						
Video Camera:						
Digital Camera:						

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45. What did you/do you use these tools for?

CD-ROM:	
Printer:	
Scanner:	
The Internet:	
Video Camera:	
Digital Camera:	

46. What's your favorite World Wide Web page:

_____

47. At school: What do YOU use computers for?
(tick one, or more than one)

☐ Game playing ☐ Multimedia
☐ Typing practice ☐ Library searches
☐ Educational software ☐ Writing (word processing)
☐ Spreadsheets and databases ☐ Internet access
☐ Desktop publishing ☐ World Wide Web

48. At your school, which of the following is true about free-time use of computers by students?
(tick one)

☐ Any student can get permission to use computers in free time.
☐ Only certain students can get permission to use computers in free time
☐ Students are not allowed to use computers in free time
☐ I don't know

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49. Are you now, or have you ever taken a Computer Studies course? (tick one)

☐   Yes   ☐   No

49 a) If yes, please specify which courses:

_____

_____

50. Have you ever used a computer as part of any of the following classes? (tick the appropriate box)

	No	Yes, but only once or twice	Yes, occasionally	Yes, frequently
MATH				
ENGLISH				
ART				
SCIENCE				
CAREER PLANNING				

51. To what extent have You been frustrated by not being able to use a computer at school? (tic one)

☐   Never, because I never want to use one   ☐   Once or twice
☐   Never, because I can use one whenever I want   ☐   Occasionally
☐   Frequently

52. Would you like to use the computers at school (tick one)

☐   The same amount I do now   ☐   More often
☐   Less often

53. When you have a computer problem at school, who do you go to FIRST for help?

_____

54. What do you usually need help with?

_____

55. At school: What was the last computer problem you needed help with?

_____

56. At school, What do you do when you can't get any computer help?

_____

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57. At school: You enjoy using computers   (tick one)

☐   All of the time   ☐   Most of the time
☐   Some of the time   ☐   Never

About Technology in Your Home

58. Is there a computer in your home?   (tick one)

☐   Yes   ☐   No

59. Do you have your own computer at home?

☐   Yes   ☐   No

60. Do you use a computer at home?   (tick one)

☐   Yes   ☐   No
☐   No, there is no computer at home

61. Where do you use a computer at home: (tick one, or more than one)

☐   My bedroom   ☐   An office
☐   Living Room   ☐   Recreation Room
☐   Other (specify) _____   ☐   There is no computer at home

62. What kinds of computer/s do you use at home? (tick one, or more than one)

☐   Macintosh   ☐   I don't know
☐   PC   ☐   There is no computer at home

63. At home: How often do you typically use computers? (tick one)

☐   Daily   ☐   Once every few days
☐   Once a week   ☐   Once a month
☐   Almost never   ☐   Never
☐   Never, there is no computer at home

64. AT HOME, how often do you use the following:

	Once every few days	Once a week	Once a month	Almost Never	Never	Never, I have no access at home
CD-ROM:						
Printer:						
Scanner:						
The Internet:						
Video Camera:						

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65. What do you use these tools for?

CD-ROM:	
Printer:	
Scanner:	
The Internet:	
Video Camera:	

66. At home: What do YOU use computers for the most? (tick one, or more than one)

☐   Game playing   ☐   Homework
☐   Typing practice   ☐   Educational software
☐   Writing (word processing) ☐   Internet access

67. Are there any computer games in your home? (tick one)

☐   No   ☐   Yes, a few
☐   Many

68. Have you ever used a computer game at a video arcade? (tick one)

☐   No   ☐   Yes, More than twice
☐   Yes, but only once or twice   ☐   Yes, regularly

69. Have you ever used a computer game at a friend's home?
(tick one)

☐   No   ☐   Yes, but only once or twice
☐   Yes, More than twice   ☐   Yes, regularly

70. What is your favorite video game?

_____

71. Suppose you are playing a computer game. Do you mostly see yourself as being: (tick one)

☐   Alone   ☐   With more than one friend

☐   With one friend   ☐   With someone in my family

☐   I can't imagine myself playing a computer game

72. Would you like to use the computer/s at home: (tick one)

☐   The same amount I do now   ☐   More often

☐   Less often

73. When you have a computer problem at home, who do you go to FIRST for help?

_____

74. What do you usually need help with?

_____

75. At home: What was the last computer problem you needed help with?

_____

76. At home, What do you do when you can't get any computer help?

_____

77. At home: YOU enjoy using computers   (tick one)

☐   All of the time   ☐   Most of the time

☐   Some of the time   ☐   Never

78. Who in your family uses computers? (tick one, or more than one)

☐   Me   ☐   Mother

☐   Father   ☐   Brother

☐   Sister   ☐   Other:_____

79. Who in your family uses computers frequently?
(tick one, or more than one)

☐   Me   ☐   Mother

☐   Father   ☐   Brother

☐   Sister   ☐   Other:_____

80. Who in your family uses computers at their job?
(tick one, or more than one)

☐	Me	☐	Mother
☐	Father	☐	Brother
☐	Sister	☐	Other:_____

81. Who in your family knows a lot about computers?
(tick one, or more than one)

☐	Me	☐	Mother
☐	Father	☐	Brother
☐	Sister	☐	Other:_____

Picture a person who is a computer expert. Draw your impression of a "Computer Whiz". Give your Whiz a name. How old is your Whiz?
Name: Age:

Picture a person who just can't learn to use computers. Draw your impression of a "Computer WhizN't". Give your WhizN't a name. How old is your WhizN't?
Name: Age:

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INFORMATION TECHNOLOGY 8
COURSE OUTLINE

(J. SHIN)
(Jan. '98)

Overview (1/4 year)
Students use sophisticated information technology tools to increase and refine their skills, knowledge, and abilities to solve complex and varied problems. Students develop an understanding of how to effectively use information technology tools to communicate ideas and information using a variety of media.

Topics
1. Keyboarding
2. Information Gathering Tools and Telecommunications: Internet - WWW, E-mail, & CDRom-Based
3. Presentation Tools: ClarisWorks
   Wordprocessing
   Spreadsheets
   Database
4. Information Ethics
5. Managing a home computer

Projects
ClarisWorks-based projects and Web page

Assignments
(All work can be done in the computer lab)

You will be asked to keep a notebook (with 3 holes) to keep notes and hard copies of the work you have done in class. You will be required to complete in-class assignments for evaluation, be prepared to demonstrate skills that have been taught in the class, and show that you have an understanding of the concepts being taught.

Testing and Grading Procedures
You will be given a floppy disk which will be turned in at the end of the quarter and evaluated. You will submit a quarter end project at the end for evaluation.

INFORMATION TECHNOLOGY 9
COURSE OUTLINE

(J. SHIN)
(Sept. '97)

This course will focus on three basic themes: (1) digitizing information (scanning, video capture, sound digitizing, multi-media presentations); (2) desktop publishing (PageMaker & ClarisWorks); and (3) managing a home computer (installing and removing hardware, hard drive management and maintenance). Students will gain the fundamental knowledge, skills, and attitudes to use information technology tools in all areas of learning.

Overview:
Students are provided with information technology tools to increase and refine their skills, knowledge, and abilities to solve complex and varied problems. Students prepare for post-secondary and career opportunities through relevant and meaningful experiences within their school and community.

Topics:
Core & other areas determined by the class
1. Keyboarding and Macintosh skills
2. Digitized Information
3. Telecommunication
   - e-mail
4. The Internet
   - Search techniques
   - Analysis of the net information
   - Creating web pages (introduction to HTML)
5. Multimedia (HyperStudio & Cocoa)
   - Creating games, presentations, movies and problem solving
6. Desktop Publishing (PageMaker and ClarisWorks)
7. Social Issues of Information Technology
   - Ethics
   - Privacy and Security
   - Copyright
8. Managing a home computer (installing and removing hardware, hard drive management and maintenance).

Projects:
CD-Rom-based project, Web site, Multimedia Presentations, and Quicktime movies.

Assignments:
You will be asked to keep a notebook (with 3 holes) to keep notes and hard copies of the work you have done in class. You will be required to complete in-class assignments for evaluation, be prepared to demonstrate skills that have been taught

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in the class, and show that you have an understanding of the concepts being taught.

Testing and Grading Procedures

You will be given a floppy disk which will be turned in at the end of the quarter and evaluated. You will submit a quarter end project at the end for evaluation.

COMPUTER STUDIES 11
COURSE OUTLINE

(S. Hill)
(Sept. '97)

CLARISWORKS

As part of this course, you will work intensively with an integrated software programme called ClarisWorks (4.0). You will explore the uses of a database and a spreadsheet. You will move from basic word processing to "desktop publishing" by using the word processing, draw and paint modules that are available in the package.

The Database Module:

- You will learn to store a collection of facts in a database and to sort it, select it and view it in many different ways. With this you will learn the mail merge capability and the making of labels for mailing.

The Spreadsheet Module:

- You will learn to develop useful spreadsheets, learn formulas and functions, cell formatting, chart making, and general formatting. You will go into more detailed uses of the database which include using the look-up functions.

Word Processing Module:

- Although many of you have been introduced to word processing, you will be learning how to develop a highly formatted document. You will be able to create you own Resumes and covering letters.

Draw Module:

- You will learn to make a presentation using the "Slide Show" feature.

DESKTOP PUBLISHING

To further explore the concepts of "desktop publishing" you will be introduced to the programme PageMaker. This programme is used extensively in the school to publish both the yearbook and "The Gryphon". You will also learn about computer graphics including the use of the electronic camera, video capture and scanning. You will be introduced to the programme PhotoShop 4.0

FILE COMPATIBILITY/MACINTOSH COMPATIBILITY

You will learn to be compatible with you PC computers at home by learning about universal file formats and you will learn about file conversions to make the computer an even more powerful tool.

ASSIGNMENTS/TESTING/GRADING PROCEDURES

- All work can be done in the computer room. You will have access during class time, before school, over the lunch period and after school if you get behind.

- There will be a textbook for you to use, but you will be asked to keep your own MacBible for reference. In it, you will be asked to keep notes and hard copy assignments.
- You will be asked to complete in-class assignments for evaluation, and should be prepared to demonstrate various skills to show that you have an understanding of the concepts being taught. You will be asked to submit work for evaluation, and will be given practical tests during class time.
- You will be given a floppy disk and protected space on a computer in which to save your work. It will be up to you to manage your files properly!
- I will be available to give you extra help if you are overwhelmed. Please don't hesitate to set up a tutorial with me.

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INFORMATION TECHNOLOGY 11
COURSE OUTLINE

(J. SHIN)
(Feb. '98)

Overview
Students use sophisticated information technology tools to increase and refine their skills, knowledge, and abilities to solve complex and varied problems. Students prepare for post-secondary and career opportunities through relevant and meaningful experiences within their school and community.

Topics
(%'s indicate approximate use of class time)
1. Telecommunications (5%)
    - E-mail
2. The Internet
    - Search techniques (5%)
    - Analysis of the net information (%5)
    - Creating web pages (HTML) (35%)
3. Multimedia and Programming (HyperStudio and Cocoa) (50%)
    - Creating games, presentations, movies, and problem-solving

Projects
CD-Rom-based project, Web site, Multimedia Presentations and Quicktime movies.

Assignments
(All work can be done in the computer lab)

You will be asked to keep a notebook (with 3 holes) to keep notes and hard copies of the work you have done in class. You will be required to complete in-class assignments for evaluation, be prepared to demonstrate skills that have been taught in the class, and show that you have an understanding of the concepts being taught.

Testing and Grading Procedures
You will be given a floppy disk which will be turned in at the end of the quarter and evaluated. You will submit a quarter end project at the end for evaluation.

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Journalism 11/12
Course Outline

S. Hill
(Sept. '97)

The focus of this course is to provide students with skills that will be used to produce the Fairfax School publication "The Gryphon". The modules of the journalism course are based on the operation of a real newspaper. You will be required to work with the editors to decide on the content and publishing dates. To enrich the course, there is the possibility that the class will hold a high school newspaper conference and if possible we may also have the opportunity to "go on assignment". You must be willing to commit to the extra time it takes to lay-out the paper on computer (usually on pre-arranged weekends).

As part of the course you will:

A.   Be involved in all aspects of the newspaper including:
- news gathering
- layout publishing
- distribution
- advertising

B.   Discuss the role and responsibilities of the newspaper medium. Topics will include:
- plagiarism
- permission to reprint
- libel
- copyright
- censorship
- liability
- ethics
- style and content

C.   Understand the various writing styles a newspaper incorporates including:
- fact based writing
- interviewing and quoting
- persuasive writing

D.   Learn other programmes in the school computer lab including:
- word processing
- scanning
- the principles of photography
- desktop publishing (PageMaker 5.0)
- electronic photography (Digital Camera)

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- graphic management (PhotoShop 4.0)

Assignments/Testing/Grading Procedures
Your grade will be assessed by evaluating the following components of the course:

- assimilation of the basic writing concepts
- ability to use the computer to its fullest capacity
- ability to meet deadlines
- contributions to the newspaper
- co-operative behaviour in the class

You will be a part of the evaluation process. You will turn in a log of the work that you have done (published and unpublished) and participate in a co-operative evaluation process with the editors and myself.

Reflections 11/12
Course Outline

S. Hill
(Sept. '97)

The focus of this course is to provide students with skills that will be used to produce the Fairfax School publication "Reflections". Its purpose is to chronicle the year 1997-1998. To do this you will:

A.   Be involved in all aspects of publishing including:
- information gathering
- layout
- photography
- advertising
- production
- setting of deadlines

B.   Discuss and decide on the styles and content of Reflections. Topics will include:
- plagiarism
- editing
- copyright

C.   Learn other programmes in the school computer lab including:
- word processing
- scanning
- desktop publishing (PageMaker 5.0)
- electronic photography (Digital Camera)
- graphic management (PhotoShop 4.0)

The work that you do will not necessarily be in the classroom. In order to chronicle effectively the life of the school in 1997-1998 , you will have to learn in detail about the life of the school, including the Junior School, the extra-curricular activities, and the special events that happen in the school. It will mean extra work when deadlines come due and extra time during the last weeks of June as the last set of pages are sent off to the printers.

You will be expected to meet all deadlines that have been agreed on by the members of the class.

Assignments/Testing/Grading Procedures
Your grade will be assessed by evaluating the following components of the course:

- assimilation of the basic writing concepts

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- ability to use the computer programme PageMaker 5.0 to its fullest capacity
- ability to meet deadlines
- contributions that help chronicle the life of the school
- co-operative behaviour in the class

You will be a part of the evaluation process. You will turn in a log of the work that you have done including copy that you have written, pages that you have completed, photographs that you have either collected or taken, and information that you have gathered. Then you will participate in a co-operative evaluation process with the editors and myself.

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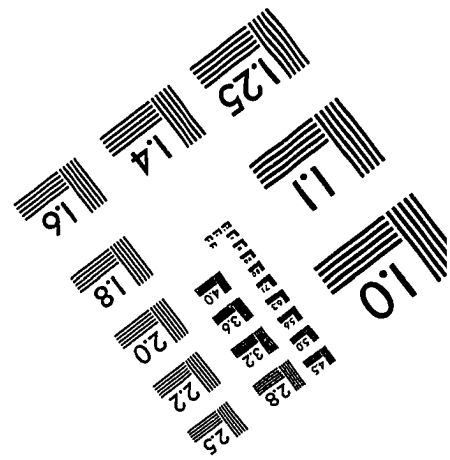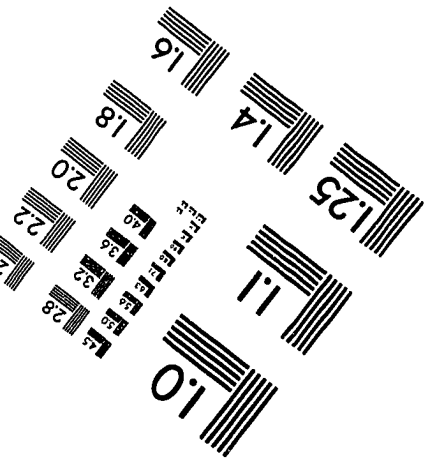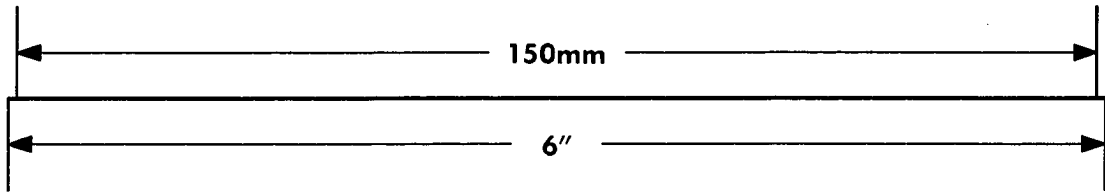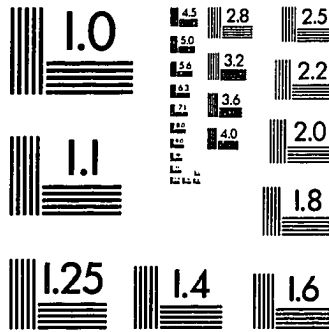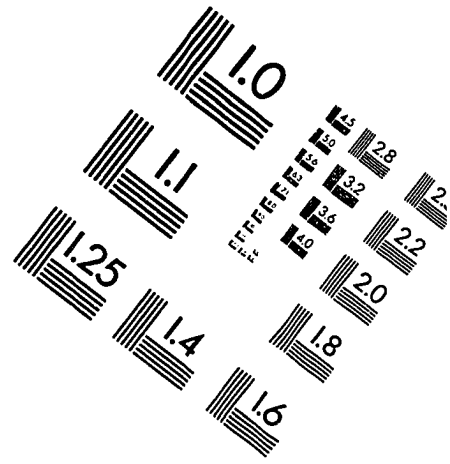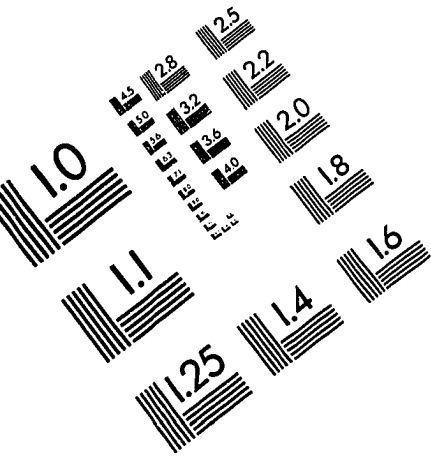
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IMAGE EVALUATION
TEST TARGET (QA-3)

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