‘WOMEN IN COMPUTING’ AS PROBLEMATIC:
GENDER, ETHICS AND IDENTITY
IN UNIVERSITY COMPUTER SCIENCE EDUCATION

by

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Abstract

My study is focused on women in graduate Computer Science programs at two universities in Ontario, Canada. My research problem emerges from earlier feminist research addressing the low numbers of women in university Computer Science programs, particularly at the graduate level. After over twenty years of active feminist representation of this problem, mostly through large survey-based studies, there has been little change. I argue that rather than continuing to focus on the rising and falling numbers of women studying Computer Science, it is critical to analyze the specific socio-economic and socio-cultural conditions which produce gendered and racialized exclusion in the field.

Informed by Institutional Ethnography – a method of inquiry developed by Dorothy Smith – and by Foucault’s work on governmentality, I examine how specific institutional processes shape the everyday lives of women students. Through on-site observation and interviews with women in graduate Computer Science studies, Computer Science professors and university administrators, I investigate how the participants’ everyday institutional work is coordinated through external textual practices such as evaluation, reporting and accounting.

I argue that the university’s institutional practices produce ‘women in computing’ as a ‘problem’ group in ways that re-inscribe women’s outsider status in the field. At the same time, I show that professionalized feminist educational projects may contradict their progressive and inclusive intentions, contributing to the ‘institutional capture’ (Smith) of women as an
administrative ‘problem’. Through ethnographic research that follows women students through a range of experiences, I demonstrate how they variously endorse, subvert and exploit the contradictory subject positions produced for them.

I illustrate how a North American-based institutional feminist representation of ‘women in computing’ ignores the everyday experiences of ethnoculturally diverse female student participants in graduate Computer Science studies. I argue that rather than accepting the organization of universal characteristics which reproduce conditions of exclusion, North American feminist scholars need to consider the specificity of social relations and forms of knowledge transnationally. Finally, I revisit how women in the study engage with ‘women in computing’ discourse through their lived experiences. I suggest the need for ongoing analysis of the gender effects and changing socio-cultural conditions of new technologies.
Acknowledgements

This study would not have been possible without the generous participation of the students, faculty and administrators who contributed their time to the interviews and to follow-up correspondence for comment and clarification. I am particularly indebted to the students for their commitment to ongoing dialogue about their experiences of the ‘problem’. Their knowledge and insights led me to further discoveries and confirmed my instincts that the direction I had taken held promise for looking at the topic of ‘women in computing’ beyond the reproduction of ‘women’ as a problem group.

I would like to thank my supervisor, Dr. Megan Boler, for her careful direction of my thesis process, particularly in the critical stages of analysis and writing. Special thanks are also due to committee members Dr. Kari Dehli and Dr. Jennifer Jenson for their ongoing and engaged support of my doctoral project. It was a privilege to receive advice from this group of talented feminist scholars in their thoughtful conversations about the work. I benefited greatly from the encouragement and the intellectual challenges they offered me throughout my PhD studies.

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Finally, I wish to thank family and friends for their continued belief in my ability to see this project through in the face of my own pessimism. I am especially grateful for my mother’s patient ear and generosity of spirit. Her own love of learning has been my earliest and best example.
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Dedication

This dissertation is dedicated to the memory of Bill Kennedy (1952-2006) and Camille Natale (1950-2000): friends, social justice scholars and teacher-activists.
Chapter 1:
Introduction

The Robot Show

We are high school teachers on a tour of the Technological Studies department to show
the rest of us what they do in Tech. In the big, nicely furnished Computer Tech lab, we’re
watching a demonstration of some robots the Grade 11 Computer Technology students
learned how to design and build. One tiny robot winds its way around the room, until it
hits a table leg, a chair, a corner, or some other surface obstructing its path. Then the
robot turns around and heads in another direction, until it hits the next resistant surface.
Another equally small robot rolls along in the same area, and as it moves to where the
first robot happens to be, the second senses the first and then turns away. It makes its way
around the room, deftly avoiding all obstructions in its path.

After the demonstration, I asked the young man who taught the course how many girls
were taking his course. ‘None,’ he said. ‘Oh,’ I said, feeling I’d definitely bumped a
corner. ‘Do you do anything to promote your course to young women in the school?’
‘Nope. If they’re interested, they’ll come.’ I guess you don’t know there are edges until
you hit them. Or maybe you just avoid them altogether. The discussion ends there, and
we move along.

- field notes from Sturman, Spring 2008

How the ‘problem’ of ‘women in computing’ became problematic

I begin this study through the examination of a question. Why, despite the
investigation for over twenty years of the problem of women’s limited participation in
Computer Science (CS), has there been so little change? In fact, despite the active
representation of feminist interests in the field, there has been a sliding back in women’s
enrolment in university Computer Science programs in both Canada and the United
States since gains made in the 1980s and 1990s.¹

My experience as a high school Computer Science teacher prompted me to
explore the literature in the field, which sought reasons for exclusion and promoted
strategies to increase female student participation in Computer Science (at the junior

¹ See Appendix D.
Increasingly, however, I became disillusioned with the framing of girls and women in these accounts, which suggested finding teaching methods and social outcomes which suited essential ‘women’s ways’, or promoted ‘girl-friendly’ activities which did not scare girls away with math. I began to understand this literature as constitutive of the very problem it was trying to solve. My research began to raise a number of questions. What do these approaches mean for girls and women who do not embrace a heteronormative hyperfemininity, who actually like math and who are interested in the ability computing technologies give them to ‘build things’ and to develop capacity for their own investigations? Were these feminist accounts, which capitalized on stereotypical images of women’s relationship to math, science and technology, simply continually reinscribing women’s deficits in the field? Would ‘girls’ ways of throwing’ be something to reclaim and encourage, or would this be seen as a stereotype to challenge rather than reinforce? Why, in these accounts, do we never hear about the pleasure of building things, the pleasure, and sometimes the risk, of inventing?

Hennessy (2000) has written that the institutions of heteronormativity for women, like marriage for example, act as a form of material compensation for women’s exclusion from other forms of meaningful activity and creative engagement. Similarly, I argue that the active production of ‘women in computing’ as a discourse for women serves to constrain and contain women’s involvement in Computer Science. I was amazed and appalled when, at an event attended by women computer scientists in advanced industry and academic positions, a gift package from Microsoft contained no new software or technical toys (the standard gift at a male-attended technical conference) but simply
makeup and chocolate. Some women gratefully accepted the gift, but a woman beside me quipped, “I guess this really shows you how they think.” I was not sure if she meant Microsoft, or the women, or both. Giving and receiving such a gift underlines the discursive reinscription of hyperfeminine norms for women in the computing field.

The burden of proof

My initial concern for and consideration of the ‘problem’ of women and computing came from a few places. First, as a high school Computer Science teacher, I was concerned about the few young women who would enroll in Computer Science courses, even at the introductory level. In a class of approximately 25 students, there would be on average 2 or 3 young women. I noticed that the female students were generally more concerned about ‘getting it right’ than most of the male students, who often just plowed into the task at hand without being concerned about following my instructions or the model of structured programming I was attempting to teach. The young women seemed to want regular reassurance that they were following the right steps in writing their programs, even though in fact there was a variety of approaches they could have taken. The literature on ‘women in computing’ often points to these behaviours as examples of differently gendered learning styles (in math, science and engineering as well as computing), reinforced by dominant appraisals of women as different (read inferior) Computer Science learners. The dominant discourse criticizes

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2 Teaching Computer Science was a position I came to more by accident than through planning, although I had received basic Computer Science teaching qualifications and had taken some university distance education courses in computer applications and programming. As I will describe later in this thesis, in participant accounts, Computer Science was something that many of the women students and faculty said they came to almost accidentally. They perceived Computer Science as a field their male peers had selected much earlier, so their familiarity and competence with the computer was developed over a longer time.
female learners for excessive ‘rule following’, for lacking the spirit of adventure and
discovery which supposedly motivates male learners.

Walkerdine (1990b) suggests that the discourse of male hegemony in the sciences
makes available a choice for young women within a gender binary where the negative
stereotypes of female passivity and emotionality are positioned against the positive
qualities of action and reason commonly attributed to males. She argues that the burden
of proof that these attributes are not ‘true’ falls to the subjects of the negative description
(women), rather than to those actors (men) who define the subject categories of ‘male’
and ‘female’ within the discipline. More specifically related to computing, Singh (1997)
describes how a group of educators and software designers testing educational gaming
software reproduce the binary relations of ‘active’ and ‘passive’ learners for boys and
girls using computers, until an intervention by the girls disrupts this reinscription. In my
classroom, there may have been many other factors determining the different approaches
to taking on the programming assignment: for example, my positioning as a female
teacher within a site of traditionally male authority, and the female students’ self-
assessment outside the dominant group. However, the individualized discursive practice
of positioning different ‘learning styles’ obscures the social relations producing the
young women as marginal Computer Science learners.

Although feminist literature which produces ‘women in computing’ in industry
and academia does serve to counter other stereotypical images of women’s (in)ability in
math, science and engineering, I argue that this active representation of ‘gender interests’
in computing reproduces stereotypical and essentialized knowledge about women’s
epistemology and ontology. The proliferation of articles on the topic, which are self-
referential within a largely North American academic ‘women in computing’ network, indicates a disturbing stasis in the field. Alongside this productive but iterative literature there is a concurrent lack of change over time in the inclusion of women and minorities in Computer Science education, especially at the post-secondary level (National Science Foundation, 2007, 2008; Statistics Canada, 2003; Zweben, May 2008). Interventionary projects which disrupt this discourse are largely marginalize(see de Castell, Bryson, & Jenson, 2002; Jenson, de Castell, & Bryson, 2003; Singh, 1997). Little has been said about the feelings of capacity and pleasure that women who do Computer Science work derive from the work itself (Faulkner, 2000; Hacker, 1989, 1990). As one faculty member interviewed in this study explained:

I like the problem-solving, I like the freedom that you have, the freedom of thought, the ability to be creative – there are so few jobs or endeavours that you embark upon nowadays where you really do have the opportunity to solve a problem creatively and to really bring yourself to it….And I think that that’s one thing that….you build something and it really is of your own doing. Nobody’s telling you, ‘Do this, then do this, then do this…’ And there’s a…it’s a modern discipline, and so jobs associated with it have some degree of flexibility as opposed to more traditional jobs…flex hours, casual workloads….those are not so much unique nowadays but certainly when I started out, that was something that was different about this type of job, that it wasn’t what you wore, or what you looked like, it was what you knew, and that you were respected for your ability and your expertise. [emphasis added]

Although the discourses of personal freedom and modernity which weave through the faculty member’s description attach to discourses of self-efficacy (which will be discussed in detail in Chapters 2 and 4), her feelings of personal agency through her own knowledge and creativity talk back to the discourses of ‘lack’ and ‘self-remediation’ which pervade the texts of ‘women in computing’. Though I will not go into specific details about the actual programming and theory work that the students in this study are
I hope to draw out their excitement about the work they do as a response to the
totalizing (and often depressing) discourse of ‘women in computing’.

I deliberately chose to investigate the work of women graduate students in
Computer Science because there has been little scholarly work done on this group.
Perhaps most importantly, as women who have proven competent in the field, they are
not subject to the discourses of lack in the same way that public school girls or
undergraduate young women in Computer Science are (these two latter groups have been
the subjects of most of the available studies on women as Computer Science learners).
The women who have reached the graduate level without dropping out or leaving for a
computing career after their BSc\textsuperscript{4} or MSc degrees have a reasonable degree of confidence
in their ability to do the work. A third reason for choosing graduate students is related to
their involvement in the university community as the recipients of funding, through their
participation in grant-sponsored research work, and for their work in sustaining
undergraduate programs through teaching, technical support and mentoring. These direct
connections with institutional operation and activities allow me to trace how their
everyday work attaches to the range of regulatory actions organizing the university in an
era of neo-liberal postsecondary restructuring.

\textit{Some local beginnings}

Although the literature indicates that women’s low enrolment in Computer
Science, particularly at the graduate level, operates in universities throughout North
America, some parts of Europe and Australia, local indicators in Canada and the United

\textsuperscript{3} Note that for the sake of confidentiality, because there are so few women in the field to begin with, descripting their research in any detail would likely identify them.

\textsuperscript{4} Some Computer Science programs are run by the Department of Mathematics, and so a Computer Science degree in that case might bear the designation BMath or MMath.
States have tracked a decline since the mid-1990s (Zweben, 2005, 2006). Young men as well as young women are not enrolling in Computer Science at the undergraduate level, and at the two universities in my study, undergraduate coordinators are scrambling both to understand the reasons for the downturn and to see if they can implement new programs which would attract more students. In interviews, they attributed some of the reasons for the shift away from Computer Science to the dot-com bust in the late 1990s and to off-shore hiring for entry level positions, which they admitted discouraged some students who felt that the job prospects for CS were uncertain. However, an area that few discussed was the radical reorganization of the secondary and post-secondary education system in Ontario that had its start in the 1980s and 1990s.

I believe that a look at some of the institutional reorganization of education gives a view into a shift in the social positioning made available to faculty and students in the university, and to ‘women in computing’ in particular. Though some of these changes in structure are echoed in other jurisdictions under the banner of the global ‘Knowledge Economy’, I will look more specifically at their local effects in the organization of ‘women in computing’.

**Restructuring common sense: Historical background and context**

As a secondary school teacher in Ontario since 1991, I experienced what constituted a radical restructuring of education at the junior, secondary and post secondary levels during the late 1990s under the Conservative government of Premier

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5 Many potential Computer Science students turned to electrical engineering as a related field with more options for employment (personal interview).

6 ‘Knowledge Economy’ discourse will be discussed in more detail in Chapter 5. In subsequent reference to this discourse I will use lower case letters and leave out quotation marks, as the term is now in common usage. I introduce it here with capitals and quotation marks to tag its meaning as open to analysis.
Mike Harris. Education reform was marked as a central part of the Tories’ ‘Common Sense Revolution’. Among other strategies, the government’s displacement of public social supports gained efficiencies through privatizing public services and amalgamating municipalities and school boards. The restructuring process followed similar neo-liberal education reforms in England, Australia, New Zealand and the United States, though each of these reforms had its distinctive local characteristics related to the political economies and populations of the different localities. For Ontario secondary schools, this meant the restructuring of five years of secondary education through the collapsing and intensification of curriculum into a four year program. This change also meant streaming students early in their secondary education for workplace, college or university outcomes, and it instituted a regime of standardized testing (see Spencer, 2006). Lining up with global benchmarking (Larner & Le Heron, 2004), this practice produces students in competitive measurement against intra-municipal, provincial, national and international standards. Teacher testing and regular performance evaluation also became part of the restructuring plan.

Similarly, post-secondary institutional restructuring was aimed at international competition for students in the knowledge economy (Powell & Snellman, 2004), with an increased emphasis on resources for science and technology education and the commercialization and marketing of research. More will be said about university restructuring and performance in Chapter 5, but the restructuring of the Ontario high school system alone had a significant impact on conditions at Ontario universities as they prepared for the ‘double cohort’, when the initial graduates of the new four-year program entered post-secondary education at the same time as the last five-year group.
To return to the secondary school changes, one of the subject areas strongly affected by these curriculum reforms was Computer Science. A number of universities, colleges and industry representatives participated in discussions about the revamping of the curriculum to suit the accelerated high school plan, and to better suit industry needs for skilled graduates in Computer Science and Information Technology. One area of discussion and debate was the shifting of Computer Science education from its home as part of Mathematics education or as a free-standing subject area to the Technological Studies department, which already taught Computer Technology courses (more to do with hardware construction and maintenance than computing theory and programming). This turf war was fierce, as Computer Science traditionalists considered it an academic subject to be studied at university rather than a course to be consolidated with a more general Information Technology focus suited to college/technical school/apprenticeship programs. Most university Computer Science programs had emerged from Mathematics faculties, which stressed formal logic and the development of mathematical proofs as integral parts of Computer Science education. It was the contention of many faculty members that a strong mathematics background was the key determinant of student success in their programs.

The revised Computer Science curriculum was circulated to faculty at colleges and universities throughout Ontario for evaluation, and generally, the universities were critical of the offerings. They fought against the program’s shift from Mathematics or Computer Science departments to Technological Studies, arguing that students coming into university Computer Science needed stronger math backgrounds than they currently
had. However, faculty acknowledged that high school Computer Science was not a prerequisite for university level Computer Science; instead, they underlined the need for strong grades in advanced level mathematics. The condensed high school program also meant that students who wanted to go on to university could not afford to take an optional Computer Science course, especially one which was designated a ‘tech’ course, when they had to fill their timetables with compulsory university-stream subjects. For those students who wanted an introduction to Computer Science prior to university, especially for young women who might have had less exposure to computers outside of school than their male peers generally had, opportunities were more limited than before.

The gendered consequences of this move went largely unnoticed, except for a comment at the end of one of the university evaluations of the new curriculum. In the last line of her response, the coordinator of one university’s undergraduate CS program wrote:

One of the negative consequences of grouping CIS [Computer and Information Science] under Technological Education is that young women may be less inclined to study it. There is strong evidence in the literature to support this concern.8

The faculty member’s comment was based on her reading of the literature which supported young women’s increasing confidence in mathematics and science in high school against their reluctance to study Computer Science in university (see Gadalla, 2001). She also admitted her own perception of high school Technological Studies programs as a ‘chilly climate’ for young women. The latter may vary from program to program.

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7 In February, 1999, I attended an all-day colloquium at Convocation Hall, University of Toronto, on the proposed switch of high school Computer Science programs to Technological Studies (Stephenson, 1999). Present were educators from high schools, universities and community colleges, and a new popular constituency, stakeholders from the high-tech business sector (Nortel, Cisco and others). The debate was heated, and high school students came up on stage to model new Technological Studies curriculum ideas.

program, but in my own experience, the fact that no young women were enrolled in a computer technology course at the school where I worked did not seem to bother the teacher of that course, nor did he feel a need to ‘promote’ the course to female students. To him, it was a matter of personal choice, not systemic exclusion. Yet choice depends upon social positioning and knowledge, not simply personal preferences. To be fair, many female teachers and faculty feel the same way as he did, and indeed, much of the liberal feminist literature producing ‘women in computing’ looks to personal rather than systemic explanations for the ‘problem’.

Again, mirroring the ‘women in computing’ literature, the faculty member who articulated her concerns about the new curriculum believed that it was mainly a lack of exposure to the diverse areas within Computer Science that kept young women away from choosing it as a field of study in university. She stressed the importance of curriculum initiatives to offer a range of different experiences in computing, an option which would have the potential to open up the field not only to women, but also to men from underrepresented groups (NSF, 2002). However, the ‘women in computing’ discourse continues to frame the ‘problem’ as one of personal choice in a climate where ‘equal opportunity’ texts shape and delimit the choices made available to a variety of subjects marked by categories of difference. This narrow description of ‘choice’ also inscribes how gender difference is performed in Computer Science education and work (Henwood, 1996, 1998).

In the chapters which follow, I start from the lives of women graduate students in Computer Science to begin to discover how it is that ‘women in computing’ are realized as a ‘problem’ in university education and in the discourses of neo-liberal economic and
educational policies. I also examine the role that institutional feminism plays in defining and regulating women’s subjectivity in the field of Computer Science, particularly in academia. In this thesis, I want to show the disjuncture between the kinds of discourse — the discourse of equality, the discourse of ‘women in computing’ which produces knowledge about actual women in computing and the way in which the ‘problem’ is represented — and the institutional operation of the university under postsecondary restructuring regimes of efficiency and accountability. I argue that these institutional practices organize ‘women in computing’ as symbolically valuable for the university’s reputation and yet render women marginal to the supposedly gender-neutral production of the performative university (Ball, 2000).

**The sites**

Pearson University and Mackenzie University⁹ are two leading Canadian academic institutions offering a wide range of undergraduate and graduate programs. They are both located in Southern Ontario in what urban studies theorist Richard Florida calls a “mega-region”, a cluster of cities, often reaching across national borders, which together form an economic powerhouse of creativity, entrepreneurial dynamism and technological innovation (Florida, 2008).

Southern Ontario has long been an economic hub of Canada, as a centre of the automobile industry and the primary Canadian location of other key manufacturers. However, with the current economic downturn in the U.S., Canada’s largest market for manufactured goods, the manufacturing sector in Ontario is suffering a major decline. In response to this decline, the provincial government (with some federal support) has been

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⁹ Pearson University and Mackenzie University are pseudonyms.
promoting the expansion of ‘innovation’, encouraging the nation’s competitiveness in the global knowledge economy, especially through information technology and biomedical research.

Both Pearson and Mackenzie are in competition to promote themselves as leaders in transferable research, with an emphasis on research that may be commercialized. These moves to attract industry include high-technology industrial park sites on campus and centres for the integration of innovative research and marketing. The demand for this kind of research also increases the demand for highly qualified researchers, including graduate students. Federal and provincial funding initiatives to increase the numbers of graduate students in Ontario universities spur competition, particularly in science and technology fields. Pearson and Mackenzie are vying with other provincial, national and international universities for the top graduate candidates in, among other areas, Computer Science. These students will also increase the university’s chances for winning more research grants from both public and private granting bodies. More will be said about these institutional graduate initiatives and policies in Chapter 5.

The students

The students in this research project are women in both Master’s and PhD programs in Computer Science at the two universities. The students were self-selecting and heard about the call for participants through a combination of listserv notices, on-site presentations, posters (see Appendix A) and word-of-mouth descriptions from other students. I interviewed six students at each university over the course of a year; there were two individual in-depth interviews with each of the women (approximately 90 minutes each), and then a final group interview at each site (2 hours). Information from
the student interviews about specific department activities and contact with faculty and administrative staff led me to interview several faculty members and administrators.\textsuperscript{10} The students ranged in age from 22 to 28. Some were married, with children, some without, some otherwise partnered, some single. All but one were full-time Master’s or doctoral students who received money from the university’s guaranteed funding provisions for graduate students.\textsuperscript{11} Some had participated in other research on ‘women in computing’ in the past, but most had not chosen to participate before.

A number of the students in the study had received their pre-university or pre-graduate school education outside of North America. Two had come to a Canadian high school before they entered university, and another two had attended public school in Canada for part of their pre-secondary education. Two of the Canadian-born women had their pre-graduate school education in Canada, but not in Ontario. The diversity of the women who chose to participate was very important to the study, particularly in the way in which they engaged in the dominant discourses of ‘women in computing’. In this dissertation, I explore how institutional discourses about ‘women in computing’ in strategies to attract more women to the field intersect in complex ways with women’s local experiences.\textsuperscript{12}

Several of the women were encouraged to investigate the field of Computer Science by parents (male and female) who were engineers, or who had some experience in computing or information technology through other work (accounting, business).

\textsuperscript{10} I will elaborate the process of selecting interviewees when I discuss my method of inquiry in Chapter 2.

\textsuperscript{11} Note that the amounts and duration of guaranteed funding for graduate students is determined by the individual universities and varies in different disciplines. The one student who was part-time was not eligible for this funding. Some of the students were recipients of external scholarships in addition to their guaranteed funding.

\textsuperscript{12} Specific information about the interviews (participants, ethics review documents, duration and general interview questions) can be found in Appendix A, B and C.
Some, however, came to Computer Science after pursuing other interests in their undergraduate programs. According to the literature, this later entry into Computer Science is more typical of women in Computer Science than it is for their male peers (Humphreys & Spertus, 2002). Several of the women in the study who entered Computer Science programs as graduate students had to take a number of undergraduate courses in order to catch up with others in the program. This added extra time-to-completion pressures, especially for Master’s students. More will be said of this and other hidden gendered practices in the chapters which follow.

**Chapter summaries**

The chapters in this thesis take up the questions I have introduced as follows:

Chapter 2: This chapter reviews the positioning of ‘women in computing’ as a discourse inside technoscience, starting with some examples of disciplinary practices within the field. I also introduce my theoretical framework, principally Dorothy Smith’s sociological method of inquiry into institutional ruling relations, and Michel Foucault’s theories of governmentality and care for the self. I do a brief review of the literature, posing what we ‘know’ against some alternative accounts of women’s subjectivity within Computer Science specifically and technoscience in general. Finally, I use the insights of Smith and Foucault, along with others, in analysis of a student interview.

Chapter 3: Here, in a look at university practices, I investigate how women in Computer Science at the university, students and faculty alike, are organized by the discursive practices of ‘women in computing’ and those of the performative university (Ball, 2000). I trace the institutional organization of campus ‘women in computing’ groups through faculty accounts of earlier feminist activist work as graduate students in a
chilly climate. Using work which elaborates upon Foucault’s theory of governmentality, I look at the institutional production of ‘community’ as a technology of governance. I argue that current equity work is translated through institutional discourses of performance and accountability. For the students, this translation work positions ‘women in computing’ negatively as a discourse of difference amid intensified ‘gender neutral’ performance expectations. However, in ‘women in computing’ discourse, difference can also be a productive resource. I look at an American model for best practices in university ‘women in computing’ programs, drawing upon Dorothy Smith’s concept of text-mediated social relations. I describe how the pedagogical texts for a specific successful intervention can be separated from practice and enter the organizing discourse of ‘women in computing’ as entrepreneurial, circulating both locally and globally as marketable and desirable.

Chapter 4: In a further discussion of the discursive practices which both frame and manage the subjects of ‘women in computing’, I examine the work that this discourse does in organizing the self. I extend Adkins’ and Lury’s (1999) work on ‘the labour of identity’ to suggest that women in Computer Science can make use of their identities as ‘women in computing’ as a self-accumulating resource. At the same time, students and faculty are subject to the operation of binary gender relations within that discourse. I show how self-(im)provement work is managed both by liberal feminist discourses and by the discourses of academic merit and accountability, and how students in turn manage the university’s regulation of their everyday work through processes of reporting and evaluation.
Chapter 5: In this chapter I discuss policy as a textual practice of ruling in the context of neo-liberal postsecondary restructuring in Ontario. I show how policy which promotes graduate education as the key to the nation’s success in the global knowledge economy works upon students in their self-government and self-efficacy as ‘good’ graduate students. Using Foucault’s work on governmentality and the ‘technologies of the self’, I show how neo-liberal discourses of individualism, progress, regulation and accountability interplay with liberal feminist education policy and practices promoting ‘women in computing’ in the production of individualized, ambitious, self-regulating and self-accumulating subjects.

Chapter 6: In a gathering together of earlier themes, I connect local practices to larger North American initiatives to promote women’s participation in university Computer Science education. My particular focus is on the identity work done by ‘women in computing’ within the boundaries created by intersecting discourses of gender equity, technoscientific expertise and neo-liberal globalization. I juxtapose local discussions with students and faculty about their participation in gender equity work against a brief ethnographic study of a major international event promoting ‘women in computing’, The Grace Hopper Celebration of Women in Computing. In this milieu, I join two of the students in the study to observe the organization of ‘women in computing’ practices on an international scale. Through description and analysis of a specific workshop at the event, I make visible how the assumed need for ‘female-friendliness’ takes for granted a unitary ‘women’s experience’ of social exclusion from the field warranting a unitary strategy for remediation. I show how in the ensuing discussion, this
assumption was questioned and reframed by the ethnoculturally diverse audience of students, professors and industry representatives.

Chapter 7: Conclusion. In this final chapter, I summarize what the research showed about how the problematizing discourses surrounding women’s participation in Computer Science worked for the women in this study. More generally, I reflect upon the contradictory threads entwining institutional practices with women’s self-identities and lived experiences, producing the subjects of ‘women in computing’ as both agential and marginalized. I suggest further research questions, extensions and new areas for exploration in order to track the gender effects produced in a milieu of rapid technological, social and cultural change.
Chapter 2:

Investigating ‘women in computing’ as problematic

I have wanted to make an account and analysis of society and social relations that are not only about women but make it possible for us to look at any or all aspects of a society from where we are actually located, embodied in the local historicity and particularities of our lived worlds. In the sociology I knew how to think when I had finished my graduate training, I could look at the everyday world from a standpoint within the gendered relation of ruling, in which women were other or object….I have wanted to make a sociology that will look back and talk back.

- Dorothy Smith (1987, p. 8) [emphasis added]

What types of knowledge do you want to disqualify in the very instant of your demand: ‘Is it a science’? Which speaking, discoursing subjects – which subjects of experience and knowledge – do you then want to ‘diminish’ when you say: ‘I who conduct this discourse am conducting a scientific discourse, and I am a scientist’? What theoretical-political avant garde do you want to enthrone in order to isolate it from all the discontinuous forms of knowledge that circulate about it?

- Michel Foucault (1980, p. 85) [emphasis added]

Part I: Theoretical framework and methods

The above quotations from Smith and Foucault, whose theoretical insights for my study will be discussed further in this chapter, represent a talking back to the “tribunals of reason” which govern technoscience (Latour, 1987, p. 179). Both thinkers articulate how disciplinary discursive practices describe both the boundaries of reasonable speech and the social positioning of subjects who will do the speaking. These constraints produce technoscientific ‘truth’ in general and knowledge about ‘women in computing’ in particular. In the context of this gendered disciplinary discourse, certain subjects of experience and knowledge are thinkable and others are not. I begin with a graduate student participant’s account of transgression when she and her faculty collaborator submitted a paper with ‘failed’ results.

Prior to our interview, I had read an unpublished paper by the student and a female Computer Science faculty member. The paper describes an undergraduate CS
final project designed by the authors that followed two project choices, one generic and one which they hoped would specifically interest female students. However, they found that both the female and the male students preferred the ‘generic’ project. In the paper they reflected on their mistaken assumptions and extended the reflection to suggest further research. Their previous publication in the same journal, a positivist account of a successful gender inclusion project, had been very well received. Their paper on ‘failed’ results, however, was rejected. In her explanation of the rejection, the student said that while two of four in the peer review group had liked the paper, she was told that the journal had already published a lot of submissions on ‘gender’. She thought there might have been some “fatigue” with the topic of gender in computing. Aside from gender, the “negative” direction of the paper was unthinkable in the context of the publication, where predictability and measurable positive outcomes are the norm:

SS: It’s too bad that they wouldn’t consider the approach that you were taking, in unearthing your own assumptions, because if they’re having a problem with too many contributions on gender, that’s kind of a different approach…

Student: Yeah, yeah…Well, I mean, that was the thing, that we didn’t get the results that we were expecting and hoping to get, but it seemed valid and worth publishing anyways because – why have other people try the same things if it’s not going to work? [Laughs]. And also, negative results are always harder to publish than positive results…

[As for taking a more qualitative approach], if it’s not counted up into statistics – 40% of this, 30% of that - what can you do with that? It’s hard for some people in Computer Science who are very used to ‘black and white’ kinds of things to understand that approach.

13 It is significant to see how ‘gender’ is used in the reviewers’ research discussion to stand in for biological ‘sex’ categories, and even more specifically, to be a quantifiable marker of issues focusing on ‘women’. This view stands apart from any conception of how the categories come to be; they are simply empty categories into which the ‘facts’ about biological males and females may be placed and then ‘blackboxed’, to use Latour’s term. ‘Gender’ in this use reinforces the gender binary between man/woman, male/female, rather than considering how both men and women are gendered.
The student understood from the reviewers’ responses that her reflective approach was outside the normative empirical research done in Computer Science education, although she and her collaborator had originally framed their project through that normative discourse. Such reflection might offer a view into the discursive practices of ‘women in computing’, but to two of the reviewers, the experiment’s negative outcome, a null set instead of a successful hypothesis with reproducible results, seemed incommensurate with established scientific analysis in the field. The student recognized that her research would be seen as invalid: “if it’s not counted up into statistics…what can you do with that?”

The submitted text failed to confirm the institutional knowledge about ‘women in computing’; the study was novel in that it did not reproduce established textual ‘truths’ about gender preferences. Instead, it unintentionally revealed the unpredictability of lived experience, raising questions about the researchers’ previously held assumptions that might both open up thinking about gender in Computer Science education and alleviate ‘fatigue’. However, even the student saw the project as a failure primarily in terms of scientific reproducibility (“why have other people try the same things if it’s not going to work?”), not as a position from which to question the discourse. The negative results were unthinkable through the disciplinary rules of successful scientific practice.

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14 See Kuhn (1996, p. 198) for his discussion of scientific incommensurability.
15 For example, Belenky, Clinchy, Goldberger, & Tarule (1986), Gilligan (1993) and Turkle (1993).
Despite Comte’s hostility to numbers, positivism soon took for granted that positive facts were measured by numbers. Even when one reads a conservative sociologist such as Frederic Le Play who inveighs against number-crunchers of the statistical sort, one finds nothing much except numbers in his great book on European workers…At the end of the [19th] century no one could dissent from the sayings of the physicist Lord Kelvin, ‘that when you can measure what you are speaking about, you know something about it; when you cannot measure it…your knowledge is of a meagre and unsatisfactory kind’. (Hacking, 1991, p. 186)

In a related example of disciplinary power, my project encountered some resistance from faculty who positioned a qualitative ‘social science’ research approach outside the thinkable disciplinary boundaries of the natural, physical, life and medical sciences.16

When I first put out a call for student participants in this study, I approached the faculty coordinator of a ‘women in computing’ group for graduate students at one of the two research sites. She agreed to an interview, posted the call on the group listserv, and invited me to present my project at the next group meeting. The audience of about forty female students and faculty (a large number for their monthly lunchtime sessions, I was told) listened politely to my description of the qualitative ethnographic study I planned to do. I received a few questions from students about research methodology and about what I hoped to find in the research data.

In answer to their questions about method, I described my intent to focus on a small group of student participants, six to ten at each site, asking them about how they experienced their work as women in graduate Computer Science studies. I planned a series of interviews over the period of a year. Rather than drawing up a set of

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16 Here I use quotation marks to represent disciplinary skepticism toward a ‘so-called science’ like sociology.
predetermined questions for my research to answer, I explained that in the feminist sociological method of inquiry developed by Dorothy Smith, Institutional Ethnography, which informs my project, researchers learn about the organization of institutional practices starting from the particular knowledge of participants about how things work for them.\textsuperscript{17} Consistent with this approach, directions for further research emerge. Participants’ knowledge about how they conduct their everyday work leads the researcher to other potential interviewees and other external actions that enable the researcher to map the institutional practices which organize participants’ local activities.

At the end of my explanation, one of the faculty members said dismissively that she didn’t think I’d be able to find out anything from such a small sample. I felt a shift in the students’ attention, which had hitherto seemed focused and positive, as some students nodded to support the professor’s negative appraisal of the project.\textsuperscript{18} The professor’s response was jarring. Her gatekeeping move, which produced my method of inquiry as unthinkable, stood in stark contrast to the responsiveness of the group’s coordinator, the faculty member who had originally invited me. In our interview, the coordinator described the group’s purpose as a “welcoming and safe space” for women graduate students and faculty in the department to meet and to discuss common areas of interest. She was supportive of my project and thought that many of the students would be interested in it. However, the encounter at the meeting made visible my outsider positioning. The professor’s ‘I am a scientist’ stance challenged my invitation\textsuperscript{19} and clearly troubled the organization of ‘women’ or ‘feminism’ as a unifying discourse.

\textsuperscript{17} Later in this chapter, I will elaborate upon Dorothy Smith’s (1987) method of Institutional Ethnography.

\textsuperscript{18} Despite the professor’s response, two students present at the lunch did contact me later to participate.

\textsuperscript{19} As Pierre Bourdieu (1975) theorized in his study of the social conditions for the production of scientific knowledge: “As scientific method takes its place among the social mechanisms regulating the operation of
This rupture, or line of fault (Smith, 1987, p. 49), reinforced my sense that the ‘problem’ of ‘women in computing’ — that is, how women in computing are institutionally organized as a ‘problem’ group — was the problematic. The experience underlined my feeling of discomfort with the ‘fact’ of gender as a unitary and institutionally productive characteristic, a discourse which is set against the actual activity of disciplinary exclusion that had taken place at the meeting. It also reaffirmed for me the need to investigate how both the disciplinary practices of university Computer Science and feminist gender equity strategies work for women graduate CS students. More will be said about these institutional feminist disciplinary practices in Chapter 3, which examines how university ‘women in computing’ groups are organized through the management of ‘community’.

By starting with graduate students, who are knowledgeable about how institutional academic disciplinary practices of evaluation, reporting and accounting operate in their daily lives, my point is not to show that women graduate students in Computer Science share a unitary identity or a predetermined standpoint. In fact, I critique this view in some of the ‘women in computing’ literature I review in this chapter. I also do not suggest that the perspectives of faculty and other university personnel should be ignored. It is important to understand their subject locations within the university’s discursive practices and their historical experiences of the discourse of ‘women in computing’. Rather, beginning from the standpoint of the students anchors the research in topics relevant to them; starting from these particular perspectives and social

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20Graduate students are organized and disciplined through grading, progress reports and professional dossiers, for example.
positions allows us to see the social relations relevant to the university’s operations. At the same time, this positioning keeps questions focussed on the concerns of the students (DeVault & McCoy, 2002, p. 32).

As for the question of ‘sample size’, this is a trial at the ‘tribunals of reason’, where those both inside and outside of scientific networks are measured against the straight line of rationality, and “where it is implicitly assumed that people should have gone in one direction, the only reasonable one to take…” (Latour, 1987, p. 183). This assumption places my research methods and the student’s project results outside of ‘reason’. Looking at these activities from outside the scientific discourse and using both institutional ethnography practices and post-structuralist feminist analysis as a guide to my research, I am neither involved in the broad description of a population rendered in numbers,\(^2\) nor do I think of the people I talked to as a ‘sample.’\(^2\) Institutional ethnographers do not try to generalize the attributes and characteristics of a selected group of people; in fact, IE and other feminist researchers often challenge the use of these data sets as part of distanced ‘objective’ sociological practices.

Situated research locates and identifies researchers within relations of power. I acknowledge that my position is not ‘innocent’, but comes with my own set of social assumptions and interests, especially given my location as a teacher in the Ontario public school system and a doctoral student in one of its faculties of education. I am also white, born in Ontario and from a middle class background, which puts me in a different social location to several of the student participants. DeVault and McCoy (2006, p. 32) point

\(^2\) As I will further detail in this chapter, I also draw on Foucault’s theoretical work on governmentality, which elucidates the disciplinary effects produced in the statistical organization of subjects. See Hacking (1991).

\(^2\) I was criticized by a member of my thesis committee for using the term ‘data’ at all: “You mean people, don’t you?”
out that some institutional ethnographers deliberately look for informants who can report
on a range of different situations. For instance, in her research, Alison Griffith (1995)
interviewed both middle-class and working-class mothers to make visible how
educational discourses about child development and mothers’ role in schooling worked
differently for them. The participants in my study, however, are self-selecting, and from a
variety of racial and ethnic backgrounds; some participants in my study are married,
some are single, some have children, some struggle financially. These and other life
conditions affect the time they have to do their work and the financial support they have
as students. Their social situations affect both their location in the discourse of ‘women in
computing’ and in the university’s expectations of them as performative and productive
graduate students.\textsuperscript{23}

The purpose of my research, then, is not to generalize groups of people, but rather
to look at how participants are subject to generalizing practices/discourses which
organize their everyday activities (DeVault and McCoy, p. 18). As a researcher who is
also a graduate student, I am situated within similar academic accountability
practices/discourses organizing my daily activities. Although I am in a different
discipline with very different organizing rules from that of the students I interviewed, as
graduate students we are all subject to similar institutional practices governing our
research and progress through our studies.\textsuperscript{24} Sharing our everyday knowledges and
experiences of these generalized institutional practices make situations of inequality
visible. In this way, explication of the discursive production of social inequalities may be
useful in work for social change.

\textsuperscript{23} More will be said about these positionings in Chapters 3 and 4.
\textsuperscript{24} For a tracing of new education research practices through neo-liberal globalized governing regimes, see
Thus, as activists, feminist researchers commit ourselves to research for and with participants rather than about them (DeVault, 1999). However, I acknowledge that the feminist participatory research/participant relationship is still problematic in the complicated set of interests and power relations that are continually negotiated (Naples, 2003, p. 190). And the product of my research, this writing, is only ever a partial view.

**Technologies of the self and technoscience**

I have attempted a history of the organization of knowledge with respect to both domination and the self. For example, I studied madness not in terms of the criteria of formal sciences but to show what type of management of individuals inside and outside of asylums was made possible by this strange discourse. This encounter between the techniques of domination of others and those of the self I call ‘governmentality’. (Foucault, 1997, p. 225)

You’re your own worst enemy of yourself in all of this, that’s why we all work so hard - it’s maintaining some standard of performance in research, and with respect to teaching, with respect to the care that you give your graduate students.

- woman CS faculty member

While Smith’s Institutional Ethnography work guides my methodological approach in starting from the students to discover the institutional organization of their everyday work, I break from IE’s focus on textual activities in my regard for subjectivity as an organizing practice. I agree with Smith’s criticism of the reification of ‘subjectivity’ away from practice; however, I think she misreads this notion in Foucault’s work. In some of her challenges to feminist post-structuralist thought, Smith continues her interpretation of Foucauldian analysis of subjectivity as a retreat from practice (Smith, 1993). Where Smith writes about the institutional material production of knowledge about people through textual practices, Foucault theorizes subjectivity not as a static and pre-given ‘thing’ but as intersections of knowledge available at a given historical juncture.

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25 This is part of Smith’s critique of post-structuralism in general – see Gough (1993) and Smith (1993).
which produce certain kinds of people — the mad, the criminal, the homosexual — through practical action. Feminist theorists of science and technology have applied similar analysis of the ways in which scientific knowledges produce gender (Haraway, 1997; Longino, 1993). Foucault also addresses the interaction of diffused governing technologies with individual activities of self-governance through what he calls technologies of the self.\textsuperscript{26} This work is helpful in theorizing how individual women take up the discourse of ‘women in technology’ and other governing practices in their everyday activities.

\textit{Subjectivity, governmentality and the enterprising self}

\begin{figure}[h]
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\includegraphics[width=0.5\textwidth]{image.png}
\caption{2007 Grace Hopper Conference \textquotedblleft I Invent the Future	extquotedblright}
\end{figure}

\begin{quote}
...the forms of political reason that yearn for an enterprise culture accord a vital \textit{political} value to a certain image of the self... The self is to be a subjective being, it is to aspire to autonomy, it is to strive for personal fulfillment in its earthly life, it is to interpret its reality and destiny as matters of individual responsibility, it is to find meaning in existence by shaping its life through acts of choice. (Rose, 1991, p. 141)
\end{quote}

Neoliberalism is thus more than a phenomenon at the level of political philosophy. It constitutes a mentality of government, a conception of how authorities should use their powers in order to improve national wellbeing, the ends they should seek, the evils they

\textsuperscript{26} This idea will be taken up in Chapter 4 in my discussion of the intersection of neo-liberal postsecondary restructuring policy in Ontario with institutional ‘women in computing’ discourses, and in discovering how that intersection works for the women CS graduate students and faculty in this study.
should avoid, the means they should use and, crucially, the nature of the person upon whom they must act. (Rose, 1991, p. 145)

As a way to extend the notion of how individual subjects connect to institutional discursive practices, I find it useful to look at Michel Foucault’s work on governmentality, particularly as it is taken up by Nikolas Rose and a number of other current political theorists who examine contemporary neo-liberal social relations. Like Smith, Foucault makes clear that the production of subjectivity is an institutional practice. Subjectivity does not simply rest with the individual but suggests a complicated working of historical ruling practices which make certain present subject positions available and others unthinkable. In these discursive practices of governance, subjects are not only shaped but also individually enlisted to become active participants. In this way, individuals understand their responsibility “through acts of choice”, as in Rose’s example above or in the Grace Hopper poster, ‘women in computing’ are called upon as individuals to “invent the future”.

Foucault’s later work on the conduct/technologies of the self (Foucault, 1988) adds a crucial layer to my analysis, especially in relation to the discourses of self-improvement (Cruikshank, 1996), self-efficacy and merit. These discourses are diffused through the texts of both neo-liberal postsecondary restructuring and ‘women in computing’, as I will show in more detail in Chapter 5. I look especially to the work of Foucauldian theorists and others who link this institutional ruling through the self to the techniques and technologies of neo-liberal governance (Burchell, 1996; Larner, 2000; Rose, 1999a, 1999b; Rose & Miller, 1992). Neo-liberal ruling relations, which depend on the discursive production of autonomous, free and self-responsible citizens, stakeholders, and knowers, make available a particular form of ‘governing at a distance’ through self-
government. Thus, subjectivity produced through these knowledges becomes a vital part of ruling. This important part of Foucauldian analysis adds what I feel is missing in Smith’s work, though there are affinities between Foucault’s methods and the examination of organizational practices through texts which is a major focus of Institutional Ethnography.

Very important to my project is Nikolas Rose’s extension of Foucault’s ‘mentality of government’ to include enterprising individuals, who invent and promote not only products but also themselves. Through this self-promotion, individuals can be ‘connected up’ to produce “specific programs that simultaneously ‘problematize’ organizational practices in many different social locales, and provide rationalities and guidelines for transforming them” (Rose, 1991, p. 145). This resonates with Smith’s concept of text-mediated social relations, which can be distributed in many forms across many sites, especially through computer technologies.

As the Grace Hopper poster illustrates, gendered ‘change agents’ invent and reinvent the future and themselves, and here the agenda for change addresses women in general as problematized, requiring a kind of neo-liberal entrepreneurial high-tech makeover. In subsequent chapters I will come back to this concept, but it is important to see ‘women in computing’ as part of the “vocabulary of enterprise” which “enables a political rationality to be ‘translated’ into attempts to govern aspects of social, economic and personal existence that have come to appear problematic” (Rose, p. 145). As I mentioned earlier, knowledge about ‘women in computing’ for this kind of governance is

27 This strategy of simultaneously problematizing existing institutions and providing “rationalities and guidelines for transforming them” is also a major practice of neo-liberal postsecondary education reform, as analysis of the Rae Review will show in Chapter 4.

28 In a contradictory way, however, this production of gender serves to retraditionalize the category ‘woman’ in reproducing images of hyperfeminity and in the feminization of labour (Adkins, 1999).
produced by the prodigious generation of quantitative data. This data and the various claims it makes for ‘women in computing’ initiatives produces the personal characteristics, interests and learning ‘styles’ which become part of expert knowledges about ‘women in computing’.

**Performing ‘women in computing’**

In Chapter 1, I discussed concerns in feminist participatory research about the researcher/participant relation. Throughout this project I was aware of my own implication in positioning the women as ‘objects of study’, even as my intended mode of inquiry argued against that positioning. As women in graduate Computer Science, the students are part of a rarified group; many had been subjected to research interviews before on the topic of ‘women in computing’, or more frequently, had filled out research questionnaires. Those who had taken up the discourse in their own self-description were actively performing²⁹ ‘women in computing’ when they talked about ‘feminine values’ or the ‘fact’ that ‘females’³⁰ preferred ‘working with people’ to ‘working alone in a lab’. Others who resisted the discourse still moved back and forth within it in often contradictory ways. A comment on one undergraduate³¹ participant’s blog before our scheduled interview showed her audience what she was prepared for:

> I’m being interviewed by a graduate student to talk about…wait for it...being a woman in Computer Science (yawn)….  

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²⁹ Here I draw upon Butler’s notion of women’s subjectivity as performative (1990).

³⁰ Note that there was a slippage between ‘sex’ and ‘gender’ in most of the students’ discussions. ‘Gender’, if it was used at all, was usually used interchangeably with ‘sex’ to mean biological distinctions between males and females. ‘Females’ was also used by some more regularly than ‘women’; it seemed that the users were more comfortable with a scientific rather than a social descriptive.

³¹ As part of a series of pilot interviews, I interviewed a very advanced undergraduate student who was already acting as an informal teaching assistant in the department. She was very knowledgeable about the workings of the department, and had participated as an undergraduate liaison on committees wherever possible. She planned to go to graduate school.
Although the student (I will call her ‘M’) admitted in our interview that her comment was partly a “public performance” for her blog audience, it was also evident in our conversation that she’d developed a public ‘patter’ on the topic. The repetitious nature of the ‘problem’ as it is articulated in the literature seems to effect a merging, where disciplinary texts are performed as ‘experience’. M understood her participation in the discourse as a literal performance; in her blog, she said, she had “different performances for different audiences”. In the interview, I was clearly participating in M’s ‘women in computing’ performance, which talked back to the discourse but also reproduced it as she set herself on the ‘hacker’ side of the gender binary:

I got interested in programming there [in MOO space, an on-line virtual ‘community’ where users manipulate text and objects], because there was somebody on it who, there’s a little item you can use, it was sort of a teleporter, and everybody used it, and they just told you, “You’ve got sparkles that come all around you”, and then you’d re-appear somewhere else. And there was this one guy who found out how you could use it to…he basically hacked it to teleport other people. And I watched that, and I was thinking to myself, that’s like, if that was real life, what he just did is the equivalent of just being like a god, like, he just got absolute power over someone. I want to do that, I have to learn how to do that!

.....

I think that I’ve sort of taken the opinion of [sic] “I’m not going to let gender become an issue by simply being the best always.” So if I’m the best, then it can’t be an issue, right? [emphasis added]

The student’s avoidance of any of my questions which she thought were specifically related to gender did not preclude it becoming “an issue”. She acknowledged that there were aspects of the hacker culture she did not like: for example, the dismissal of ‘newbies’, those who were new to the ways of hacking and anxious to learn. When being put off by other hackers that she knew (mostly male) when she was trying to learn some of the intricate programming skills she so admired, she resolved to ‘do it’ herself.

32 Like several of the other students and faculty I interviewed, she’d done several interviews before as a rare ‘woman in computing’.
She was participating in what Walkerdine (1989, p. 268) refers to as the fiction/fact/fantasy of male mathematical and technical superiority, which means positioning women as the Other, irrational and incompetent. In this positioning male ‘brilliance’ is recognized as such, but female brilliance is merely ‘hard work’. Through her public disidentification with ‘women in computing’, M perceived herself as outside of the gender debate, yet in her performance of the discourse, she set the ‘god-like’ power of the male hacker and her own drive to attain computing power against her contempt for some of her female classmates:

M: I found in my various studies, in my various classmates, that there’s sort of two categories of females in my classes. There are either ones who are really incompetent, or there are the ones who are very competent but match it with arrogance to try to show the fact that they’re competent.

SS: Who gets treated better?

M: Arrogant. Definitely.

SS: The others are just sort of written off?

M: Yeah, well, they’re at the front of the class asking another question…

The student did not identify herself as arrogant, but she certainly disidentified with the ‘incompetents’, whom she dismissed for asking questions much as the hackers had done to her. She clearly positioned herself as competent but not one who had to ‘show’ it, although it might be argued that her performative blog display is evidence of ‘showing off’ to others. She explained that in her blog, “I’m putting on a performance for all my people”, the ones she imagined regularly read her blog. She represented herself to

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33 I acknowledge that male hacker ‘identity’ is also discursive, and needs to be complicated as much as I argue for a more complex view of women’s positioning within Computer Science and Information Technology. Here I am using it in relation to an essentialized gender binary which positions the active and independent male programming fanatic against the more passive and collaborative female learner and user. For a nuanced analysis of and intervention into hacker discourse, see Håpnes & Sørensen (1995) and Gansmo, Lagesen, & Sørensen (2003).
me throughout our interviews as an ‘insider’, as one who knew things that other students in her position did not know about computing, or about the department.

As part of this ‘insider’ discourse, the student positioned ‘women in computing’ as outsiders, marginal, not where she wanted to be. Later in this chapter I will show how the same student became positioned in the discursive practices of ‘women in computing’ in a work situation, despite her disidentification with the category ‘women’ as represented in the discourse. I provide this example not to suggest that subjects are inevitably and irrevocably trapped in a singular discourse, but instead to make the point that the specificities of social relations produce a multiplicity of discursive effects, temporally making some subject positions available while closing off others (Davies & Harré, 2000). Throughout this thesis, I will illustrate how ‘women in computing’ is produced for the students in my study in different ways, and show how their lived experiences complicate, contradict and sometimes extend the iterative texts of the discourse.

Here it is once again important to make clear that the focus of my research is not on the students as individuals in a psychological sense but on the particular social organization of their lives as graduate students in Computer Science. While hearing participants’ rich accounts of their formative school experiences in mathematics and computer science, and their descriptions of everyday work as graduate students, it is important for me as a researcher to keep the institution in view (McCoy, 2006). In so doing, it is necessary to listen for clues to how their actions and decisions as individuals are coordinated textually through the university’s organizational activities (Campbell &

34 Note that ‘insiderness’ can also mean positioning within a dominant discursive frame (see Naples, 2003, p. 79)
Gregor, 2002, p. 27) and through the active institutional co-ordination of ‘women in computing’ as a discursive practice.

**A partial view of the problem**

As a member of my thesis committee remarked, our research into the ‘problem’ has to be regularly revisited and updated. This attention is important not only because of the rapid changes in computer technology but also because of the insights that a detailed look at micro-level interventions in computer education for girls and women can provide (see Jenson et al., 2003). I realize that by the time this thesis is completed, many local and global conditions in Computer Science and in computing education will have changed. The field’s overarching discourse of innovation might determine this project already ‘out of date’, but the specific, embedded and embodied accounts by students and faculty suggest ongoing changes that will happen for them and for the women who will follow in graduate computing studies. What is out of date is the circular account of ‘women in computing’ as a problem trapped in numbers. Yet this latter research is productive both in its volume and in the coordination and regulation of an institutional subject who can be reproduced across many geographical and temporal locations and contexts.

My desire to bring discussion of identity and subjectivity into the institutional analysis of ‘women in computing’ is to draw out the institutional practices which produce this subjectivity. In this thesis I do not focus upon personal accounts of discrimination. Nor do I rely upon social or cognitive psychology studies generalizing women’s attitudes towards computing or their preferred learning styles. I critique these forms of analysis in the ‘women in computing’ literature for individualizing the problem as part of innate
gender characteristics or personal affect; this is a reductive approach which keeps the
same ‘problem’ circulating, with no exit. Rather, I use subjectivity as a way to explicate
the work discourse does in delimiting the subject positions made available to people in an
institutional setting, here specifically in education. This latter concept comes from post-
structuralist feminist work on how gendered subjects are produced and positioned
through discourse (Butler, 1990; Davies, 2000).

To reiterate, when considering knowledge about subjects in Institutional
Ethnography, or in a Foucauldian analysis studying the historical traces of discourses and
subjectivities, it is important to remember McCoy’s (2006) admonition to keep the
institution in view. It is also critical as a feminist researcher to keep my own subject
position as researcher visible, along with the embodied experiences, assumptions, power
and blind spots that I bring to that position. I acknowledge my own partial location and
knowledges.

Part II: Re/stating the ‘problem’ of ‘women in computing’:
Disciplinary literature as productive text

The purpose of this section of the chapter is to provide a brief mapping of the
main directions which different strands of feminist theory have taken in an ongoing
examination of the issue of ‘women in computing’, and to indicate the theoretical and
methodological directions of my own investigation.

Feminist theory and the organization of ‘women in computing’

For this brief review, I find it useful for heuristic purposes to divide the feminist
literature on women and computing into five categories. These include: gender
differences in computing, educational/cultural intervention in computer technology, the
gendering of computing and technology, identity and subjectivity in technoscience and
cyberspace, and computing in workplace settings.

Earlier scholarly work on ‘women and computing’ in North America and continuing popular accounts of women’s use of computer technology often refer to
gender difference theories from feminist social and cognitive psychology. These writings theorize ‘women’s ways of knowing’ (Belenky, Clinchy, Goldberger, & Tarule, 1986), the relational interests of girls and women (Gilligan, 1993 [1982]), women’s occupational and educational choices (Eccles, 1994) and, in a specific computing context, ‘hard and soft mastery’ (Turkle, 1995). What I would refer to as the normative literature argues against a “competitive male-dominated hacker subculture of singular focus on the machine” (Margolis, Fisher, & Miller, 1999) for ‘female-friendly’ computer education (Margolis & Fisher, 2002; Rosser, 1997) and for the importance of female role models in computer education and work (Barker & Cohoon, 2006; Blum, 2001; Haller & Fossum, 1998; Miller, 2002; Turner, 2000). This approach also drives theory on feminist pedagogic practices, ethics and epistemology in computer science education (Adam, 2002, 2005; Klawe, Cavers, Popowich, & Chen, 2000; Margolis, Fisher & Miller, 1999; Turkle & Papert, 1992). Here the ‘problem’ of ‘women in computing’ becomes an individualized one, with educational practices geared toward an appeal to individual (and differently gendered) learning styles.

Many of the above works are primary textual forces behind ‘women in computing’ discourse, particularly as it is accomplished in educational contexts like the American Computer Research Association’s CRA-W Graduate Cohort program for women in graduate Computer Science studies, the Grace Hopper Celebration of Women
in Computing, and individual university ‘women in computing’ groups. In particular, the documents produced by CRA-W are designed to model ‘best practices’ for university CS education where departments are interested in doing equity work. I will provide more detailed analysis of such texts in the chapters which follow.

Other researchers in ‘women in computing’ follow the methods of institutional sociology and conduct large longitudinal studies of, for example, women’s undergraduate drop out rates in Computer Science (Cohoon, 2000) graduate enrolment and retention (Cohoon & Lord, 2007; Cohoon & You, 2006), and the future academic goals of women in high school computer science studies (Creamer, Burger, & Meszaros, 2004). These studies attempt to trace causal factors for low enrolment, and to study predictors for attrition in order to plan retention strategies. While these large surveys do allow for comparison of trends over time, and researchers do point to the importance of keeping in touch with current information about women’s participation, the overall effect of this textual work is to produce a generalized ‘women’s experience’ rendered in numbers. Many of these texts are short conference proceedings which circulate electronically in computing and engineering journals. They contrast starkly with fine-grained ethnographic studies which analyze the everyday workings of educational and working practices in computing and other technologies (Hacker, Smith, & Turner, 1990; Jenson et al., 2003; Singh, 1997; Suchman, 1987; Vehviläinen, 1994).

In a third category of feminist literature on ‘women in computing’, those who take up practices of educational/cultural intervention in computing locate their problem not in an individual but in a socio-cultural and socio-economic realm, talking back to

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35 In Chapters 3 and 6 I will go into detail about the discursive play of these texts in the organization of this institutional work and how the study participants take it up.
assumptions and gendered stereotypes as social constructions. Here, the ‘problem’ of ‘women and computing’ is located in social exclusion in schools and in larger societal settings due to the marked categories of gender, race, class and sexuality (Clegg, 2001; Clegg, Trayhurn, & Johnson, 2000; Lie & Corneliussen, 2003; Stepulevage & Plumeridge, 1998). This approach turns the problem to conditions of possibility outside the individual, with the rejection of an essentialized female subject as the basis for educational intervention (Bryson & de Castell, 1996; de Castell & Bryson, 1997; de Castell et al., 2002; Gansmo et al., 2003; Jenson et al., 2003).

A fourth area of feminist inquiry in looking at technologies in general and computer technology specifically has to do with the gendering of technology, and at how technologies produce gender. Such work includes analysis of the material conditions surrounding the production and uses of technology in time and space (Cockburn, 1992; Cockburn & Ormrod, 1993; Huws, 2003; Massey, 1995; Massey, Quintas, & Wield, 1992; Wajcman, 1991). Several studies have explored the production of masculinity in hacker culture and gaming, along with analysis and suggestions for gender intervention (de Castell & Jenson, 2003; Gansmo et al., 2003; Håpnes & Sørensen, 1995; Jesiek, 2003; McPherson, 2003; Schleiner, 2002). This intervention involves setting aside the culture of the essentialized male hacker and gamer, and theorizing the potential for learning and pleasure which these activities provoke. Others explore the emergence of cyberfeminism as another form of gendered response to technology (Kenway & Langmead, 2000; Wajcman, 2004), and the intersection of race and gender in cyberspace (Kolko, Nakamura, & Rodman, 2000; Loader, 1998).
Other theorists take up the post-structuralist critique of essentialized identity in the problem of ‘women in computing’ and gendered computer technologies, challenging concepts of ‘women’s experience’ and ‘women’s voice,’ as well as women’s bodies, as socially constructed, while at the same time recognizing bodily desires as knowledge (Balsamo, 1995; Braidotti, 1994, 1996; King, 2003; Plant, 1997; Sofia, 1993; Star, 1991). Donna Haraway’s work understands feminist encounters with technoscience as an appreciation of multiple voices in ironic relationship to subjectivities which are produced by the ‘machines’ of languages, technologies and texts. Haraway’s ‘cyborg identity’, embodied and situated knowledges intervene in dialectic with the technical world (1998; 1996). Fractured and interconnected subjectivities possess agency not only through embodied knowledge but also through experience of technical subjectivities.

Lastly, a number of feminist ethnographic studies have investigated ‘women in computing’ in workplace settings. Some of these studies have examined the occupational culture of computing for women, looking at issues of mentoring, work-life balance and career streaming as part of the organization of ‘women in computing’ (Tierney, 1995). Others have focused on the construction of masculinities in the computing and engineering workplace (Faulkner, 2000; Wylie, 1995a), even analyzing how the arrangement of physical space in these work sites is constitutive of gendered identities (Massey, 1995). Still other researchers, Hacker (1990) in engineering, Scott-Dixon (2004), Suchman (1987) and Vehviläinen (1997) in IT and computing work, begin from people’s experiences in the workplace to trace how their work is organized through larger structures which are beyond their everyday practices.
In Vehviläinen’s case, this research practice emerges from the work of feminist sociologist Dorothy Smith, who has developed ‘a sociology for women’ which starts its inquiry from everyday life. Drawing upon Marx’s theories about the consciousness of labour, Smith’s method of analysis understands people’s knowledges and interpretations of the social world as shaped in their local settings and activities, within their life histories and in their bodily, gendered lives. Given these situated knowledges (Haraway, 1988), people act from particular embodied locations, and their relationships to technology vary according to these different positions. This runs counter to the ideological location of technological determinism, shaping social life from above.

Approaching research from the standpoint of women doing computing work, I argue, is not the same as starting from the standpoint of ‘women in computing.’ Smith’s methodology is different from other ‘standpoint’ positions in that the standpoint is a starting point in social relations – it is not an identity. While a woman working in computing is in a field which is dominated by men, the way in which various aspects of her life conditions and practices are coordinated may be very different from those of another woman. Practices reveal social relations, but identity categories as a form of organizing ‘text’ reproduce them.

In Smith’s theory, printed, electronic or otherwise replicable texts have the double capacity of being read or produced in people’s everyday activities and at the same time may be replicated in multiple different settings (and at different times). This latter capacity of texts enables a standardization of practices in every setting into which the text is introduced. As material objects, texts provide “a crucial join between the everyday actualities of people’s activities and the social relations they co-ordinate” (Smith, 2002,
p. 45). ‘Women in computing,’ I argue, is also an organizing text which moves across sites to reproduce social relations. In Part Two, I will further develop the idea of text-mediated social relations in the context of computing.

Marja Vehviläinen (1999) considers information technology as a ‘textuality’ – taking up Dorothy Smith’s concept of social organization of knowledge through institutional texts (Smith, 1990b). Following Smith, textuality consists of texts as well as processes of producing and interpreting them. Texts, after they have been produced, have a life of their own in ‘textual time’ and in ‘intertextual relations’:

Computer programmes, computers, e-mail messages, net discussions are texts which are produced and interpreted by people. Production and interpretation are socially organised: they are material practices of actual, particular people. Information technology textuality consists of texts, the practices related to them, and the social and material relations embedded in the practices. The organizing relations can be textually mediated but even those have material orders. The approach is focused on the persistent orders but it also gives credit to the flexible nature of information technology. Both development and use of technology can be seen both as interpretation and production of texts. The boundary between development and use is blurred. There are elements that become fixed during the design but there are options for (re)design within use practices as well. Furthermore, the approach has room for the definition of one’s own, for the transformations. (Vehviläinen & Heiskanen, 1999, p. 2)

As in Smith’s theories of text, information technologies and the social relations which organize them have a ‘life of their own’ and organize the practices of groups of people in several different places and at different times. The interesting point which Vehviläinen makes is that in information technology the line between development and use is blurred. Particularly in collaborative programming work, where teams work on a single piece of software, there is room for the kind of simultaneous relationship to the text as both developer and user.36

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36 A female informant told me of a software development project she was working on in which she set up a blog as a readily accessible log book to test out a teammate’s software. After she tested the software and posted her responses for how things were working or not working, she received the ‘fixed’ software the next day. She was very pleased that her suggestions as an interactive user were acted upon immediately.
Information technology texts are material and can be moved to another place or time. Information and other technologies, like scientific facts (Latour & Woolgar, 1979), contain embedded human activities, or what Katie King calls ‘frozen social relations’ (2003). Yet, like other texts, they are accessible to people only through human practices; texts are both activated and produced by people. The interpretation and production of information technology texts are concrete practices among people’s daily activities. As practices they are organized by social relations. In Smith’s method, it is the practices, not individual subjectivities, which are the centre of the research.

However, I agree with Vehviläinen that Smith’s work eschews valuable feminist work on subjectivities. Reading Haraway’s ‘cyborg vision’ through Smith’s examination of how subjects are located in social, textual and material coordinating relations suggests a move toward a subject aware of divergent consciousnesses of embodied and technical knowledges. Vehviläinen concludes that ‘cyborg vision’ is “a starting point for the redefinition of concrete practices of agency in information society.” She suggests that this vision “challenges the liberal view of giving ‘equal access’ to technology” by pointing out the asymmetrical local and global social relationship embedded in ‘equal access’”. Haraway’s ‘cyborg’ work has had its own asymmetries, drawing challenges of cultural appropriation from some Chicana feminists while being reconstituted by others to bring oppositional consciousness to the fore (Moya, 1997; Sandoval, 1999). What speaks most to the subject of this thesis is the ‘divergent consciousnesses of embodied and technical knowledges’ that are part of a look back and a talk back to the essentialized subjectivities of ‘women in computing.’
These fixed identities produce an infinite loop of constrained actions and disembodied selves, which in turn produces ‘women in computing’ as an iterative extralocal text which can be and is replicated globally. The institutional discourse of ‘women in computing’, following primarily American educational research, teaching practices and student experiences, reproduces asymmetrical social relations which contradict the actual capacity, skill and enjoyment women find in the work in other local (and non-Western) settings. In Chapter 5, I will focus on an international event which promotes the ideological practices which both promote ‘women in computing’ and which for me, as both participant and observer, draws out key disjunctures.

Thus, the study of ‘women in computing’ is not only about the study of the computing work women do, their production of knowledge in situated connection with technology, and of the social relations which both organize and are produced by this work. It is also the study of ‘women in technology’ as a productive discourse. These discourses, however, still move through an embodied female subject who is situated in her local knowledge. Smith’s work brings us back to this point. Vehviläinen and Heiskanen (1999) argue that the approaches to studying information technology should take local situated knowledges seriously, acknowledging the different social locations and concrete practices of actors.

Although technical artefacts are ‘fixed and touchable,’ they are also a part of social processes and indeed, transformed by them. Technology is not held apart from the social, and neither is the social subsumed by technological artefacts, as Latour (1993) seems to suggest. As Grint and Woolgar (1998) point out, Actor Network Theory (ANT) may be faulted for this same slippage beyond the social, though it claims a blurring
between human and non-human actors. Feminist critiques of ANT (Ormrod, 1995) argue that this blurring also undermines agency in a flow through and past embedded and embodied subjectivities, with little room for resistance or transformation. Similarly, technological determinism leaves no space for social transformation within technology. And, I argue, an essentialist view of ‘women in computing’ which fixes identity to exclusion and sets ‘women’s ways of knowing’ as inherently outside the epistemological practices of normative science and technology is technological determinism’s consort.

‘Women in computing’ as problematic

To return to my question in Chapter 1, how is it that after decades of observation and analysis, theorizing, state and industry ‘incentives’ and active participation of women in the IT field, ‘women in computing’ remains as a problem in the West?37 I argue that the ideological practice of problematizing ‘women in computing’ is the ‘problematic’ which presents itself for analysis. This inquiry is my entry point into the social relations which inscribe the identification and identity of ‘women in computing’ as a ‘problem’.

‘Women in computing’ as an ideological circle

These textual accounts of the ‘problem’ of ‘women in computing’ largely focus on an individualized view of both the problem and the solution, most typically independent of any analysis of institutional practices of power. Yet the individuals represented sit in as generic ‘simulacra’ (Baudrillard, 1994) because they are in fact textual practices of institutional power in the inscription of ‘women in computing.’ This

37 Dettmer (2002) notes that “the trend to male-domination in computer science is not universal” (29). He explains that in Malaysia, for example, more than 50% of computer science students are women. This is supported by an e-mail exchange I had with a woman programmer in Malaysia, who confirmed that there were many women in the field; she was a bit puzzled about my questions regarding women’s participation in IT, as it was not a ‘problem’ to her.
process of pulling individuals apart from the lived activity of their experience to a
generalized textual ‘idea’ which can then be recursively generated, widely circulated and
replicated in different contexts is what Smith calls an ideological circle, drawing from
Marx and Engels’ writing in *The German Ideology* about the ruling class and ruling ideas
(Marx & Engels, 1970).

Smith, following Marx, conceives of ideology as a *practice*, as the actual
observable activity of particular persons, concretely situated in local-historical settings
and acting together within divisions of labour which are complex and multifaceted.
People are active agents in these recursive ideological practices; ideology is not a matter
of outside subjectless forces enacting a kind of brainwashing upon individuals
(McKendy, 2004). As in Marx’s account, this ideological practice is initiated from the
standpoint of those who are part of the relations of rule, but through the recursive
organization of these texts, ideological practices are iteratively produced and reproduced
across time and space. Smith describes the operation of an ideological circle as follows:

First, ideas generated by these subjects are detached from the actual empirical
circumstances of their utterance, the actual material conditions of people’s lives, and
from the actual individuals who expressed these ideas. Once these ideas are detached
from their local context, they may be rearranged to demonstrate an order which accounts
for what is observed. The next step is to turn the ideas into a ‘person,’ that is, to set them
up as distinct entities (for example, a value pattern, norm, belief system, etc.) to which
agency or possibly causal efficacy may be attributed. Finally, these ideas are to be
redistributed to ‘reality’ by attributing them to actors who can now be treated as
representing the ideas. (1990a, pp. 43-44)

Once a concept is detached from its local context and the practices which
surround it, it can be reassembled in an orderly way such that, to restate Latour, it
becomes the only reasonable way to look at a situation, the only plan to take in order to
arrive at a solution. Thus, the subject ‘women in computing’ is assigned a series of

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attributes, which may or may have a basis in empirical fact,\textsuperscript{39} and strategies for remediating the ‘problem(s)’ may be put forth.

\textit{Ideology and identity: A brief example}

Smith’s concept of the ideological circle provides a basis for understanding how a certain identity is inscribed for ‘women in computing,’ through ruling beliefs about the presence of ‘women in computing’ as a problem. For example, this problem carries with it the unspoken historical ideological beliefs about girls’ and women’s innate lack of competence in maths and sciences (see Walkerdine, 1988). For many women who have been successful in these fields, identification with feminist aims to fight this ideological construct seems defensive or besides the point (see E. Hammonds in Longino, 1990; Williams, 2000).\textsuperscript{40} In this next section I apply some of Smith’s analytic frame to a student interview.

For the young woman, M, whose comments about hacking were featured earlier in this chapter, programming competence was not an issue, but she admitted to a dislike for (and a difficulty with) the compulsory math courses she was now compelled to take. To improve her chances for success, she chose to go into the software engineering specialization in order to avoid having to take a second year calculus course, from which that stream was exempt. She later found out that some male students who were ‘good programmers’ also deliberately went into software engineering for the same reason. But despite this admission of her own weakness in this area (and perhaps because of it), as we

\textsuperscript{39} Of course, as Latour & Woolgar (1986) show, an empirical ‘fact’ is also the result of practices, negotiations and agonism rather than a pre-given thing in itself.

\textsuperscript{40} Valerie Walkerdine (1990) offers an interesting departure from this strategy, one which turns the burden of proof back on men to confront their fear of female competence.
saw earlier, she was very dismissive of the other women in her classes who ‘asked a lot of questions’. It appears that public display of weakness reinforces the ideology of ‘women in computing’.

In the first interview, although she claimed a sympathy to feminism, which she understood as ‘equality’ or ‘equal rights for women’, M appeared to reject the ‘problem’ of ‘women in computing’. Several liberal feminist accounts reinforce this essentialized category by calling for special attention to ‘women’s particular learning needs’ as a possible solution to women’s lack of confidence in the field (Beyer, Chavez, & Rynes, 2002). While she identified with hackers to some degree, what she displayed in our conversations was more a ‘disidentification’ (Butler, 1990) with actual women who seemed to fit the ideological representation of ‘women in computing’. Thus, M was active in the ideological circle of ‘women in computing’.

In a second interview with M, she talked about her paid IT job at PLab, working with two professors to use sophisticated programming skills for social activist interventions. For instance, one project involved ‘hacking into’ a particular government’s censorship of a popular search engine; government IT workers who were asked to prohibit distribution of some of the available information had simply blocked use of the whole site. Other projects involved talking to progressive political groups about security issues in a country with developing IT infrastructure. M was interested in the work politically and also loved the programming challenges as a ‘hacktivist’ (Jordan & Taylor, 2004). M had worked with the organization for two years, and it was ready to expand. Two male programmers were hired on independent projects, and M was asked to manage the lab, stepping away from programming projects:
SS: Ok, talk a little bit about the PLab.

M: So that’s the ‘hactivist’ lab that I’m working at…

SS: What projects are you doing now?

M: Several ones. The one that I’m mostly involved with is circumventing Internet censorship. So, managing people who are writing software to help others get around Internet censorship.

SS: That was interesting when you said that they’d rather have you do the managing than the programming.

M: Yeah. Because, well, they were considering for a while hiring someone to do the managing. They said, ‘The problem with that is that they’re going to take forever to learn all of the stuff, whereas if we just stick you in as manager, you already know all the stuff so you can do it, but then we’re losing a good programmer.’ So, they were having issues with that, and they finally decided…they kind of struck this weird kind of compromise where they want me to manage and program, and I don’t have enough time to do either properly.

SS: …For you, in terms of what *you* want to learn, is it more programming or managing?

M: I don’t know. At the PLab, I would much rather be doing the programming…um…because it’s really interesting stuff, and the managing’s just kinda getting tedious. Like, yeah. Managing has nothing to do with Computer Science. So, you might have to understand it to manage programmers, but it’s a completely different sort of thing. So, it’s not really…I can do it, but it’s not what I’m passionate about. [emphasis added]

As the professors pointed out to M, unlike a new hire she had the experience with the organization which would allow her to fit into its organizational ‘culture’ easily. She is also well-organized and has ‘good communication skills.’ The fact that she is a ‘good programmer’ became secondary to her management and writing skills. In her required group software design course, she had been asked to manage a group of more senior students while working to complete her own portion of the programming. While she felt this extra task was a mark of her professor’s confidence in her abilities, she had found the management responsibilities interfered significantly with the programming work she wanted to do:
M: It was a lot of work...managing...so, I was, first of all, doing my quarter of the project and managing, so if I was going to do it again, I wouldn’t do a quarter of the project...I would...because managing took more time than a quarter of the project took, so both together were just way too much. And I told my prof that and he laughed and said, ‘Ah, I can see why...you pass the course for just having said that, because that’s one of the things you had to learn.’ So, it took a lot of work figuring out who’s doing what parts of it, and getting things ready so when they’re done one task, the next one is all specified for them, and that sort of thing.

SS: Plus then you had to do the content work as well, more than a quarter of it.

M: Yeah [Laughs].

SS: If it had been a quarter of it, really, do you think it would have been manageable?

M: No, I think I should have just been managing. Because I was managing and doing tech support, because I knew all the stuff, so they were coming with questions, like ‘how do I do this,’ so it was really a dual role, and then add on that also being a member of the team, and it was just way too much work.

SS: But once you’re out in the work force, is that a job you’d like to do?

M: I don’t know. See, at the PLab where I’m working right now, they’ve sort of moved me from programmer to ‘she who manages programmers.’

....

SS: It’s a bit of a backhanded compliment because in a way this says, “We recognize your good ‘people’ and management skills...”

M: Yeah...that’s the thing...like, over this summer, we hit a point where documentation needed to be written, and the prof who was managing our project took me aside and said, ‘I know that by far you can write the best documentation, but at the same time, that means that you can’t be doing the coding for us...um...how disappointed would you be if you had to write documentation for a while?’ And at first I was like, ‘Uhhhhhhghhhhh...I’d rather kill myself’ but then I realized that I’m writing documentation, not user documentation, but documentation for the next group that’s going to be taking this over. And I was like, ‘Ah, that’s all right, because that’s more like teaching than really technical writing.’ So I thought, oh yeah, I can do that. So I sort of volunteered my way into that one. But, um, yeah...so it came up then, too, right? Because it’s sort of like, it’s a compliment, like, yeah, you can do both and we recognize that you can do both... [emphasis added]

M’s experiences recall Tierney’s (1995) case study of the career paths of two women software engineers in a high-tech firm in Ireland; in one example, a woman was put in charge of training young male recruits, who were then promoted past her. The other was moved into a Human Resources position. Although the study is a over a decade
old, these conditions are still present in the field, as feminist accounts continue to
document gender inequality in higher level IT jobs (see Scott-Dixon, 2004). Essentialized
notions of women as good communicators, organizers, writers and teachers become part
of the ideological practices of ‘women in computing’ which play against the everyday
experiences and desires of women skilled in and passionate about the technical work of
software design and programming.

These notions are not only part of institutional discourse but also find their way
into popular feminist texts. In her everyday work, M felt torn between her loyalty to the
organization, which motivated her desire to keep things running smoothly, and her own
keen interests in programming. However, in her subject position as “she who manages
programmers”, the complexities of ‘women in computing’ as an extralocal discourse
weave into M’s experience in a way which contradicts a binary victim-perpetrator
position. Using a Foucauldian analysis, a variety of contradictory discursive practices and
the power relations produced by them also meant that ‘she who manages programmers’
was managing herself. Examining practices from the standpoint of women who are
actively producing computer technologies may be a way to re-write and complicate the
particular feminist script of ‘women in computing’ which locates women as
always/already victims.41

**Curriculum changes and/as text-mediated social relations**

Following Smith’s method, in unpacking the relational threads of M’s account, I
used the interview process to map some of the social relations organizing the institutional
practices which shape M’s work as an undergraduate Computer Science student. In IE

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41 Thanks to Dr. Kari Dehli for her elaboration on this point.
research practice, the purpose is not to generalize about the group of people interviewed, but to find social processes which have generalizing effects (DeVault & McCoy, 2002, p. 753). Thus, M or any other interviewee in this project is not studied as a ‘subject’ as in other forms of ethnography. Rather, in the interview process, M is an informant knowledgeable about school life as a female undergraduate Computer Science student; through dialogue with M about her activities, we both discovered how she is ‘subject’ to discursive and organizational processes which shape those activities. Using the methods of Institutional Ethnography, any institutional practice could be traced through printed, electronic or otherwise reproducible ‘texts,’ which might mean correspondence, policy briefs, curriculum guidelines, enrolment statistics, government legislation, forms, newspaper reports, multi-media presentations and even, as Marja Vehviläinen has introduced, computer software programs.

**Texts and everyday knowledges**

Smith’s examination of the institutional practices and texts organizing and coordinating actual people’s lives, her insights into consciousness and ideological practices, and especially her concept of a “bifurcated consciousness,” prove useful to my examination of the everyday and extralocal activities which organize both the actual lived experiences of women doing advanced computing work and the institutional ‘problem’ of ‘women in computing.’ I argue, however, that the changes which computing practices present to actual and intertextual relations call for a further development of feminist theory about subjectivity and identity in this work, a point which Vehviläinen also makes. I contend that this presents a weakness or at least a gap in Smith’s work when so much in
feminist thought of the last quarter century has taken up the topic of identity and subjectivity.

I would also suggest that there are ways to use Foucauldian analysis that do not preclude a focus on everyday practices and which recognize embodied subjects. Here both Bronwyn Davies (2000) and Valerie Walkerdine (1988, 1990a) focus on education and classroom practice through a feminist post-structuralist analytical lens; they bring rich thought to feminist concerns about how identity and subjectivity, and particularly gender, are produced through institutional practices. Walkerdine and Davies use Foucault to articulate how particular technologies of power work through subjects to make available certain knowledges about them, positioning them within or outside of educational discourses about, for example, the subjects of classroom behaviour management, child-centred learning or in this case, ‘women in computing’. For Smith, this ‘textual’ knowledge (which can include various communications media, information and communications technology, and software programs) is produced by actual people and distributed through practices which obscure its origin and its material effects. I argue that making these textual relations visible as discursive practices is a move toward both redirecting the ‘problem’ of ‘women in computing’ and reshaping the question.
Chapter 3: ‘Women in computing’ as a managed community of identity

For those who advocate an anti-politics of community, civil society or the third sector, part of the political attraction of these zones lies in their apparent naturalness: their non-political or pre-political status. But like the social before them, these ‘third spaces’ of thought and action have to be made up. Boundaries and distinctions have to be emplaced; these spaces have to be visualized, mapped, surveyed and mobilized. And perhaps, what distinguishes the contemporary spaces of community from those references to community in the social philosophies of the late nineteenth and early twentieth centuries is precisely this – that communities have been objectified by positive knowledges, subject to truth claims by expertise and hence can become the object of political technologies for governing through community. And these political technologies involve the constitution of new forms of authority of this new space of natural associations, and the instrumentalization of new forces in the government of conduct. (Rose, 1999b, p. 188) [emphasis added]

I’m the Coordinator [of the Computer Science department’s Women in Computing group]…and right now I’m just trying to formulate what the role of the Women in Computing group should be. At one extreme it’s just…it’s lunches, it’s an opportunity to create community for women, and at the other…you know, somewhere in the middle, maybe…it’s an opportunity for us to reach out in particular to undergraduates. But I want it to not be driven by me, or by the faculty – I want it to be driven by the graduate students, because that’s really who it’s meant to serve. And so one of the things I’ve decided that I really want to do is to try to get some of the graduate students involved in the mandate [of the group], so that it’s not just me imposing on them what I think should be their values. Because as much as I may feel that I’m in touch, I realize that I’m probably out of touch. You know, I’m one generation different, I had very different experiences growing up than they have.

- woman CS faculty member  [emphasis added]

Technologies of community

In this examination I have deliberately placed the category of ‘women in computing’ within quotation marks, as the purpose of my study is to differentiate this category as an imagined community from the everyday experiences of women who go about learning Computer Science (CS) at the graduate level. The formation of local ‘women in computing’ groups in the university setting echoes Nikolas Rose’s point above about the ‘apparent naturalness’ of ‘community’ as an alternative to institutional

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42 As Judith Butler (1995) writes of her own use of quotation marks: “The effect of the quotation marks is to denaturalize terms, to designate these terms as sites of political debate” (p. 54).
politics and hierarchical governing powers, even as ‘community’ is mobilized as an organizing institutional practice of governance. ‘Women in computing’ also draws upon a feminist political understanding of ‘community’, although this understanding is a site of both past and present challenges. North American feminist conceptions of ‘community’ since the 1970s have undergone continuing transformation and contestation, moving from the liberal and radical feminist romance of a unitary ‘women’s community’ to more complex understandings of ‘community’ as the interplay of contingent and discursive processes of identification. In this chapter, I will examine how current CS faculty’s earlier university feminist activism in a ‘chilly climate’ becomes translated through discourses of institutional governance as professional feminist expertise. As this chapter will also show, the student participants in this study find themselves organized through a ‘women in computing’ discourse which emerges both from an instrumentalist version of liberal feminist community and through the practices of neo-liberal governance through community which Rose describes above.

As in Rose’s description of ‘the contemporary spaces of community’, a community of ‘women in computing’ does not pre-exist or naturally come together through the mere presence of a group of women who are studying and/or teaching

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43 I define the North American strand of liberal feminism featured in this thesis as a political philosophy grounded in the belief that women are suppressed in contemporary society because they suffer unjust discrimination, a view which derives from historical liberal humanist thought about equal rights under the law (Pateman, 1988). Liberal feminists seek no special privileges for women and demand that everyone receive equal consideration without discrimination on the basis of sex. Liberal feminists seek to remove barriers that prevent equal access for women to Information Technology jobs not only to provide economic equality but to provide access to higher-paying jobs for women (Rosser, 2005). Like classic liberalism, liberal feminism stresses the individual and takes for granted the benefits of a capitalist system in enabling individual freedom under the law. Liberal feminist analysis does not consider systemic reasons for discrimination and thus does not examine intersecting social categories of race, class and gender. In the context of education in Information Technology and Computer Science, liberal feminists generally address the problem of women’s low enrollment in these programs with the view that increasing the actual numbers of women to achieve virtual equality is the best solution for achieving equality between men and women in computing work. These inclusion initiatives based on numbers appeal to the needs of government and industry to show that they are accountable to equality demands.
Computer Science. One of the student respondents most aligned with feminist discourses in computing\textsuperscript{44} questioned this ‘naturally’ occurring grouping in her response to a regular Computer Science ‘women’s lunch’:

\textit{It has to be more than just the fact that you’re a ‘woman in computing’ that bonds you together. ...} When I started graduate school there wasn’t much to attract me to those lunches, since there was nothing that I considered to be of great interest or concern to me. It was literally a ‘women’s lunch’, like, a bunch of women having lunch... [\textit{Laughs}] in the same room... [\textit{emphasis added}]

For this student, there was no inherent commonality to the group based on gender, other than the fact that they were all women, and they were all together ‘in the same room’. The lunches were organized by women CS faculty members ‘to create community’, as one faculty member put it. The faculty member recalled her own experience as a graduate student when the few women in Computer Science and Engineering bonded together informally in order to actively improve the chilly climate for women in their departments (Prentice, 2000). However, the institutional creation of ‘community’ sets formal boundaries that both constraint and enable practice. As Rose suggests, the boundaries of community space and the constitution of its actors have to be ‘made up’ and the knowledge or ‘truth claims’ about them produced.

In earlier work, Rose and Miller (1992) argue that political power in liberal democracy is extended beyond formal governance by the state to the work of various authorities or experts, “who endeavour to administer the lives of others in the light of conceptions of what is good, healthy, normal, virtuous, efficient or profitable” (p. 175). In Rose’s writing on governing through community, some of which opened this chapter,

\textsuperscript{44} In saying this I refer partially to her affiliation with the ‘women in computing’ discourse, which is described in examples throughout this thesis. For examples of this discourse, the student referred several times to gender differences in behaviour, choice of computer specialization, and social/practical versus mechanical/theoretical interests in computing. She also expressed an interest in feminist theoretical work.
‘experts of community’ produce knowledge which brings particular communities into being (for example, the new visibility of ‘at-risk youth’ as an anti-community in mainstream educational research). This knowledge is formalized into theories and concepts; experts offer advice on “how communities and citizens may be governed in terms of values, and how their values shape the ways in which they govern themselves” (Rose, 1999, p. 189). Rose makes the point that in the current attention given to community space by political institutions (‘community policing’, ‘community projects’, ‘community enterprise’), ‘indigenous’ community experts have a new political authority. The authority of these community-based experts is less easily contested than the claims of external experts and professionals because of their location in the “apparently natural space” of community.

The concept of governing through community is useful as a way to examine the imagined community of ‘women in computing’ as a site of institutional governance. Although Rose cites ‘Third Way’ (Giddens, 1998) programs to build strong communities through active responsible citizenship as “an attempt to create some novel links between the personal and the political” (Rose, 2000, p. 1398), he makes no mention of the earlier feminist insight, ‘the personal is political’, feminist concepts of community, or indeed, feminism at all. I suggest that in his blindness to issues of gender Rose omits a particular understanding of community developed in North American liberal and radical feminism, which not only underlines the social links between the personal and the political, but also

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45 The phrase was used by Anne Koedt and Shulamith Firestone, editors of the early radical feminist anthology, Notes from the second year (1970), as a title for Carol Hanisch’s paper (Hanisch, 2006). In the paper, and in other descriptions of the term, ‘the personal is political’ is meant to call attention to the exclusion of ‘women’s issues’ (deemed personal) and women’s embodiment from ‘real’ political concerns on the Left, and to suggest that not only are these issues of political importance, but outward political acts also have profound effects upon the everyday life of individuals.
serves as a mode of ethical governance and self-governance. These aspects of community have been an integral part of North American feminist discussion and political organizing since the late 1960s.

The desire for a community of women in Computer Science brought some of the women faculty members in this study together as graduate students in an informal network, which I will describe more fully in this chapter. As faculty, their intention to promote a similar atmosphere of support for women in Computer Science, particularly graduate students, led them to organize formal ‘women in computing’ groups for students and faculty, and to encourage student participation in other local and external ‘women in computing’ initiatives. I argue that the institutional discourse of ‘women in computing’ links the personal and the political in ways which not only recall a feminist past but also translate earlier feminist activism through the model of self-governance, self-efficacy and accountability in current university governance practices (Blackmore, 1997; Martimianakis, 2008).

This reconfiguration of feminist aims in the academy echoes what Barbara Cruikshank (1996) has written about the transformation of social movements (for example, feminism) into a ‘revolution from within’ (Steinem, 1992), as self-esteem emerges as a new technology of the self, “a specialized knowledge of how to esteem ourselves, to estimate, calculate, measure, evaluate, discipline, and to judge ourselves” (Cruikshank, p. 233). Similarly, ‘women in computing’ as a managed and managing community organizes women graduate students in Computer Science through get-togethers, meetings, workshops, conferences and other activities to focus on preparing themselves for the self-identity work

\[\text{\textsuperscript{46}} \text{Callon and Latour (1981) use this term to describe a transaction which enables an actor to take the authority to speak on behalf of others: “Whenever an actor speaks of “us”, s/he is translating other actors into a single will, of which s/he becomes spirit and spokesman” (p. 279).}\]
that they will need to do in order to be successful women in Computer Science careers. Student and faculty self-identity work will be the main focus of Chapter 4.

Central to my thesis is this transformation of the personal and political in contemporary liberal feminist encounters with neo-liberal governance. I explore how the community of ‘women in computing’ acts upon the ethical formation and self-management of women graduate students and faculty, how gendered and racialized student identities are mobilized in graduate Computer Science education, and how the promotion of the ‘women in computing’ community functions as an institutional technology for accumulation in the global knowledge economy.

In my discussion of ‘women in computing’ as a governing and governed community, I would also extend Rose’s thinking to another important and contested part of feminist theorizing which takes up both governance by community and governance of the self. One important means of community governance is through the authority of ‘experience’ (Scott, 1992). This authority serves to naturalize feminist ‘community’ (in a white middle-class North American context) as an unbroken line from earlier women’s suffrage to current gender equity concerns. In a recent essay, Scott (2001) challenges the imbrication of feminist histories into a linear narrative of progress:

In my recent book, Only Paradoxes to Offer, I tried, in the last section of each of the biographical chapters, to demonstrate that feminist identity was an effect of a rhetorical political strategy invoked differently by different feminists at different times. These sections constitute a critique of the notion that the history of feminism, or for that matter the history of women, is continuous[,,]...a vision of uninterrupted linear succession: women’s activism on behalf of women. The identity of women, I argue, was not so much a self-evident fact of history as it was evidence - from particular and discrete moments in time - of someone’s, some group’s effort to identify and thereby mobilize a collectivity. (Scott, 2001, pp. 286-287) [emphasis added]
In this chapter, I investigate different ways in which the community of ‘women in computing’ becomes a means both by institutional feminists and by university administrators to “identify and thereby mobilize a collectivity”, and how this identity is taken up (or not) by the students in my study.

**From ‘chilly climate’ to feminist expertise?: Feminist genealogies and ‘women in computing’**

They could sometimes admit that women were oppressed (but only by “the system”) and said that we should have equal pay for equal work, and some other “rights.” But they belittled us no end for trying to bring our so-called “personal problems” into the public arena—especially “all those body issues” like sex, appearance, and abortion. Our demands that men share the housework and childcare were likewise deemed a personal problem between a woman and her individual man. The opposition claimed if women would just “stand up for themselves” and take more responsibility for their own lives, they wouldn’t need to have an independent movement for women’s liberation. What personal initiative wouldn’t solve, they said, “the revolution” would take care of if we would just shut up and do our part. Heaven forbid that we should point out that men benefit from oppressing women.

– from Carol Hanisch (2006 [1969]), ‘The Personal is Political’ [emphasis added]

Perhaps the most fruitful distinction with which the sociological imagination works is between ‘the personal troubles of milieu’ and ‘the public issues of social structure.’ ….Consider marriage. Inside a marriage a man and a woman may experience personal troubles, but when the divorce rate during the first four years of marriage is 250 our of every 1,000 attempts, this is an indication of a structural issue having to do with the institutions of marriage and the family and other institutions that bear upon them.

- C. Wright Mills (2000, pp. 8-9) [emphasis added]

The faculty members who sought to ‘create community’ in order to mobilize graduate women CS students drew upon their own experiences as an ad-hoc group of women graduate students in Computer Science at a different period in the history of the university. In the 1980s, as some of the feminist activism of the late 1960s and the 1970s in Canada and the United States was beginning to be taken up on a more formal level in academic life, women’s caucuses organized in different faculties and in student groups to draw attention to ‘women’s issues’, and to open up disciplinary areas which had few
female faculty members and students. Women also began to focus on campus safety, including formal complaint procedures for sexual harassment by faculty and other students. Alongside these more visible concerns, some feminist faculty and students at the universities argued for structural change by confronting the deeply embedded and invisible discriminatory practices which created a ‘chilly climate’ for women at the university (Chilly Collective, 1995; Janz, 2000; Osborne, 1995; Pascarella, 1997; Prentice, 2000; Pyke, 1997). Most of this discussion got its start in regular informal meetings of women to share experiences and common concerns, much like the ‘consciousness raising’ groups of earlier decades.

The need ‘to come together for communication and support’ had a definite meaning for some of the women from a previous generation of Ontario graduate students in Computer Science in the 1980s. A faculty member who had started an informal group with other women graduate students in CS when she was a doctoral student talked about the original purpose of their group:

Faculty: So you probably heard about the…a number of people you interviewed were involved in a group that I was in at university [in Ontario, in the 1980s]…we had a number of…most of the PhD women students got together and we had sessions where we talked together, and there were definitely people who were not in the group because they didn’t see a need for it, and there were people that…most of us in the group had…could look back to the time where we didn’t realize there was a need because even though we knew that we were outnumbered, we didn’t view that we were ever being treated any differently, and I think for a lot of it, it was a realization….even there were times in that meeting, I remember one time one of the people talked about working as a TA and how disrespectful some of the students were….And somebody else said, ‘Hey, this happened to me, too…’

And it became clear around the room that it wasn’t her as an individual, it was her as a woman, and she didn’t realize it then, until she talked to a number of people, and realized that no, it wasn’t just her. And I think that’s a lot of….you talk about this ‘moment of truth’ where you sort of sit back and say, ‘Ok, wait a second…you’re

47 All of the current women faculty I talked to defined themselves as feminists, though their individual meanings of this term varied. Although some didn’t affiliate with feminism in a strong way when they were students, they were surprised at current students’ reluctance to call themselves feminists.
right.’ Now it colours what you’ve seen before to say, ‘This is something where I’ve been treated as…this…this…this…or this…it wasn’t because of me.’ And that’s a moment to come to. So I can imagine that a woman who has not gone through that in the educational system would not see the need, not having experienced that directly, and maybe taking a while before those experiences mount up enough to realize that there’s an issue [Laughs].

But the other thing to keep in mind for all of us….especially, I grew up in the United States, which is not very different from Canada…is we’re the survivors. We’re the ones who could put up with all the crap, and we had enough, a strong enough sense of self, or our personalities are such that we fit in well enough with the dominant, mostly male environment that we were able to do fine. So we would be the last ones who’d be able to tell that the atmosphere is poor…in some sense we’re part of it, if that makes sense [Laughs]. We were selected for being able to put up with toxins, so we’re probably not the best ones to detect it, necessarily.

We got together once a month, and the reason for the gatherings was that we were such a small minority, we didn’t see each other regularly. It was so small that it was really very much a case of exchanging common experiences --- ‘it happened to me’ – and it was very much a support group for us, you know – ‘I’m having doubts,’ and ‘no, it’s not really you’ and ‘Hang in there!’ …

SS: Consciousness raising?

Faculty: To some extent – a lot of it was just venting. We’d vent in ways that we’d had experiences that others didn’t have. And some of it was just general grad student angst … it was nothing that was female-specific, but the fact that we were there to support each other would hopefully help keep people in the program. So that was part of that. [emphasis added]

It is interesting that this was a student-initiated intervention to ‘help keep people in the program’ – each other – rather than an external institutional project to help support enrolment goals. Even though the faculty member denied any direct activist intentions for the group, the students organized themselves effectively outside of a then-non-existent institutional ‘women in computing’ discourse:

SS: Did you feel, out of that program, or out of the group of you getting together, that there were some initiatives that you really could put forward? Did it get to be activist?

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48 I had previously mentioned that some of the student participants from outside of North America or Western Europe were very surprised at the level of sexist behaviour that still went on in Canada and the United States, which they considered so ‘advanced’ in matters of gender equality. In their countries of origin they had not experienced a similar challenge to their competence in Computer Science.
Faculty: It wasn’t intended to be, it was really intended to be just a… it wasn’t intended to be much, just support for people and encouragement. I remember in an early… one of the early meetings… we talked about who was thinking of going on, getting a faculty position. I was more… closer to graduation than many of the others, and I think I was just about the only one who said I would… I was kind of surprised at that - a lot of them talked about balancing family – almost all of them are faculty members now [Laughs] – which is kind of nice – but at that point, just having that discussion and ‘here are our doubts,’ and ‘here are our fears,’ and so forth. So, it didn’t have a direct goal, but I think that indirectly, it was positive. [emphasis added]

In fact, another faculty member who was also part of the group discussed how she and other group members later went on to do activist work. For example, she and several others presented a report to the university about improving the ‘climate’ for women in science. Among the local concerns for women in Computer Science at the university was building and campus safety at night when they worked late in labs. The women who worked on this project, from a range of science areas, succeeded in getting the university to do a safety audit and to put several of their suggestions into effect. The group which the latter faculty member described emerged out of the everyday experiences of women in graduate Computer Science and Electrical Engineering programs in what they perceived at the time as a ‘chilly climate’ for women in science and engineering.

Although women’s numbers in these fields were smaller than they are currently, the late 1980s and early 1990s spanned a wave of feminist research work and activism in science and technology in Canada and the U.S.

Thus the women faculty in this study who first started an informal ‘women in science’ meeting group worked actively to create their own interventions into the male-

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49 This phrase was coined in 1982 by American researchers Roberta Hall and Bernice Sandler (1982) to describe “a number of practices [in university settings]….which cumulatively communicate lack of confidence, lack of recognition and devaluation, and which result in women’s marginalisation”. It is used by feminists in the academy to describe “the normalising and normalised gender regime which characterises the university as an institution” (Prentice, 2000, p. 196).

50 See, for example, Franklin (1990) and Canadian Woman Studies (1993), special issue, ‘Women in Science and Technology: The Legacy of Margaret Benson’, 13(3).
dominated cultures of Computer Science and Electrical Engineering. However, as Scott suggests above, these political moves are messy and contradictory rather than stable and continuous. The erasure of this history of struggle is part of the dehistoricizing practices of both neo-liberal and scientific innovation discourses, but it is important to remember that liberal feminism has also enrolled in these discourses of linear progress, a point I will make further in Chapter 5’s exploration of policy. It is also part of the university’s disciplining of feminism and its public portrayal as an outdated and irrelevant project for current female students (see Blackmore, 1997, pp. 81-82). More will be said in Chapters 4 and 5 about how the production of both post-secondary reform policies and institutional gender equity work as intersecting regulating effects for the students and faculty in my study.

In the mid-1980s, contestations for gender equity (and other forms of equity-seeking, around issues of race, class, ability and sexual orientation) along with the development of Women’s Studies programs and academic feminism, were beginning to generate a more formal process for equity claims in various Canadian universities (see Martimianakis, 2008). A new form of university governance came into being, with equity policies under the expertise of equity officers. In 1986, the federal government brought in the Canadian Employment Equity Act, which mandated universities, as a federally regulated employer, to “provide equal opportunities for employment to the four designated groups: women; Aboriginal peoples; persons with disabilities; and members of visible minorities” (Canadian Human Rights Commission, 2008). This resulted in the establishment of university equity oversight functions, either as the job of separate equity officers or as a responsibility of senior administrative faculty, in order to draft equity
targets and to monitor their implementation through annual submitted reports. Equity practices are thus made countable though not easily quantifiable by this translation through accountability.

This rationalization of institutional responses to ‘equity’ is very different from the examination of local systemic practices of discrimination which ‘chilly climate’ reports sought to make visible. Yet to have a university department or a particular faculty and/or administrator appointed to be accountable for the university’s attention to equity matters shows a degree of success by feminists in the academy. Unlike the situation for academics who attended graduate school in the 1980s, issues such as sexism homophobia, racism, classism, ablism and transphobia are all seen as unacceptable in official university policy. However, as one equity officer I interviewed explained, it is very difficult to track how the university’s censure of this discrimination is taken up in the everyday lives of students and faculty (see Wagner, Acker, & Mayuzumi, 2008). Much of the work she does is ‘unquantifiable’ in the terms of measured outcomes, but in practice she sees indications of both successes and failures. She is aware, also, of the gap between the equity language in policy documents and how these policies are put into practice (or not) in specific departments, but she still requires representatives from individual departments to come to her with documented complaints before any action can be taken. The textual capture of ‘climate’ issues into legalistic language, as in the ‘chilly climate’ reports of the past (Prentice, 2000; Smith, 1997; Wylie, 1995b) translates systemic problems into reports of individualized and individuated ‘incidents’ or ‘violations’ which then become a part of university governance, or, in more severe cases, criminal law.
What I wish to articulate in this chapter is a genealogical shift in which institutional feminist expertise intersects with neo-liberal university reorganization through discourses of excellence, equity and accountability (Martimianakis, 2008), including graduate student and faculty accounting for the self, to produce a certain subjectivity, or ‘identity’ for ‘women in computing’. The latter self-accountancy process, through self-identity, will be examined in more detail in Chapter 4.

‘Most of us do live here, right?’

The production of knowledge about ‘women in computing’ through ‘community’ expertise inscribes the subject positions made available to its participants. Thus, the formation of ‘women in computing’ communities through institutional feminist expertise becomes what Rose describes as a political technology for ‘governing through community’, a technology which, following Foucault, he links to the governance of the self. This hybrid, ‘made up’ community space intersects with on-the-ground organization of community among student activists. In this space of interaction it may serve to set institutional boundaries for action. One student participant talked about how her activism as an undergraduate at another university was encouraged by the department. Students felt part of a Computer Science ‘community’ through participation in CS department decision-making. She contrasted this atmosphere of transparency against her current department’s culture and against vague institutional policy directives toward ‘improving student experience’. Her frustration with the institutional limits upon her involvement as

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51 This policy directive is part of Ontario: A Leader in Learning (2005) (from here on referred to as the Rae Review), a review report for Ontario post-secondary education restructuring by former Ontario premier Bob Rae. The phrase ‘improving student experience’ is also part of post-secondary restructuring policies elsewhere in Canada and abroad; it frames a neo-liberal consumerist approach to serving students as customers. As part of their duties under Ontario higher education restructuring policy, universities and community colleges are required to conduct annual surveys of student satisfaction and to post the results on
a student in the CS department as a ‘community’ confirms what Rose theorizes about the management of community ‘boundaries and distinctions’ and the dissemination of knowledge through ‘expertise’:

Student: When I was at [another out-of-province university], I was very active in my undergrad, and I sat on committees, and worked as a rep for the Undergraduate Society, and I did lots of stuff for them….And what I found here was….there is no such thing [Laughs]. So, I come here and I want to know what’s what…isn’t there an Undergraduate Affairs committee?…And, how come none of the students are on these committees? And why is it all faculty-run? And how come the minutes aren’t at least posted for public knowledge – our knowledge? …There was no sense of ‘open house.’ You know, we had an open house for each of the labs…we would open up the rooms and high schools would just come in and go through them. And slowly now, they’re starting to have these things, but just….there’s a completely different culture here. [emphasis added]

SS: How so?

Student: Well, the whole idea of knowledge dissemination just doesn’t seem to exist. Knowledge of anything seems to be kept in its local place. They don’t publish their minutes, they don’t distribute it within the department, even. A lot of issues are not known until they get really big and blown out of proportion….Students are now allowed to be on the committees, because I complained about this, and so they’re there now…But, still [Laughs]….just the sense of students being part of the department…that was not there five years ago when I first came. A lot of it was, you know: ‘Mind your own business and do your research, because that’s what you’re here to do.’ And it shouldn’t be like that…At least the way it was run at [the other university], anybody’s welcome who’s interested in the community that they’re working in , all the time – because most of us really do ‘live’ here, right? [emphasis added]

The student ironically noted the role of graduate students as TAs and sessional teachers in contributing to this ‘improvement’ of the undergraduate experience while graduate students’ own material conditions for teaching were getting worse. She recognized her fellow Computer Science graduate students and faculty, male and female, as an actual community: “most of us really do ‘live’ here”. As part of a community of public websites. The quality of teaching and of student-faculty contact are part of this ‘quality control’ assessment.

52 Teaching assistants had regularly struggled with the university over workload intensification and pay. The student and other graduate students in her union had just successfully fought an attempt by the university to increase the hours of TA work as a component of their guaranteed funding.
value to the department and to the university both monetarily and through enhancing the university’s reputation with their research, she expected to have agency in how that community worked.

In effect, the student’s affiliation with this particular community links her personal aspirations with department and university governance, even if she opposes certain practices. Following Foucault, Rose suggests that ‘community’ acts as a technology which extends practices of ruling ‘beyond the state’ to the conduct of individuals (Rose, 2000; Rose & Miller, 1992). ‘Community’ acts upon “the ethical formulation and self-management of individuals to promote their engagement in their collective destiny, in the interests of economic advancement, social stability, and even justice and happiness” (Rose, 2000, p. 1398). The student’s work in seeking committee representation by students fulfills the department’s and the university’s mandates to increase accountability and to enrich ‘the student experience’. More will be said about these policy targets in Chapter 5.

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53 For the group of English and American scholars who use ‘governmentality’ as a frame for political analysis in their specific histories of the present, the concept of governing beyond the state ‘at a distance’ (Rose & Miller, 1992) is particularly useful in understanding neo-liberal forms of governance, which decentralize the role of traditional state or sovereign-centred rule.
Creating community through regulated self-identities

In this chapter and the chapter which follows, I show how institutional feminist strategies to create a community of ‘women in computing’\textsuperscript{54} are set in contradictory relationship to the formation of performed individuated and competitive subjectivity in the self-identity of graduate students. At the same time as ‘women in computing’ discourse promotes community, liberal feminist support for women as autonomous and entrepreneurial subjects compliments an individualistic self-identity. This individuated identity formation includes the accumulation of knowledge resources, intellectual (cultural) and material capital (Bourdieu, 2000). In a local context, it is important to consider how the research culture under SSHRC, NSERC and CIHR\textsuperscript{55} (among others), and carried out according to specific resources at each Canadian university, directs graduate students to take up the management of self-identity. The self-management of the graduate student toward the ideal autonomous, self-directing and self-regulating subject is produced through evaluation, progress reports, examinations and other comparative measurement devices as instruments/technologies of this subject formation. I will continue the above discussion in more detail in Chapter 4, which will examine the formation of individual identity through ‘women in computing’ more explicitly.

An important part of how graduate students become part of the ‘new’ corporate culture of the academy is through establishing ‘communities’ of awards recipients, researchers in SSHRC/NSERC/CIHR-funded projects, project teams in ‘Centres of

\textsuperscript{54}The ‘caring script’ (Acker & Feuerverger, 1996) is at play here, with the desire to create ‘a safe space’ for women graduate students and faculty, and the responsibility (both mandated and felt) to mentor graduate students. This seems an odd clash with the faculty member’s comment about being selected for CS because of her resistance to toxins.

\textsuperscript{55}The Social Sciences and Humanities Research Council (SSHRC), the Natural Sciences and Engineering Research Council (NSERC) and the Canadian Institutes for Health Research (CIHR) are the largest federal funding bodies for social sciences, natural sciences and health sciences.
Excellence’ and through work under Canada Research Chairs (Atkinson-Grosjean, 2006). These practices of seduction into the realm of an intellectual élite centralize and organize the social relations of knowledge production. Under this increasingly centralized research regime which is also increasingly funded beyond the State, one may ask what kinds of research questions are being rewarded and what kinds are being ignored. As Rose notes, “New ‘experts of community’ have been born, who not only invent, operate and market these techniques to advertising agencies, producers, political parties and pressure groups, but who have also formalized their findings into theories and concepts” (1999, p. 189).

The university increasingly reinvents itself as an entrepreneurial producer of this expertise as a purveyor of innovation and ‘value-added’ research for the knowledge economy (Florida, 1999). In Foucault’s concept of governmentality, the self-conduct of subjects through neo-liberal discourse is framed in the economic power of this expert knowledge (Gordon, 1991). In this thesis I show how the discourse of ‘women in computing’ comes to represent the contradictory and productive intersection of feminism in the academy with the discursive practices of university reinvention.

**Feminist entrepreneurs of community**

As part of my research question I ask: how do liberal feminists serve as these ‘experts of community’ in academe, in business and in government, when promoting the ‘community’ of ‘women in computing’? Although this question will be explored in greater depth in this chapter and elsewhere in the thesis, I will introduce some preliminary concepts here as a context for a discussion of the student performance of

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56 A particular example of this promotion is the annual ‘Grace Hopper Celebration of Women in Computing,’ started by the late IT entrepreneur Anita Borg in 2001, which brings together a ‘community’ of women “representing industrial, academic and government communities” (conference website, http://www.gracehopper.org). I will discuss this event in detail in Chapter 6.
‘women in computing’. I argue that liberal feminist ‘experts of community’ utilize various political technologies for the governance and production of a new feminist entrepreneurial subject in Computer Science and Information Technology (IT) (see Napier, Shortt, & Smith, 2000). For example, this practice overlaps with international neo-liberal IT development projects such as those sponsored by the World Bank and the UN (Huyer, 1999; Moll & Shade, 2004), where ‘community expertise’ regarding women as a global category is mobilized as an economic resource (Bergeron, 2001; Rittich, 2001).

Of the women participants in this study, students and faculty members both, it was clear that some had taken up liberal feminist discourse to assert a belief in equality, free choice, and in their use of self-identity in the ‘community’ of ‘women in computing’ as a beneficial resource (for example, in access to scholarships, or as an attractive aspect of their working self-identity in academic job interviews where gender equity may be a part of hiring policy and enrolment goals). For others, a strong assertion that their success in the field should be based on ‘objective’ standards of merit and not on gender led them to question and resist the discourse of ‘women in computing’, even as they are ‘made up’ by it (Hacking, 1986). In the next section of this chapter, I will discuss how community expertise in ‘women in computing’ pedagogic practices becomes a reputational resource for Carnegie Mellon University as a text for institutional conduct that can be distributed across many sites.

The Carnegie Mellon effect

Performativity works from the outside in and from the inside out. As regards the latter performances are, on the one hand, aimed at culture-building, the instilling of pride, identification with and ‘a love of product or a belief in the quality of the services’ provided. On the other hand, ratings and rankings, set within competition between groups
within institutions, can engender individual feelings of pride, guilt, shame and envy – they have an emotional (status) dimension, as well as (the appearance of) rationality and objectivity. (Ball, 2000, p. 2) [emphasis added]

As in the example of organizational culture-building above, it is integral to the organizational plan of university ‘women and computing’ groups (Frieze & Blum, 2002) to build a culture of identification, but the discourse of ‘women in computing’ works in disparate and contradictory ways for both the institution and the self. In this chapter I will not attempt a genealogical tracing of North American white liberal feminism, but, as previously discussed, the ‘women in computing’ discourse derives from a ‘second wave’ feminist culture which had at its centre a highly problematic unity of identity as ‘women’. In university ‘women in computing’ culture-building, this community of identity aligns itself with university aims for a marketable and competitive knowledge economy culture of merit and expertise, discussed earlier in this chapter. Within this inter-university, inter-provincial and inter-national competition a seemingly ‘visible’ commitment to gender equity through these ‘group’ projects advances the institution’s reputation. In particular, Carnegie Mellon University (CMU), in Pittsburgh, PA, has benefitted from this identity work and has marketed its expertise in the area of ‘women in computing’ as part of the competitive practices of the ‘innovative university’. In this section of the chapter I will discuss the dispersal of the CMU approach (and its influence on other institutional feminist interventions in CS/IT) as an extralocal textual relation which is transportable across different sites and made operational through particular institutional practices (see Smith, 1990a).

57 The unity of ‘women’s’ identity has been contested from a wide range of feminist perspectives, most notably from US Women of Color and from feminist post-structuralist theorists. For examples, see Moraga & Anzaldúa (1983), Butler (1990) and Riley (1988).
Before I examine some of the translation problems in writing the particular social context of the Carnegie-Mellon experience into an extralocal and circulating institutional text (in discursive interplay with postsecondary restructuring), I will first give a brief description of some of the basic ideas in Margolis and Fisher’s approach. The program’s transformation was not merely due to the implementation of a specific set of new courses but to an intervention which required the somewhat hyperbolic vision of ‘changing the university’, or, at least, changing what they considered to be the culture of university Computer Science.

Margolis and Fisher, in *Unlocking the Clubhouse* (2002), describe their approach to improving the undergraduate Computer Science program at Carnegie Mellon, in order to encourage an increase in the proportion of women who would enroll in Computer Science and also to attract a wider range of students in general: “When we began our study in 1995, the undergraduate program at the School of Computer Science at Carnegie Mellon University was overwhelmingly male and included few non-Asian ethnic minorities” (Margolis & Fisher, 2003, p. 17). They were also concerned about the high rate of attrition among women students, which was more than double that of men. Their very successful intervention, which resulted in the proportion of women entering the program rising from 7% in 1995 to 42% in 2000, has become the model for CS inclusion strategies for women in universities throughout North America.

One of the main assertions of Margolis and Fisher’s initiative is that the low numbers in female undergraduate enrolment in Computer Science are due to the influence of “the male norms of who can do computer science” at many stages of a student’s university career (2003, p. 17). For some students, the sense of their own lack of
background in Computer Science, of not having been ‘obsessed with the machine’ from early childhood, kept them from enrolling in the first place. For others, this feeling of a lack of fit came after unsuccessful results from early assignments or tests in first year university core CS courses.

Many of my study participants noted that even with the relatively few women who started in their undergraduate Computer Science classes, their attrition rate was high in the first year of undergraduate CS studies compared with the proportion of male students who left. Several of the students commented that there were also many male students in the class who did poorly, but they didn’t tend to drop out; they were committed to future studies and future careers in Computer Science. One student said she was amazed that while superior women students in her undergraduate classes felt they weren’t up to the class standard and left, mediocre male students “thought they were the greatest”. A major part of the Carnegie-Mellon initiative involved curricular strategies to change the ‘culture of computing’ at the institution so that students (not just women) who were inexperienced in Computer Science in their secondary education could follow a number of different first year pathways. This allowed students who lacked programming background to catch up and move on to advanced courses and also to gain a sense of where they could ‘belong’ in the field. The curriculum also included what Margolis and Fisher describe as an ‘immigration course’ to present a broader view of computer science beyond the narrow focus of introductory programming courses, in order to show the range and breadth of the CS field, and its ‘real-world’ applications.

Margolis and Fisher, and others who have worked on the Carnegie-Mellon project with them (Blum, 2001; Frieze & Blum, 2002; Margolis & Fisher, 2003), have made the
claim that the results of the program can be replicated elsewhere. As I have previously suggested, the CMU plan has provided a model for promoting ‘women in computing’ at the two universities in my study. The authors make four recommendations for initiating a similar change in other university CS programs: first, and of primary importance, is their directive to “pay close attention to the quality of the student experience”, noting that “[w]omen and other students who do not fit the prevailing norm are disproportionately affected by problems like poor teaching, hostile peers, or unapproachable faculty” (Margolis & Fisher, 2003, p 19). As the student informants pointed out above, the typical early ‘weeding out’ process, with high failure and attrition rates “to let only the brightest and most committed through” often encourages bright and committed women to select themselves out of a CS program. A female faculty member who had taught several undergraduate courses commented on practices in her own department:

I can think of one of our young lecturers, teaching capacity, who is extremely well liked by the students. Most of them are male, and this person teaches the core Computer Science course. And I think one of the things is that the young male students look up to these young lecturers who are their models for what they would also like to be. The person I’m thinking of, one of my students was mentioning to me that in the class, half the class had failed the midterm, and to my mind, that signals that the professor, the instructor has done something wrong. When you have highly qualified, hard-working students, there’s no way that half the class should fail. But the students, instead of taking umbrage, saying ‘Let’s go to the undergraduate chair and mount a protest’, took it that they were at fault: ‘Well, he’s so demanding, he’s so good. He must be in the right.’ And I think this breeds an inferiority in students, a loss of self-esteem, in that they’re always trying to appease professors, whose demands can be so arbitrary; for these students there’s a sense that...how can they ever achieve, how can they ever do well? It’s the boot camp mentality. Or, if you remember the TV series The Paper Chase, with Professor Kingsfield saying to the incoming lawyers, ‘You come in here with a skull full of mush, and if you survive, you’ll be thinking like a lawyer.’ And that’s the attitude.

And I think that really puts off people who might otherwise be very talented in Computer Sciences, particularly women, but not just women, males who are not of this mentality, because they don’t want to put themselves through that...We have had a very high

58 Note that ‘the quality of the student experience’ figures largely in the current language of postsecondary education reform documents; of specific relevance to this study is its use in the Rae Review (2005). See Chapter 4 for a discussion of this policy.
attrition rate in Computer Science. We had before…as the new cohort came in at a younger age, at 17. But it is still an issue at our departmental meetings that our attrition rate is worse than the rest of the university. And we’ve been looking into this, to see how it might be improved. [emphasis added]

To offer alternatives to this masculinist hazing culture, the second of Margolis and Fisher’s recommendations is “to accommodate a wide range of computing experience among incoming students” (p. 19), achieved through the four different curriculum pathways mentioned earlier. The third recommendation concerns curricular offerings which promote the breadth of Computer Science practice, an awareness of its role in society, and the presentation of role models for future career paths. Finally, and most important to the next part of this chapter, is the recommendation for the formation of ‘women’s groups’ as a structure for women students “to come together for communication and support”. At CMU the Carnegie Mellon Women@SCS group was formed both to integrate new women students in the Computer Science program into departmental participation and to create an advisory council of activist women students (both undergrad and graduate) to guide the faculty advisor and program coordinator in improving the enrolment and inclusion of women in the School of Computer Science.

While much of the text generated by the CMU project both produces and disperses the essentializing discourse of ‘women in computing’, the description of the actual project makes clear that a critical part of the project’s range and subsequent success had to do with the support of university administrators at the highest level, including the Dean of Computer Science and the President of the University, and with the immediate involvement of activist students. The project responded to the specific needs of a particular group of students, faculty, staff and administrators, with sufficient
resources and an overall plan which was a reputational accomplishment consistent with CMU’s branding as a technologically innovative, entrepreneurial university.

The Carnegie Mellon plan as an extralocal governing text

In its dispersal across other sites, the Carnegie Mellon plan’s definition of the ‘problem’ inscribes the subject of ‘women in computing’ and obscures or closes out other ways of looking at the problem of women’s underrepresentation in Computer Science. For example, concentrating on the ‘culture’ of Computer Science and describing women’s interests in Computer Science through the lens of liberal feminist psychology theory serves to: a) frame the conditions and practices of Computer Science as a static and unchanging set of departmental operations standing outside of other university programs and larger socio-economic structural conditions in operation both nationally and globally, and, b) inscribe the essentialized subject of ‘women in computing’ with a set of general characteristics which stand apart from the institutional discursive practices which produce said subject/subjection/subjectivity.

It is important to stress that the reasons for the success of the CMU plan at Carnegie-Mellon have to do with the fact that many of the suggestions in the plan are good pedagogic practices for all students, not just for women. Primarily, of ultimate importance to the success of the plan as a specific strategy at a specific institution was the commitment by the top university administration to the plan’s implementation with all the necessary material resources, including staff, faculty and administrative organization, to put the plan into action. This included engaging and training teachers and administrators at the high school level to support curricular preparation for higher level programming work and to encourage more students, particularly those from
underrepresented groups, to pursue Computer Science at the university level (Blum, 2001).

In offering up the plan as a text which can be transmitted across different sites, the specific processes, which were not achieved in a linear and smooth fashion, are translated into a set of step by step practices. This leads to the black-boxing of discursive processes involved in introducing the project, gaining support, negotiating just how and with whom the implementation would take place, as well as settling conflicts and controversies which arose along the way. What also becomes hidden are the specific features of institutional life at CMU which made the project possible and which contributed to its success. This omission tends to focus potential failures upon individual departments and upon ‘women’s’ lack of interest in Computer Science, despite attempts at outreach. Even more critically, it hides the social production of gender in the university in general and in the disciplinary field of Computer Science specifically.

Reduced to a series of suggestions, the CMU plan becomes an array of ‘best practices’ from which administrators can select elements according to institutional objectives and resources without necessarily making the local changes in program philosophy and delivery which Carnegie Mellon’s own transformation required. It is clear from accounts of the CMU implementation of the plan that administrative support functioned at a variety of levels and that the university coordinators understood the necessity for a holistic and overarching set of principles and practices if the project was to be successful (Blum, 2001; Margolis & Fisher, 2002).

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59 As Dr. Kari Dehli commented on this point, ‘best practice’ is a key technology of neo-liberal organizational governance. Carnegie Mellon makes its strategies for organizing campus ‘women in computing’ groups widely available on the Internet, and the university has recently opened up a branch of its computing school in Qatar.
Key to this approach is the involvement of graduate (and undergraduate) women students in the ongoing planning and monitoring process (Frieze & Blum, 2002). This is the fourth recommendation in Margolis and Fisher’s set of measures for implementation, and it is of critical importance institutionally. It is also the recommendation which is taken up in the most problematic way for the women students at the two universities in this study. The recommendation “that structures be established for women students to come together for communication and support” and the suggestion that “[s]tudents who belong to women’s groups often have a much stronger sense of the presence and participation of women than statistics alone would suggest” (pp. 19-20) has different institutional interpretations and effects for the students I interviewed.

As their accounts reveal in this chapter, the graduate students in this study did not so much feel a need to find a group for ‘communication and support’ as they wanted to have a chance to effect some departmental/institutional change on how their experiences as graduate students took shape. They also wanted to network with other women in their particular area of specialization for technical advice. Ironically, the existence of the group as evidence of ‘the presence and participation of women’ in their Computer Science program often had a negative effect upon their own self-perceptions and upon their hopes to help implement change.60

Some of the students sought other means to become involved by participating in departmental graduate student associations and in union activities for teaching assistants, rather than affiliating with ‘women in computing’ or ‘women in math/engineering’ groups. The contradictory institutional ‘gender equity’ agenda, in concert with faculty

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60 At one of the sites, students said that an aggressive male faculty member had shown up to protest the ‘women-only’ meetings, and other women did not attend because they could not bring their male partners.
goal-setting for such groups as a ‘safe space’ for ‘communication and support’, but not for activism, sent a confusing message to these highly motivated and independent graduate students. S’s comments reflect this contradiction; she was suspicious of being ‘singled out’ as needing ‘special attention’ in the ‘women in computing’ discourse in a way that seemed to deny her own efficacy in seeking student leadership in the department. She also worried that such a distinction for ‘special treatment’ (for example, scholarships and conferences for women) would seem ‘unfair’ to her male colleagues.61

To S and to some of the other students, who identified themselves as autonomous, independent and highly competent graduate students in Computer Science, the ‘women in computing’ groups seemed a position of powerlessness. In such a position, they felt subjected and subjectified as ‘women in computing’ for special interest from the university but with little direct power in effecting institutional change where gender inequity was identified. Unlike the Carnegie Mellon example, the presence of a ‘women in computing’ group was not necessarily an indication of any integrated attempt by the university to encourage women’s enrolment and ongoing participation in Computer Science, or to encourage graduate student participation in any comprehensive plan to change the male-dominated ‘culture of computing’ through curricular change. Rather, it seemed to students that the existence of the group and the funding of ‘get-togethers’ served as the main commitment of the department (and of university administrative resources) to gender equity, though both universities were concerned about the declining enrolment of both male and female students in undergraduate Computer Science.

Both Mackenzie and Pearson (my two fictional universities) appeared to be incorporating some of the Carnegie Mellon suggestions for expanding the appeal of

61 S’s comments appear in more detail in Chapter 4.
Computer Science to underrepresented groups. For example, they broadened the courses they offered. This new approach was particularly visible in interdisciplinary course offerings such as Bioinformatics, which administrators hoped would attract more female students in the way that Biology had in the natural sciences. Unfortunately, initiatives to encourage non-traditional Computer Science students were diminished by the shifting of resources from undergraduate programs to encourage new graduate enrolment. Targetted funding for graduate expansion and university research mandates set by the Ontario provincial government necessitated putting many larger undergraduate curriculum plans on hold for both universities, in order to free up senior faculty for increased graduate supervision and for externally funded research projects.

The institutional practices of accountability and standardization under university restructuring has also served to render many local equity initiatives less of a priority for individual departments, faculties and the university as a whole. In general, equity programs become largely the responsibility of individual faculty members and interested graduate students, unless they can be tied to the university’s reputational gains or ‘branding’ in order to attract students, particularly at the graduate level. Carnegie Mellon has been successful in branding itself as a leader in ‘women in computing’ initiatives, and has managed to distribute its particular ‘product’ discursively in a manner which serves the institutional governance of ‘women in computing’ across many sites.

A faculty member who was involved in undergraduate programming for Computer Science said her committee referred directly to the Carnegie Mellon plan when they worked on a major redesign of the undergraduate curriculum. They were specifically interested in CMU’s strategies for attracting a more diverse group of students to Computer Science.

Managing diversity

At the same time as faculty promoters of ‘women in computing’ events understand the need to promote ‘women in computing’ as an underrepresented unitary category, they also recognize that the group it encompasses is diverse (Cohoon & You, 2006). However, in my research, I found that the approaches followed in initiatives for ‘female-friendly’ Computer Science or other liberal feminist inclusion strategies do not take this socially situated diversity into account. Women who received their earlier education outside of North America, and who did not experience gender exclusion in science and technology education had much to say about how that education worked for them. In Canada, they experience difference in a range of other intersecting ways besides gender through race, religion, class, history and country of origin.

Like the North American “liberal-pluralistic understanding of feminism” from which it derives, the discourse of ‘women in computing’ overwrites other genealogies of struggle such as those against class division, racialization, heterosexualization and colonization (Alexander & Mohanty, 1997b, p. xvi). Through this discourse these students negotiate gender barriers they did not experience in previous schooling before they came to North America. Yet, they are told that Canada and the United States are much further ahead on gender issues than their countries of origin. They are increasingly asked to align their own personal strategies for success with the values of the entrepreneurial university. ‘Diversity’ is also a managed discourse, and in neo-liberal government policy, in Canada and in several other Western countries, ‘gender equity’ under an institutional diversity umbrella serves as a means of mainstreaming and

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64 Although not geographically linked with ‘Western’ countries, I include Australia and New Zealand here.
managing feminism, which has come to weaken work for equal employment opportunity and affirmative action (Bacchi, 2000, in Blackmore & Sachs, 2003, p. 15; Brodie, 2007). This diversity management also separates overlapping experiences of difference into discrete identity categories which often compete with one another in educational institutions for recognition and resources (see Baez, 2006). The following section will illustrate the intersection of academic feminist practices with the complex forms of textual governance in the ‘performative university’ (Ball, 2000); these governing texts serve to delimit and inscribe knowledge about targeted groups, and to render them countable (Hacking, 1991). ‘Women in computing’ is one such targeted group.

In the following interview segment, a women faculty member, who as a graduate student was part of the student-organized support group referred to earlier, discusses her department’s enrolment concerns and student ‘diversity’ in her programs, weaving the Carnegie Mellon University (CMU) texts through university performance targets:

SS: Have you noticed any change in the student population over time?

Faculty: There are statistics that have been held, and have been monitored for the percentage of women in our program, but it has not increased over time. It has flatlined. Engineering has improved, Sciences, Physics may still be problematic, but it hasn’t been something…You were probably talking to people involved in the Women in Math committee – that’s been something that has been examined there over time: what is it about female enrolment? I’m also serving now on the Undergraduate Recruiting Committee for Computer Science, and again, this is a question that comes up – what can be done? Looking at some of the work that the CMU has done in order to increase their enrolment....

SS: …. Why do you think things have flatlined?

Faculty: In Computer Science overall, as opposed to local things? I don’t think we have a very…unlike other fields….and we were talking about this, the drop in enrolment in Computer Science overall...when you think about Computer Science, people come in with a preconceived notion of what Computer Science is, whereas they don’t about something like Geology, right? You don’t have to worry about media depictions and what that does for people, and I think that’s a big problem that Computer Science faces.

SS: What does the media depict?
Faculty: The idea of the Computer Scientist as this lone geeky person, with no social skills, spending all their time with a machine, that these technical details are what obsess people, as opposed to seeing it really as what it is, which is a very diverse field. That’s one of the issues that come up in the issues of recruiting, that’s there’s going to be more women, more people with all sorts of different interests, that we will be able to attract by being able to have a broader appeal by showing the diversity of what is there...

SS: So, you’re not really interested in trying to make it more ‘sexy’ to women.

Faculty: Well, some of the Carnegie-Mellon work has said that what makes things more appealing to women is its having more impact on the rest of society. So, I don’t know that we would...I’ve seen the idea of having pink Barbie laptops, or something [Laughs]...I was interviewing somebody for a position where we were talking about women being involved, and he said, ‘Oh, yeah, we could have a program...an assignment...where people were shopping for makeup...’. 65 I mean, that’s not what we’re talking about here [Laughs]. It’s more realizing this is what’s appealing...this is appealing to women, but it’s appealing to people, it’s appealing to a more diverse group. And I think the way it’s been marketed, and the way it’s been targeted, and the way it’s been viewed, is appealing to a small segment of society, that happens to be mostly male, but that doesn’t mean that we’re getting all men, either. So, people with diverse interests, I think that’s healthy overall for any field, diversity. [emphasis added]

While the faculty member ridicules ‘pink Barbie laptops’ as a sign of gender diversity in computing, she objectifies ‘diversity’ as a category for institutional accumulation. Like Carnegie Mellon’s text, she sets the appeal to diversity as marketing

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65 Truth is stranger than fiction. The culture-building strategies of CRA-W and ABI promote the subjects of ‘women in computing’ as hyperfeminized, to counter the male geek image, and there are some curious examples of gender stereotyping. The makeup assignment may have seemed ridiculous to the faculty member, but it was actually similar to a real invention. The ABI newsletter (Krasne, September 2007) featured a story about a female computer scientist, Nina Bhatti, who invented software to solve “the agonizing chore of finding the right shade of foundation”. She explained her particular ‘women in computing’ expertise this way:

As you mature, you will learn to embrace your differences from the rest. I know a lot more about makeup than the guys I work with. I leveraged my “special” knowledge — because I have bought and used makeup — to take the leadership role. It is incredibly empowering to be able to apply your academic knowledge to a consumer problem and translate it into actionable science.

While the piece lauded Bhatti’s skill, it also reinscribed her gendered preference for applied Computer Science projects. The project itself, a program which would allow women to select their ‘perfect’ cosmetic colour, reinforced gender stereotypes by making this use of computer technology seem of utmost importance to women in general. But her comments also engage with the discourse of self-esteem and self-empowerment as technologies for governing the self (Cruikshank, 1996). Also, for women who do not wear makeup, or who think it is unimportant, this discourse positions them as somehow outside of or alien to a social position inside ‘women in computing’. As Carrie Paechter (2006) writes in her theorizing of masculinities and femininities as ‘communities of practice’ (Lave & Wenger, 1991; Wenger, 1998), meaning is ‘negotiated’ through communities of practice and those at the centre of communities of practice have the most power to decide, in the case of femininities, gender norms.
against the media stereotype of the male computer geek; also, like the CMU reference, she extends the appeal to diversity beyond gender to include diverse ‘people’ as potential CS students. In a similar way, university restructuring texts take up the category of ‘diversity’ as a sign for international students and other global resources for the entrepreneurial university. Contrary to this objectifying discourse, the faculty member’s everyday work recognizes the pedagogic value of diverse approaches to teaching Computer Science, and the diverse bodies of the students she teaches. The neo-liberal educational language of ‘target’ and ‘market’ which threads through university administrative discourse sits in contradictory relation to that work even as it shapes knowledge about ‘diverse’ students.

Through these extralocal pedagogic texts, the institutionalization of ‘women in computing’ reflects the disciplining and diffusion of student interventionary actions like those which created the original informal Computer Science/Math/Engineering women’s groups. The current graduate students I spoke to have access to a range of institutional ‘women in computing’ lunches, dinners, or other get-togethers, including the two largest U.S. events for women CS graduate students, The Grace Hopper Celebration of Women in Computing and the CRA-W Graduate Cohort meetings. But in discussing these community-building initiatives, there were ambivalent feelings, as the student comments at the beginning of this chapter also make clear. For the first student, ‘women in computing’ as “a bunch of women having lunch...in the same room” seemed no basis for a community of identity in itself, though she personally felt committed as a feminist to challenging gender inequality in Computer Science. The second student felt a connection
with other male and female Computer Science graduate students organizing around departmental concerns, but she felt no sense of common purpose in the women’s group.

Both universities provided funding for these ‘women in computing’ events, including some support for the American conferences (which also offered scholarships). Most of the students had been to one or the other of the conferences, some to both. At the conferences there were opportunities to present papers and to network with other women in academia and in industry about their particular technical fields. These presentations provided self-accumulation potential in the form of professional contacts and technical advice, though generally the emphasis was more on social networking, which some students felt was of less interest to them.

As for the local group get-togethers, implemented partly because of the student experiences of faculty members and partly according to the institutional texts of ‘women in computing’ expertise (from Carnegie Mellon and elsewhere) and the discipline of mandated mentoring, this seemed to be where students responded most ambivalently to the discourse of ‘women in computing’. Some disidentified with the problems other women talked about, and were depressed by or disinterested in warnings about ‘toxins’ that they as yet did not detect; others saw their inscription as ‘women in computing’ as part opportunity, part burden. In a group interview, students expressed mixed feelings about their local ‘women in computing’ group:

S1: I didn’t go last year, and there wasn’t any really good reason…I think it’s good to have the sort of connections, it’s good to meet more people in the department ….Like, I’ve met people that I’ve worked with, obviously, but there’s tons of graduate students and professors in this department that I just really don’t know very well, because the work never touches theirs, and so…so it’s a really good way to get to know people. And I think that’s helpful if you ever have a question that’s related to the discipline… I really….I don’t really feel a huge need for a sort of a…support group, though. I think

66 See my discussion of the Rae Review in Chapter 5.
it’s a good connection group, but there’s no, like, real issues that I really feel like I want to….get off my chest…it’s a good idea, but it’s not really something essential…

S2: I didn’t know about the lunches when I was an undergrad. I didn’t know that the group existed at all. I just found out when I entered the Master’s program, and then, suddenly, there was an e-mail that if I want to, I can sign up for their list. And I thought, ‘What list? There’s CSWomen? Really?’ [Laughs]. It would have been more useful for me to find out about this as an undergrad because I could approach somebody, and it might have been easier to talk to them because they’re women and, you know, there’s sort of less tension going on there, and stuff like that. But when you’re an undergrad, you’re not considered a part of the department.

S3: It has to be more than just the fact that you’re a ‘woman in computing’ that bonds you together. And you can speak better about how it is now in the women’s lunches – when I started graduate school there wasn’t much to attract me to those lunches, since there was nothing that I considered to be of great interest or concern to me. It was literally a ‘women’s lunch’, like, a bunch of women having lunch…[Laughs] in the same room…

S4: I don’t feel that I am part of any ‘women in computing’ community. I don’t really see a community. I mean, I hardly see there’s a category….I think I’m still not seeing the real need for the category. I’m not sure what they’re trying to address. I just don’t find they offer me enough information for me to want to go. And when I first started out, I went, and then I stopped. And then I’ll go again next year, and then I’ll stop. I keep trying, because maybe I’ll actually find something useful, or I’ll meet somebody new, or there’s something better I can get out of this, but I just can’t. So I stop. I’m on the mailing list, because sometimes I get information. If it’s not useful, I can delete it.

S1: I didn’t really realize that….I shouldn’t say so many, because there’s not very many of us…but people who aren’t going to the lunches. I thought that everyone was going, but it was me being too lazy to go. I wasn’t really going for any ideological avenues, but it makes me aware that it’s not like there is some wonderful community that is getting together and doing all these wonderful things, and I’m just not there. That’s really kind of a lot of different people doing their own thing. So…I don’t know if that’s a good discovery, or a bad one…[Laughs]. Like, it’s not bad, anyway…[emphasis added]

Salient to these reflections is a shared recognition of the institutional attempt to create an imagined ‘community’, ‘support group’ or ‘category’ (still subject to departmental hierarchies of graduate over undergraduate students), and a shared sense that this ‘community’ is ‘not useful’, ‘not essential’ or ‘not of great interest or concern’.

The students challenged the idea of the category, of a bounded community, with an
almost post-structuralist sense of difference: “it’s not like there is some wonderful community that is getting together and doing all these wonderful things, and I’m just not there”, but rather “a lot of different people doing their own thing”, where connection is more meaningful than support. This idea of the importance of looser and more contingent networks suggests that the generational differences in feminist affiliation between faculty and students reflect a difference in thinking, where, for the students, modernist conceptions of solidarity and unity of identity have fallen away. Though the student comments reveal a certain resistance to institutional techniques of governance through community, the students are still positioned through the discursive practices of ‘women in computing’.

Thus, in the two universities I studied, ‘women’s issues’ in Computer Science are institutionalized through Carnegie Mellon-like discourses. Institutionalization of these concerns means that university administrators can take up a ‘textual’ equity plan like Carnegie Mellon’s without seeing any of the actual work of people,\(^\text{67}\) the processes and struggles, negotiation, contestation and hard-won decisions over resources which produced the institution’s ‘women in computing’ expertise. The everyday practices necessary for ‘transforming the culture of computing’\(^\text{68}\) at CMU relied on a firm and detailed administrative commitment to its implementation, along with the material and physical capacity of faculty, staff and students to do the required work. The weekly ‘women in computing’ committee meetings of faculty (time-released), staff (paid) and

\(^{67}\)Latour (1987) refers to this process as inscription, which transfers the actions and practices of people and the material form of objects to text. The text then stands in for the practical processes, controversies and alliances behind what is being produced (in Latour’s case, scientific fact, for example). The ‘actual work of people’ is black-boxed, with only the final text, or ‘fact’ available for view. Similarly, Smith (1987) calls this process of transforming human activities into text ‘text-mediated social relations’.

\(^{68}\)See Blum (2001).
students (also paid) actively involved in departmental work were crucial to the CMU plan (Blum, 2001). Implementing Carnegie Mellon’s ‘women in computing’ initiative in text, like the implementation of government equity policy, involves a translation through institutional resources and priorities, both human and non-human (Callon & Law, 1982; Gansmo, 2003).

For female faculty, the responsibility for promoting ‘women in computing’ initiatives at the university once again becomes hidden ‘self-identity’ work (Acker & Armenti, 2004; Adkins & Lury, 1999). The Carnegie-Mellon text is read through Pearson administrators as monthly or more sporadic ‘women in computing’ lunches funded by the Dean’s Office. The discourse of ‘women in computing’ is produced in an atmosphere of institutional containment and constraint. For McKenzie, although much time and practical attention has been devoted by departmental committees (including ‘overcommitteed’ female faculty and overextended graduate students) to implementing some of CMU’s curricular strategies, the larger institutional priorities for entrepreneurial performativity under the innovation and accountability regime of Ontario postsecondary reform mean that there is still no change (and even a deterioration) in undergraduate and graduate enrolment for CS (both male and female).

More pertinent to my problematic, these ‘women in computing’ inclusion strategies are outside of and contradictory to the mandated institutional drive to streamline funding, to speed up time to completion, and to accelerate BSc students past the Master’s into PhD programs. This latter action, as one faculty member commented, has a gendered effect, as women who are undecided about graduate school may be encouraged during their Master’s experience to pursue a PhD. She also mentioned that
the university had decided to cancel an MA entry scholarship for female CS students in order to put the resources toward female PhD students, for whom there was more government funding. In effect, for many female faculty and students working to put changes in place for gender inclusion, the texts of self-identity in strategies which supposedly give them agency are reinscribed under the subjectivity of the ‘gender neutral’ performative graduate student in the performative university. These latter institutional practices are both gendered and gendering, as the student accounts in the first part of this chapter make visible and as this thesis will continue to show. Particularly when taken up under the signs of ‘equity’ and ‘diversity’, these institutional practices are especially discouraging to women who want to pursue graduate Computer Science studies. As Bryson and de Castell explain:

[the institutional program of ‘gender equity’ signifies] an impossibly contradictory injunction, on the one hand, to enact a series of characteristics designated as ‘gender appropriate’ in educational feminism’s project (for example, to legitimate ‘women’s ways’) and, on the other hand, to embrace and participate even more ‘equally’ in the set of rules, roles, and relations established and maintained by a predominately masculine power-elite. (1993, p. 344)

Finally, for the women graduate students in Computer Science who participated in this study, the university practice of ‘gender equity’ means negotiating the contradictory position of attending to institutional demands for individuated ‘gender neutral’ scholarly performance in competition with peers for external and internal awards, jobs and research recognition while at the same time being hailed to affiliate with the ‘community’ of ‘women in computing’. Through these intersecting discourses, for many of these students, the sign of ‘feminism’ seems more a set of institutional rules and boundaries for gender performance and identity management than a relevant activist project. In the next
chapter, I will explore more deeply the self-identity positions produced by these intersections of excellence and equity.\textsuperscript{69}

\textsuperscript{69} See also Martimianakis (2008).
Chapter 4: The performance of ‘women in computing’ as self-identity

Consider that the struggle for recognition in the Hegelian sense requires that each partner in the exchange recognizes not only that the other needs and deserves recognition, but also that each, in a different way, is compelled by the same need, the same requirement. This means that we are not separate identities in the struggle for recognition but are already involved in reciprocal exchange, an exchange that dislocates us from our positions, our subject-positions, and allows us to see that community itself requires the recognition that we are all, in different ways, striving for recognition. (Butler, 2004, pp. 43-44 in Davies, 2006, p. 435) [emphasis added]

In this chapter I move from a focus on the institutional organization of ‘women in computing’ as a governing practice for ‘mobilizing a collectivity’ to the role the discourse plays in connecting institutional order to the governance of the self. In this consideration the ‘collectivity’ of ‘women in computing’ produces the self as autonomous, individualist, ambitious and in liberal discourse, free. These characteristics are certainly at odds with traditional understandings of women’s performance of identity (Butler, 1990; Davies, 2006), while there are other aspects of ‘women in computing’ performance which in fact retraditionalize women’s subjectivity in discourses of care and in hidden emotional work.

In their study on women’s performance of identity in service work, Adkins and Lury (1999) have pointed out that in the increasing importance of the performance of identity in the workplace, self-identity may constitute “a key resource in new regimes of accumulation” (p. 598). They note an intensification for workers of the practices of aestheticization which emphasize self-presentation, appearance and “the management of impressions”; in this climate “the performative aspects of the self increasingly constitute cultural resources” (p. 600). The authors suggest, however, that assumptions about the ability to perform one’s working identity understand a worker’s relationship to his or her self-identity as uncomplicated and universal, as if these subjects possess equal ability to
claim their identity performance as a workplace resource. Adkins and Lury contend that because of these assumptions, differences in relation to self-identity and in the terms and conditions of their performance in the political organization of production remain hidden. Specifically, in regard to gender and the body, they illustrate how some workers (particularly women) may be denied ownership over the performance of their working self-identities and therefore cannot be assumed to claim their identity performances, as others may do, as occupational resources. Thus a worker’s self-identity may be a key site of contestation and struggle over the control of production and indeed over the self-possession of identity as a resource.

This consideration may be brought into how ‘women in computing’ is performed in many ways. The discursive and contradictory play of liberal feminist views about women’s learning styles and ethical consideration in computing constantly threads through the participants’ self description (and/or in their opinions about other women they know involved in this work). These discussions will be brought into the thesis throughout, but they raise a specific question here: what issues of self-identity governance enter into how these women have presented themselves in their interviews with me?

A principal point that Adkins and Lury make is that women’s labour of identity is not recognized as ‘work’, but that identity is seen as an inherent part of self (and indeed is hidden). For men, identity is recognized as a value that can be externalized and rewarded. Self-identity is mutable, adaptable and detachable; men are the possessors of self as a marketable resource. One question my study examines is how (and indeed if) the women in the participant groups are able to manage/mobilize their self-identities as ‘women in
computing’ as a resource. This is a complex and contradictory process. On the one hand, in their self-identity as female CS graduate students they may attempt to affiliate with the universalized self-defining, self-possessing rational subject who does not see (or want to see) a differentiation by gender (and/or by other identity markers).\textsuperscript{70} As Adkins and Lury explain, the male subject in this domain is adaptable and can use his identity productively \textit{because} it is unmarked, flexible.

On the other hand, liberal feminist discourse about ‘women’s ways of knowing’ in computing (see Margolis, Fisher, & Miller, 1999; Turkle & Papert, 1992) and a differentiation of female identity as applied to CS education can in some contexts be used as a way of using a universalized (essentialized) self-identity as a resource for accumulation. This form of self-identity as a generalized and generalizing category is especially useful in the application of differentiated identities toward institutional ‘diversity’ mandates and enrolment targets. Ironically, in an academic field which remains one of the few non-traditional areas where North American women have not managed to increase their numbers, these feminist strategies call for a retraditionalization of gender through appealing to interests and values which are attributed to women, such as an interest in the social application of Computer Science rather than theoretical abstraction, or a preference for collaborative projects over isolated lab work.

Within this framing of feminist values in the field, certain areas of CS research are also considered more ‘female-friendly’ (Rosser, 1990), particularly those dealing with human language and human-machine contact, such as Computational Linguistics, Human-Computer Interaction (HCI) and Artificial Intelligence (AI), or areas like

\footnote{\textsuperscript{70} I will explore this identification with the neutral subject of science further in Chapter 5.}
Software Engineering which address real-world, concrete needs rather than more theoretical problems (e.g. Complexity Theory). As I will show, while some respondents appeared to have taken up the discourse of ‘women in computing’ in their disciplinary pursuits, many of the women found themselves outside the discourse in relation to the subject positions made available by these texts. For example, one student described her decision to change her doctoral specialization from the more ‘female-friendly’ area of Computational Linguistics, in which she could have gotten support from women faculty and other women graduate students engaged in the field, to pursue her interests in Machine Learning:

The work I was doing was mostly in **Computational Linguistics**…I just found that there were too many limits…. And so, then, all of a sudden there’s this whole area of **Machine Learning**. And it was kind of scary, because there’s a lot of math. And at the same time, I couldn’t see myself graduating without knowing this stuff. …I knew that **what I was doing wasn’t enough**, so I finally stepped over and then went over to things that are closer to Machine Learning …I feel a lot happier that I did it, because I know I can do it… And here it’s more that you have to understand the math behind it and understand the abstractions. [emphasis added]

The student’s comments reflect her disidentification with the ‘women in computing’ discourse in Computational Linguistics and also illustrate how the discursive ideological representation of gender preferences worked against her actual interests and affinities. In ‘stepping over’ and hence pulling away from the boundaries of this ‘community’, she also underlines and in fact supports the perception within the mainstream male-dominated ‘culture of computing’ that the feminization of areas like Computational Linguistics and HCI makes them more marginal and not a part of ‘real’ Computer Science. The discourse of ‘women in computing’ serves to reinforce this gender binary, although the student’s action is an attempt to disrupt it. At the same time, the student’s ‘knowledge’ that what she was doing ‘wasn’t enough’ motivated her to
embrace a position as the autonomous self-actuating subject of science in order to choose a path of self-improvement for future self-accumulation.

In talking about studies of workplace organization, those dealing with “new forms of workplace governance and of new social technologies of production”, Adkins and Lury believe that these have not considered “how the labour of identity contributes to the political organization of production” (p. 599). This labour is gendered in the CS/IT workplace and in CS/IT education through the attention paid to women’s innate ‘people skills’ rather than to the labour of identity required to produce these skills. Not recognized as work, these skills have no monetary value as a resource and have no particular professional advantage; in fact, technically competent women may be disadvantaged when these ‘innate’ qualities are used as a rationale to justify women’s placement in non-technical managerial positions (for an example, see M’s account in Chapter 2). Similarly, while the relational and communicative interests attributed to women are used to draw women CS students to the study of areas like Computational Linguistics and HCI, they are also seen as innate in women both in the discourse of ‘women in computing’ and in the discourse of Computer Science traditionalists who devalue the intellectual work done in these fields. What is hidden in both discourses is the question of a person’s relation to their self-identity as a worker and/or student:

It is as if, while everybody has an identity, and those identities are recognized to be different (and complex and contradictory), every person’s relationship to their (complex, contradictory) self-identity is assumed to be the same...Everybody, it is implied, is in the same position vis-à-vis their capacity to perform an identity as part of their employment. But is this so? Is this not to presume the labour of identity, to presume the relationship between subjectivity and identity, and of both with the body, to erase the hyphen between self and identity in the notion of self-identity? (Adkins & Lury, p. 599) [emphasis added]
The labour of identity is both productive of and produced by the labour of production. In this labour, the perception of a neutral autonomous, liberal subject is echoed in university policies modelling the ideal graduate student upon whom the measure for merit is founded. Like ‘everybody’ above, the performing self is gendered male. Adkins and Lury note the increasing value of the ‘performing self’ as a cultural resource, with an emphasis on the body, “appearance, display and the management of impressions – is key for membership, and indeed is constitutive of, the new middle classes” (p. 600). Angela McRobbie has made this point in her examination of the aestheticized identities of ‘club culture’ (2002), and the notion of the resource value of the creative performance of self has also found its way into popular accounts of new high-performance economic forms, such as economist Richard Florida’s (2002, 2005) promotion of the diverse bodies (including racial and sexual diversity) which make up the ‘creative class’ in the ideal ‘creative city’. This emphasis on performance is also heavily gendered, and taps increasingly into the identities of employees outside the workplace:

A number of workplace techniques are identified as precipitating this shift, including the apparent intensification of the regulation of employee dress codes and behaviour, and increasing interventions in the emotional life of employees, through, for example, therapy, counseling, stress management practices and self-appraisal and performance-review techniques. Many of these interventions…open up and make available the aesthetic aspects of the worker’s self-identity for mobilization as occupational resources….The apparent intensification of such interventions has led a number of commentators to suggest that labour is now best understood as largely performative in character, since it requires an iterative monitoring of more and more aspects of presentation, communication and appearance… (Adkins & Lury, p. 600) [emphasis added]

For CS/IT students at both of the sites in my study, much institutional emphasis is placed on creating the future CS/IT worker; this may play out in more market-driven curricular programs, and in increasing attention to preparing students through communication and social skills training for work in order to counter the stereotype of the
anti-social ‘computer geek’ (see a later discussion of this). These communicative and social skills, as well as dress, become an increasingly important part of labour as performance. Dress is regulated quite differently in some CS/IT firms; for example, ‘geek casual’ is the norm in some workplaces. This style of casual wear has increasingly gained cachet as it has come to represent the ‘cool’ and often young IT entrepreneur who is completely in command of his relaxed performance of self. Other CS/IT firms follow a more formal dress code in keeping with their corporate or governmental clients. Many of the professors at one university site wear business attire (students are more casual), while at the other site, dress seems more casual for both students and faculty, and the physical environment of the building resembles a more informal IT startup company workplace. In Chapter 6, I will discuss the modelling of corporate feminine presentation for graduate attendees at the Grace Hopper Celebration of Women in Computing, where an aestheticized anti-geek self-identity is encouraged as a marketable commodity for women seeking CS/IT careers.

The above workplace interventions into self-identity rely on the ability of self-regulating, self-appraising workers; these are also crucial resources for graduate students. These techniques rely on “giving responsibility for the management, regulation, appraisal, presentation and performance of self identity to employees [and students] themselves” (Adkins & Lury, 1999, p. 600); they assume “the sovereignty of self-actualizing, autonomous subjects” (Newton, in Adkins & Lury, p. 600), or, as Allison Weir describes the classical disembedded (male) subject, ‘the free and unfettered author of his destiny’ (1996, p. 184). In such a social context, one’s particular relationship to individualization allows for the ability (or inability) “to claim certain presentations of the
self, for example, a stylized identity, as occupational resources” (Newton, in Adkins & Lury, p. 600). Thus performance, self-monitoring and individuation are linked to rewards in the workplace and in the academy. In both environments an ‘ideal self’ is one who is assumed to benefit from these practices and can give examples of how such benefits may be made to accrue through the management of ‘self-accumulation’. For graduate students, the regular performance of self-reporting, through progress reports, CVs, and personal research websites becomes an ongoing demonstration of this self-accumulation.

According to Adkins and Lury, individual workers enter into a ‘psychological contract’ which is an informal (and often unspoken) set of individual and organizational expectations which mutually influence each other. In an environment of instability and change, the worker’s self-possession and adaptability is critical. The ability to enter into such a contract, and indeed to accumulate benefit from such an agreement is dependent upon “his or her ability to be self-transforming, self-governing and self-possessing in regard to self-identity, their progress monitored by regular self-appraisal or performance review” (p. 601). This is key to an understanding of the participants’ identity as graduate students in a regime of accountability, subject as they are to ongoing evaluation, presentation and performance reviews from supervisors, from the university, from funding bodies, from colleagues at conferences, as TAs, in peer working groups, and in publication. All of these practices produce them as performative subjects for future academic life in the performative university (Ball, 2000; Blackmore, 1997).

The women CS students I interviewed seemed well aware of the various steps necessary to enhance their self-identities for the academic market, from choosing the ‘right’ supervisor and determining where to publish and present their research down to
planning postdoctoral activities if the desired academic job was not available to them upon graduation. Most of the women were also successful scholarship winners, and they had researched the most beneficial networking and internship opportunities for their specific interests in the field. In her own self-appraisal for an academic job, one student expressed her concern that her former supervisor did not encourage her to publish more:

In fact, [he] generally strongly discouraged publishing because he comes from the Physics world, where you publish one journal article at the end of your PhD, and that gets you your job, which is very different from the Computer Science world, where everything changes rapidly. **You’ve got to publish-publish-publish in conferences, and journals are sort of less important to some extent.** [emphasis added]

The student’s ability to be self-possessing prompted her to change supervisors; she then had the opportunity to gather more of her research data and to publish more frequently, and thus, to take control of her self-accumulation.

**Inventing the global future, reinscribing the gendered past:**

*Experiencing Canadian ‘gender equity’ as text and action*

Another key aspect in activating self-identity as a resource is flexibility. Aihwa Ong (1999, 2003b) describes the flexible citizens of globalized capital, the transnational ‘astronauts’ and other mobile entrepreneurial/technology workers who are able to accumulate based on their own governance of the self as an adaptable resource.71 Ong also indicates how these mobile subjects are gendered, and indicates the gender divide between the ‘free agent’ male subject who readily adapts to new institutional, economic and geographical changes, and a more traditionalized identity for the migrant women who support them, often working to maintain the domestic site and to preserve traditional values.

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71 Note that in her book *Buddha is hiding* (2003), and more recently in *Neoliberalism as exception* (Ong, 2006) Ong contrasts these ‘flexible’ bodies (what Zygmunt Bauman [1998] calls ‘people on the move’) with those refugees and migrant workers at the other end of the economic scale, people who move not of choice but of political and/or economic necessity.
social values from ‘home’ (see Ong, 1999, p. 20). In Adkins and Lury’s account, these women, unlike the men, cannot disengage their self-identities from the aestheticization of their cultural selves, and remain almost frozen in time culturally. The discourse of ‘women in computing’ serves to reinscribe and retraditionalize gender characteristics in paradoxical relation to the speed of development in CS/IT knowledge, at the same time as its subjects are hailed to ‘invent the future’.

This latter situation of ‘traditional’ gendered identity turns around for some of the women CS students I talked to, particularly those who came to Canada from the Middle East and Eastern Europe. In their countries of origin, they experienced a cultural differentiation between men and women, and often a traditional division of labour in the home. Yet in education, they were equally placed in mathematics, science and technology programs with male students, although the two students I spoke to from the Middle East went to sex-segregated schools before they came to Canada. Encouragement in these areas was never a question; one student’s father, an engineer, had come to Canada to complete his own graduate studies, and he promoted his daughter’s getting additional mathematics and science education on the weekend to supplement what he found an inadequate Canadian public school curriculum. The two young women did well throughout school in math and science, and from both accounts, this was expected rather than remarkable.

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72 As the poster illustrated in Chapter 2 indicates, the theme of the 2007 Grace Hopper Celebration of Women in Computing was: ‘I Invent the Future’. Note the entrepreneurial ‘I’ rather than the communitarian ‘we’.

73 Note that I am deliberately generalizing the participants’ geographical places of origin not to suggest that all Middle Eastern or all Eastern European countries are the same, but in order to preserve the confidentiality of the student participants; because their numbers are so few, it is likely that they could be identified by their specific countries of origin.
In both the Middle Eastern and Eastern European environments in which the students had their formative education, it was also expected that they would be working in CS/IT/Computer Engineering fields once they graduated. Some informal arrangements would be made to accommodate familial leaves, although there were no formal maternity leaves. What was tacitly understood, though, was that there would be differentiation in the kind of work women did; research and higher academic positions were reserved for men.

Still, in their interviews as they talked about moving to Canada, although they had heard and read about the greater gender equality and general social progressiveness in North America, compared to what they saw as more traditional gender attitudes in their countries of origin, they almost immediately encountered resistance and de facto discrimination based on gender from both faculty and other students in mathematics, general science and CS classes (some entered high school here and others entered at the university level). A student from Eastern Europe, whose parents both worked as civil engineers, describes her initial sense of the disjuncture between the textual representation of gender equality in Canada and her experience:

Where I come from, I know it sounds strange, but in theory, Canada is more advanced and women have more opportunities here, and women are involved in the sciences. In practice, I find that many more women become engineers and scientists and whatever there than here. That was very surprising to me….when I was coming to Canada, I had a very different image in my sixteen year old head [Laughs]. Umm….I thought, ‘Wow, this is great! It doesn’t matter who you are, whether you’re male or female, there is no bias…everything’s great….this is what people were talking about, because, you know, all those changes were being brought from the United States and from the West, from Europe, and everybody said that, you know, Canada is one of the lead countries…the dream country. When I first came here, I thought, ‘I don’t understand why all the feminism here, if everything’s here already,’….And then I started to see examples of these issues over and over and over…. And in my experience, no matter….well, I haven’t seen everything….but it seems that a lot of women are experiencing pretty much what I experience. They come to Canada, and they have this preconceived notion of how great things are, and then it’s even worse than what they’ve come from, even though that was bad enough. [emphasis added]
Another Eastern European student expressed a similar sense of disjuncture between the represented view of Canada as more ‘advanced’ and progressive than her native land in promoting the equality of women, and her own experience after her arrival in Canada, when she suddenly felt marginalized as a woman in Computer Science:

I started questioning whether I changed here in Canada, which was very odd stuff. I didn’t have that question there, and I think part of the reason is because in my high school, my class was 50-50 male-female. It wasn’t male, it wasn’t full of guys, right?…And all my math teachers, now that I think of it, from elementary school through to the end of high school, were women, all of them. My computer science teachers were men, but all my math teachers were women. And there was never any question there that in order to do math you have to be male…it just wasn’t…I don’t think it was in anyone’s mind. And in university, electrical engineering was full of women, and it wasn’t odd, like it is here. Like, I was really stunned here that I was one of the very, very few. You know, I expected that Canada would be a lot more advanced place to be than where I come from…you know, it just seems traditional, but it wasn’t, as far as the department goes… that is, computer science. [emphasis added]

The textual promotion of institutional gender equity practices in Canada seemed especially strange to both of the students when they were aware of the feminist ‘women in computing’ discourse. ‘Feminism’ initially seemed unnecessary to the first student when “everything’s here already”. However, as both students experienced what they considered the sexist attitudes of fellow students and some faculty members toward them as part of the “very, very few” women pursuing Computer Science, they began to see the difference between the official texts in support of gender equality and everyday practices of exclusion. That gender identity could also be used as an asset in negotiating academic support and rewards made the first student highly skeptical (for example, she was reluctant to join the ‘women in computing’ group sponsored by the department). It also made her wonder if she was truly being assessed based on merit or in order to fulfill a gender ‘quota’. The gaps she and the other students noted between their everyday
experiences and the textually-mediated social relations in the form of governmental and university equity policies were yawning.

**Accounting for the self: Tracking self-identity as an institutional resource**

Part of the production of both worker and student self-identity is feedback, which serves as both the monitoring and production of performance. Human performance experts point to the importance of feedback as something which both gains results and shapes behaviour (Adkins & Lury, p. 601). Again, the self-governing and self-monitoring systems built into both workplace and academic monitoring and production assume an undifferentiated, autonomous subject and do not recognize the work of identity involved in producing the model worker or student, whose production is assessed and evaluated according to an assumption of universality in self-identity. The desire for feedback is naturalized, and thus obscures the social organization of this self-monitoring and self-regulation as the outcome of governing social relations, or what Dorothy Smith would call the relations of ruling (1996). Through social relations which are mediated by texts (in the form of progress reports, key performance indicators, budgets, surveys and other forms of audit), university administration, faculty, staff and students are drawn into a web of relationships in which institutions can practice a form of governance at a distance from actual subjects (Dehli & Taylor, 2006; Rose, 1996; Rose & Miller, 1992). These subjects include both those who produce the texts and those whose activities are organized by them. At the same time, the organization of feedback through these textual practices as a technology of governance is not only a form of institutional disciplinary power, but it also acts upon self-disciplining subjects (Burchell, 1996; Rose, 1996).
The ability of the universalized ‘graduate student’ to fall into the self-monitoring regime of progress reports and the quantification of production (publications, conference presentations, research reports, awards and scholarships) contrasts sharply with the exacerbated feelings of pressure for many students whose four year (for doctoral) or sixteen month (for MSc) limit is up. A highly productive doctoral student, who took one term off when each of her two sons was born, describes her situation, in which feedback, as a text-mediated relation, works upon her own self-discipline:

Student: Every term I need to submit a progress report and extension form, because I’m now past the four year program time limit, there’s a time limit. Uhm this is pretty standard procedural stuff. It’s some paperwork that takes probably a couple of hours to fill out at most, and then get signed and submit and I keep copies of each term so that when I go to do the next term I can sort of just revise the last one. I didn’t do that at first; I’ve gotten better at that. [Both laugh]

SS: Is that a problem all of a sudden?

Student: The first year that I had to do an extension, so in my fifth year of my PhD this was all fine and not really a big deal, it’s pretty standard. Now that I’m in my sixth year, I’m starting to get more pressure from the university that …

SS: Who specifically?

Student: Uhm … from the graduate officer for the faculty, and I think as well you know from higher up in the graduate studies office of the university as a whole.

SS: Do they send you nasty emails?

Student: No, it’s not that actually, really not to that point. It’s more on the forms. So that when I submit the forms, I have to have my supervisor sign it, and then I submit them and they go through sort of various levels up to the top of the university, and then actually come back to me all signed with comments. And the comments have been more and more sort of an ending, so that the last one that I got which I received at the end of last term, said “must finish in two terms”….It came from, I’m not sure where it came from because it was written on the bottom of the form, it wasn’t written in by people’s signature. Saying you know come on, you have to finish. Uhm two or three terms ago when I got one of these forms back, a female faculty member was the chair of graduate studies for the faculty at that point. And she wrote on this form “student should not sit on any more departmental committees; student must concentrate on finishing thesis.”

SS: Oh that’s right. That’s what you wrote to me when you first responded to my call, and I was worried about your being overextended. You told me that you’d been forbidden
to [Both laugh] sign up for anything.

Student: Yeah. The interesting thing about that was, I know the faculty member, we know each other, you know. Uhm she came up to me I would say less than a month later and asked me if I’d be willing to tutor her daughter in high school math [Both laugh]. And I thought, oh have you forgotten that you forbid me from sitting on committees and that I MUST concentrate on finishing my thesis!? Uhm so I politely declined that [Laughs]. It was bizarre, but anyway….It certainly is getting to the point where they’re making it clear that they want me to graduate soon. [emphasis added]

It is telling that the student felt pressure not through any direct encounter with the graduate officer or a department administrator: ‘it’s more on the forms’. Thus, the reporting form as text mediates between the sources of institutional power and the student; the feedback on the form operates as a diffuse and distant form of governance. The anonymous comment telling her that she had to finish was something she already knew and was working hard to achieve; the form reinforced her own self-governance. As for the directive to ‘not sit on any more departmental committees’, the student was involved as a student representative on department hiring committees, and was monitoring the implementation of the university’s hiring policies, one a federal government mandate to hire Canadians first if possible, and another a departmental policy of affirmative action for qualified women in CS. She also participated in other paid and unpaid work promoting women in Computer Science, despite the fact that the university did not have an official ‘women in computing’ group. Overall, she was called upon by professors in the school of Computer Science to provide direct feedback and support, particularly on issues of ‘women in computing’, but this activist work was ultimately considered incidental, and even detrimental, to her academic work. She also noted how female faculty were ‘overcommitteed’:

Another issue that I thought they should deal with was the overworking of the female faculty. Because there’s so few in Computer Science, and yet everybody wants to have female representation on every committee.
As a graduate student she was sometimes called to help relieve this committee overwork, but even this very visible ‘self-identity work’ went unrecognized; in fact, as a graduate student it proved a liability for her in taking time away from her own thesis work. She had gone past her eligibility for guaranteed funding and for the government scholarships she had carried throughout her graduate programs, and she saw the gendered effects of institutional time-to-completion pressures:

SS: And you don’t have any TA responsibilities, well you’re past the point where you’d be funded so they wouldn’t give you a TA, but are …

Student: I’m funded by my supervisors still. I’m really past the point of getting TA support. I’ve never gotten TA support because I’ve always done high school liaison work [promoting Computer Science to high school girls]. Now I’ve also been told that the funding for that runs out as of the fall. So there are numerous financial incentives [Laughs], and other incentives for me to be finished…..The bigger incentive to graduate is the fact that scholarships run out. I stopped qualifying for scholarships two years ago, or a year and a half ago I guess. NSERC and OGS are the two major funding agencies for me, and you are only allowed to have a total of four years of combined funding. If you do a Masters and you get funding, you’ve got funding for the first two years of your Masters, then you go into funding for two years with your PhD. That’s inadequate to me. Uhm if you do a Masters and then you do a PhD, you should be allowed to get six years of funding in my opinion…You have four years total and that’s it. So I feel that that’s especially difficult for females because females generally are going to take a little bit longer if they have, especially if they have kids….So and as I’ve had kids, my expenses have gone up and my funding has gone down. Uhm if I didn’t have a husband with a job that pays him well, I would not still be here and I would not be getting my PhD. It’s not really supportive of that financially. [emphasis added]

By the time of our second interview the student had applied for several academic jobs, and in her interviews she made it a point to ask about gender equity work; however, in an earlier interview she admitted that while she was committed to ‘women in computing’ work, she felt the need to be cautious:

You know, it costs you to some extent to do what you feel is right and put…and try and promote women. And it can really be costly to your career. And that is something that I have to keep in mind. It’s obviously something I’ve invested a lot of time in already, and I’d like to invest more time in it in future, though. I have to make sure that I get the balance right, that I don’t portray myself as only doing that... [emphasis added]
As a result of her practical experience as a graduate student and her concerns for the female faculty she observed, the student also wanted to make sure that she would be given course reduction or other accommodation to allow her to do equity work. In her negotiations as a new hire, she asked careful questions to ensure that the work would be recognized and supported institutionally, not merely invisible ‘self-identity’ work added on to her other academic responsibilities. She was finally offered a position and was pleased with what the university was willing to do to support her ‘women in computing’ work; the new program that the institution had started seemed to be attracting more female students, and she felt it a good ‘fit’ with the kind of teaching work she wanted to do. Her institutional savoir, gained from her student activist work, as well as her observation of conditions for the female faculty where she studied, suggested a difference in how new academic CS women understand themselves in the ‘performative university’. Through a certain ‘virtuosity’ of performance and a practical investment in the discourse of ‘women in computing’, this student was able to ‘leverage’ her self-identity for self-accumulation in a way in which a previous generation, who had in fact scripted ‘women in computing’ as an institutional text, could not. The student was capable of assessing her identity resources and used her ‘women in computing’ expertise strategically. At the same time, her narrative makes visible the complex and contradictory discursive interplay of ‘women in computing’ as text with the performativity discourses of university restructuring.

In the above interview passage, the institutional language of ‘cost’ and ‘investment’ creeps into the student’s desire “to try and promote women”. She has learned an institutional lesson towards her future academic life: she understands that if
the time and energy expenditure devoted to promoting ‘women in computing’ is not
properly managed it might be “costly to your career.” Yet it is an investment she feels
committed to maintaining in the future. She still displays a concern about been seen as
investing too much in ‘women in computing’, but in our discussions she was less
ambivalent about what she considered a feminist project than many of the other students I
interviewed. Unlike an earlier generation of women academics who were ‘pioneers’ in
university Computer Science and whose naturalized identities as women were never
perceived by male colleagues or students as separable from their performance as
computer scientists (see examples later in this chapter), this student appears to be able to
detach identity and self. She is able to perform ‘women in computing’ in a way that is
beneficial, when carefully managed, to her self-identity in the practice of accumulation. I
argue that this generational difference in the ‘labour of identity’ is largely achieved
through the disciplining of feminism in the academy (see Blackmore, 1997), in which
“‘gender equity’ function[s] as a placeholder, an unwritten, but nevertheless a regulative
fiction” (Bryson & De Castell, 1993, p. 349).

**Performing managed identity**

The above student’s (let’s call her ‘C’) contestation for the recognition of
gendered self-identity contrasts with the experiences of K, a Masters student who was
well along in her thesis work and who felt calm because she had “plenty of time” to
complete; she had a scholarship through the summer, and thus did not feel pressure to
complete quickly. K is a perfect example of what Nickols might describe as someone
who can claim ownership of her behaviour but who is also in charge of her “goals,
expectations, behavior and the effects of behavior [sic]” (Nickols, in Adkins & Lury, p. 602).

For her self-efficacy, K is rewarded by only having to fill out an annual progress report; C, who has exceeded her completion deadline, becomes a ‘problem student’ who is regulated by quarterly progress reports, an intrusion which in fact regularly interrupts her thesis work. K’s other encounter with ‘feedback’ occurs through TA evaluation forms, which are completed at the end of each term she works as a TA:

I don’t know how much attention they pay to specific details on that [the annual progress reports]. It’s like the TA evaluation forms too…They have either the prof…either a professor or the what they call the Instructional Support Group Coordinator fill out a form at the end of the term on your performance as a TA and the last time I got one of these back three of the items had ‘did not observe’ …they had no interaction with me…So it’s kind of one of those things where this is a lot of paper work but it doesn’t necessarily mean anything [Laughs]. It’s not like they had enough interaction with me to say anything particularly useful, so to me it seems like a lot of this paperwork is paperwork for the sake of paperwork.

I meet the Group Co-coordinator maybe once a term [Laughs] and they’re supposed to somehow evaluate us and it…Sometimes the professors actually get involved in evaluating because they have more interactions with the students and with the TA’s. Other times with some of the undergraduate courses they have a tutor assigned who is an undergraduate student…those students actually do interact with us and I think they give input to the TA evaluation forms when they do. **But I’ve just gotten some of them back and I’m like how do they even know this, they’ve never seen me, they’ve never met me you know [Laughs] how can they assign a random number to my evil…my performance….I have a feeling that if the performance review is particularly negative or if there’s a particular problem then that gets shown but if everything is you know working relatively smoothly I don’t think it really has any bearing on anything. So I suppose I can see a purpose for it in the sense that if **somebody gets a really negative evaluation it probably means something. [emphasis added]

While K’s comments about the TA forms reveal her annoyance with the meaninglessness of the feedback she gets, she is not marked as a ‘problem’ in need of institutional attention; she does, however, take part in the regulative work of these text-mediated relations by considering the form’s usefulness in disciplining those who receive a ‘negative evaluation’. K might be said to able to claim ownership of her behaviour (she
is self motivated, quick to learn, with good work habits and effective interpersonal skills), and the *effects* of her behaviour (her scholarships, completion on time), as self-actuating parts of her individual performance as a graduate student. In her public performance of self, she is calm and quiet, though personable, perhaps a bit shy, rather than an ambitious go-getter. She is entirely committed to her working group as a participant but not as a leader, though in the brief visits to her office, I saw her as a pivotal organizer. She could easily use these resources of flexible self-identity to advantage in a workplace environment, and her specialization in the practical realm of software engineering also adds to her self-accumulation. The modeling of such behaviour as a means to corporate success for women is very much a part of current CS/IT industry practice, and it is also part of mentoring panels at major ‘women in computing’ events (see Chapter 5 for more detail). As a recent Globe and Mail article relates:

A growth industry almost exclusively populated by women has emerged, espousing the importance of *work-life balance, networking and diversity* (code for “not all white men”). At ground zero is Catalyst, a New York-based advocacy group that tracks, and advises on, women’s progress in the corporate sector. Its Toronto office, founded in 2000, has more than 50 Canadian member companies to whom Catalyst consults, among them banks, major law firms and conglomerates. **These services aim to groom women for corporate success**, as if leadership were something that could be taught. At the Toronto-based Humphrey Group Inc., playwrights and actors offer a course called Taking the Stage, which purports to show women how to project authority—not too much inflection at the end of a sentence; don’t be too wordy; and never ask for permission (it counts Microsoft Canada and Bell Canada among its clients). **At the other end of the spectrum is a semi-monthly seminar at the Growth and Leadership Center in the heart of Silicon Valley.** Titled **Intimidating Behavior in Women** (formerly Bully Broads), the program teaches women to project less authority, to smile more, to lower their voices (Intel, Sun Microsystems and Hewlett-Packard have participated) (Kingston, 2005, p. 56) [*emphasis added*]

The emergence of this kind of ‘diversity’ training for corporations suggests that women who might be identified as (neo) liberal feminists are advising professional women that, like their male counterparts, they in fact *can* use their self-identities as a
marketable resource, but that this resource is predicated upon *difference*. Like the ‘Women in Computing’ discourse, this self-performance reinscribes (and at times embraces) stereotypical gender characteristics through which women are subjectified and subjected.

K’s relationship to the ‘women in computing’ discourse is very much situational; though she enjoyed attending conferences for women graduate students in CS and attended some of the university ‘women in computing’ functions when she ‘had time’, she was ambivalent when asked about identifying herself as a feminist. It was somehow a part of self-identity which she could separate from her affiliation with institutional ‘women in computing’ discourse; the latter, it seemed, served as a ground for professional networking, self-presentation and self-accumulation:

K: Well, *I do feel like most people have an expectation that if you’re a female in a technical field, you’re going to be a feminist of some sort*, which isn’t always true – and I would say *I’m definitely not the type of feminist that some people would expect me to be*. I feel like sometimes people expect me to really support special events for women – and I do, depending on the event – but *sometimes, the special events for women just end up singling women out and causing some amount of resentment by men*. Support groups are great, but *special opportunities designed only for women are not always so good*. I recently heard of someone pushing for female-only computer labs and female-only tutorials, and I think that’s a really bad idea, and would just lead to resentment. *On the other hand*, *events like the CRA-W Grad Cohort program are good opportunities to get together with like-minded women, talk about problems we encounter on a daily basis*, *meet other smart women who are interested in similar research problems*, and *form a mentorship/support network*.

SS: Do you see yourselves as part of a ‘community’ of ‘women in computing’?

K: I do, to some extent. I do have to say that *I also see myself as part of a wider community of people in computing*. I think that’s important. I used to belong to the Systers mailing list, though it got to the point where reading the messages there got too time consuming. It’s interesting to hear how other women deal with balancing family and career, and dealing with misogynistic bosses/coworkers, etc. *The grad cohort program was good for me this year, because it gave us some support in terms of learning how to present yourself for job interviews and things like that*. They’re trying to develop better ways for us to keep in touch over the years, and I think that will be good. I can’t say there’s really any negative aspect to it. [*emphasis added*]
K’s adaptation to institutional ‘speeding up’ processes meets with human performance expert advice to claim one’s ability to adapt, or to any other unintended effects of behaviour, exercising ‘choice’ “if and when this seems beneficial to ‘make’ or accumulate the self” (Nickols in Adkins & Lury, p. 603). She expands her subjectivity to associate herself beyond the discourse of ‘women in computing’ to a wider “community of people in computing”. She also understands her relation to the ‘women in computing’ discourse in a way which ‘fits’ the liberal feminist discursive practices which produce ‘women in computing’ as an self-accumulative, open identity category for ‘balancing’ personal choices between ‘family and career’, and for ‘presenting’ the self. Contrary to Adkins and Lury’s point about women’s inability to detach self and identity for accumulation, K produces herself as a subject through the discourse of ‘women in computing’ who can use her identity as a marketable resource and who can use an expanded subjectivity through networks of identification (rather than identity) for flexible accumulation.

**Room for self-(im)provement: Discourses of ‘women in computing’ and merit**

Like several of the other women CS students I interviewed and others with whom I chatted more informally at ‘women in computing’ events, K expresses her ambivalence about participating in “special events for women” which “end up singling women out” and which cause “some amount of resentment by men”. Many of the students resist being seen as different; they reject any suggestion that their academic successes are not due to personal merit and are suspicious about being targetted for special equity consideration as a marketable resource for the university. At the same time, K appreciates the opportunity that special ‘women in computing’ events provide for affiliation with “like-minded
women” to “talk about problems we encounter”. Thus she identifies with a collective ‘we’, although it is, in fact, very diverse. On a professional level, she understands the value of meeting “other smart women” to “form a mentorship/support network”, which again provides opportunities for self-accumulation. What K’s ambivalence shows, though, is how the practice of freedom (see Rose, 1999) is governed by K’s relation to the paradoxical discourse of ‘women in computing’ and to the subject positions which the discourse makes available to her. ‘Women in computing’ is a liberal discourse that produces an individualized and particular subjectivity – ‘singling out’ is an effect both by and on subjects - and at the same time, it assumes an essential and unitary ‘we’ which is regulated by its positioning in relation to a male-dominated field. As I have shown, this subjectivity may provide an opportunity for self-accumulation, but it is also constrained by the normative identity of the ideal CS graduate student against whom difference is measured and maintained.

Another participant, S, a doctoral CS student, admitted to the ‘use’ of her gender category if it benefits her (e.g. being invited on an all-expenses paid trip to Toronto to interview, being able to bring her partner to conferences). Yet she, too, rejected what she perceived as women being singled out for “special privileges”: “If they’ll give me money for being a ‘woman in computing,’ I’ll take it, but I don’t think it’s really fair.” Again, unlike the women whose labour of identity remains unrecognized and unrewarded, S’s ability to use ‘women in computing’ as a performative self-identity “presumes and prescribes a self-possessed and self-transforming subject; indeed, it is only such a subject who could lay claim to behaviours and their effects as occupational resources” (Adkins & Lury, p. 603). S seemed to understand and believe that she could be self-transforming as
a resource and a choice; she enthusiastically recounted a presentation she attended on ‘Women and Ambition’, though she expressed ambivalence about how another visiting speaker described teaching her four year old daughter how to do a PowerPoint presentation. S said she would draw the line at such an early workplace intervention, as she showed me pictures of herself and her boyfriend on a camping trip as evidence of her successful performance of ‘work-life balance’. The successful management of ‘work-life balance’ is a workshop topic at many ‘women in computing’ events. In contradictory interaction with the intensification of institutional performance of the self, it is often an almost impossible feat for young women (and men) who are entering the CS/IT workforce, whether in the academy or in industry.74 Proof of the accomplishment of work-life balance, or of attempts to self-improve in that direction, is an important part of ‘women in computing’ discourse. As an example of her own performative self-identity governance, the above display was part of S’s general self-presentation to me as a well-organized, ambitious yet fun-loving individual whose own self-actualizing capacities and personal ability preempted the need for any ‘special treatment’ as a woman. Yet at the same time, and in a way which contradicted her rejection of ‘special treatment’, she was rewarded for her performance of ‘women in computing’.

Adkins and Lury argue that for some (women and other socially marked subjects), behaviour and presentation of self-identity “will tend not to be recognized and so, while contributing to the performativity of organizations, is not made worth their while (it does not pay for them as a performance, it may ‘backfire’)” (p. 603). In S’s case, she has been able to use her affiliation with the identity category ‘women in computing’ to tactical

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74 As a student informant said of a new woman professor with a one year old daughter, “I think she sleeps for one and a half hours each night.”
advantage as a resource. However, it is a cultural identity open to only a few, with economic currency only in relation to the production of institutional equity resources and to her rarified position as part of ‘women in computing’. Such recognition still does not acknowledge the work of identity involved in producing gender. While gender-tagged for the benefit of the production of ‘women in computing,’ S paradoxically identifies with and reproduces the self-possessing universal subject, gendered male. Hers is an example of how the discourse of ‘Women in Computing’, along with many current forms of liberal feminism committed to operational/instrumental rather than philosophical/ethical goals, permits women to identify with ‘women’s issues’ without identifying themselves with feminist aims, or to take up ‘feminism’ as text but not as action.

Though I will not go into detail about its development here, this disjuncture between feminist action and text marks a genealogical rupture between feminist activism and the development of academic feminism as a textual mediation in institutional policy and practices. This rupture is marked by the institutional separation of feminism into the operational goals of numeric equality on the one hand and the philosophical goals of substantive equity on the other. Many of the students I interviewed had little acquaintance with the latter goals of feminism; indeed for several, ‘feminism’ seems outmoded and irrelevant. As S sees it below:

I don’t know…it’s really mean to say, but, like…this whole feminist thing, like, that we females are being treated wrongly and we have to act upon it…if they [female faculty in support of ‘women in computing’] found out that a woman was being treated wrongly in the department, it would, like, fuel their…their…

SS: So…that…you don’t consider yourself a feminist? Or you do? Or…is that what feminism is to you as far as….

S: It’s hard…I think the role of feminists should have changed over the years…I don’t know if it *has*…but there was definitely a time…and I’ve heard lots of
stories…where there were **people, like, my mother’s age, were fighting for their rights.** And, like, my mother, even…she did a four-year general instead of like an honours degree, because general at that time was the way to go…like, females doing education, even...like, my grandmother talks about it all the time... she couldn’t even get her high school because females didn’t do education back then…**And definitely there was a time when you had to push**...and, you know, people in their thirties and forties have told me how, you know, it was normal for them to get groped by males, that they’d be the secretary and in the elevator, like, people would, like, *grop* them, or feel their butt….or like, other inappropriate behaviour. And definitely if that happened, you’d need someone to advocate for you. Um...whether...**But I have a feeling, like, nowadays, like, women are like, there is this… ‘We need so many women professors’**...[emphasis added]

This appraisal of feminism as part of a bygone time “when you had to push” echoes what Jill Blackmore has described as an anti-feminist institutional discourse of the ‘generational war’, “largely defining women in their forties and fifties as products of the 1960s, as hard-line feminists, as bitter and humorless man haters, and as out of kilter with current issues,” and thus discrediting some ongoing feminist struggles in the university (1997, p. 81). In this supposed generational conflict, the genealogies of current feminist activities are erased as ‘battles already won’, while indeed, the discursive and differentiating nature of ‘gender’ reaching for an institutional interpretation of ‘equity’ as ‘equality’ or ‘sameness’, as Bryson and de Castell (1993) theorize, means that ‘gender equity’ is inherently contradictory and a site of continuing struggle. For S, who understands the ‘equality’ interpretation, the ‘differentiating nature of gender’ is part of a past generation’s ‘problems’, but not, in her opinion, a reason for the current promotion of gender equity through ‘unfair’ preferential treatment. In the following passage S describes her discomfort with awards and privileges given to ‘females-only’, as she experiences gender equity’s contradictory discursive struggle of ‘difference’ and ‘sameness’:

And it is my belief that they give out....like...*I’ve gotten scholarship money for females-only twice*....where....
SS: Which scholarships were those?

S: Well, one was just an Applied Math one...there was only three people in ‘female’...it was only like a $500 one...and it was...three people...there was only three females that time, and there was, like, twenty five men, and there was, like, top male, and top female...Top male was against twenty seven students, you picked the best, and top female was against three , you picked the best [Laughs]. And it seems not quite fair. Um...and it seems like, Joel, who won the top male...was a couple points better than me, and, like, the second guy was a couple...and it wasn’t because I was female that I was down in fourth or fifth place, maybe, it was because that’s just the way I ranked amongst everyone [Laughs]...It just doesn’t seem fair...maybe the top two should get it...

And the other one was related to a conference, where I partly understand, because...um...it was partly...part of it was attending a women’s conference, but it also...And you get to go to your conference in your area afterwards, for free, and they paid for everything – they paid for the hotel, they paid for your conference registration fee in the other conference. And, so, I get to go to the conference, basically, like, as far as I’m concerned, because I was female. Because when I thought...it wasn’t me thinking, ‘Oh, I really want to go to the women’s conference...and...oh look...I get to go to a conference in my area, too...’. It was, like... ‘Oh, look...I get to go to a conference in my area that I would have to pay, you know, over a thousand U.S. dollars for, and I get this cool seminar, too, about, like, you know, building my teaching portfolio, and all this other stuff, too. So, yeah...sign me up!

SS: So you don’t think you deserved that?

S: Well, I think it could have been...both ones could have been a little more fair. Like, I definitely think that the topics discussed at the conference...there were males at the female-only conf...like, it wasn’t a female-only conference...It was designated for females, but anyone could sign up. And there was a couple of males. And even there, some of the females were, like: [whisper], ‘I didn’t know there would be males there.’ Like, some of the people organizing it were, like, ‘I didn’t realize males were going to sign up for this...’ And they had this stigma, that, maybe they didn’t want to share...um...their problems that they’d encountered over the past thirty years with, like, males in the room. Whereas, to me it seemed like, well, educating the younger males about problems that had happened in the past...I mean, should know the history, it’s not just the females that need to know the history of what’s happened, and gone wrong...So, I think now they overcompensate...I bet I could find a job much easier than someone who has my skills who’s a male, because given everything else equal, they’re trying to boost the numbers of female faculty that they have in their research groups...everyone. [emphasis added]

The issue of ‘fairness’ resonates with the ‘merit’ discourse which dominates university science and technology education and which weaves so strongly through post-
secondary restructuring policy; a debate about equity versus merit\textsuperscript{75} frames a major part of the student (and faculty) narratives about ‘women in computing’.\textsuperscript{76} S’s comments about ‘fairness’ flow from a discourse of (numeric) equality and identification with the unmarked (male) subject of science. In many ways the institutional focus on ‘women in computing’ as a ‘problem’ identity undermines some women’s self-identity as independent, autonomous and self-possessing graduate Computer Science students. As S explains:

I think….so, I’m not really a ‘Women in Computing’-group person, in that I \underline{personally have always believed that I’m equal with everyone else}…well, maybe I like to think, ‘Oh, I could take this course if someone else could’….but I’ve never thought, ‘Oh, I’m a female, and they’re male…and I’ve never thought I’m not doing well because lots of males….like, anything, the situation where I’m in where….you know, people have come up to me and said, ‘\underline{Do you realize you’re the only female in this room?’} And I’m, like, ‘Well, not ‘til now!’ [Laughs] Um…..so…\underline{I find singling myself out as a female …for me to be uncomfortable}, like, going to the Women’s lunch…and, like, this is for women only …to be strange to me. [\underline{emphasis added}] 

Thus, as I have stated earlier, ‘women in computing’ as an identity category has a different status than the women workers Adkins and Lury describe, for when managed through technologies of community and self, the discourse of ‘women in computing’ places women Computer Science students, faculty, and CS/IT managers in the realm of “the ideal of the abstract entrepreneurial individual at work” (p. 604), whose labour of self-identity is available as a resource for self-accumulation. This is typically the domain of male workers, though not all males are able to reach this ideal equally. Rather than having only “a naturalized relationship between self and identity” which is immutable and not available as a detachable and flexible resource, some women in computing are able to practice an ‘entrepreneurship of identity’ which is based on liberal feminist goals

\textsuperscript{75} See Scott (1988) for a discussion of this debate.

\textsuperscript{76} For a similar debate surrounding women in engineering, see Williams (2000).
and the seemingly paradoxical naturalizing of women’s ethical and educational identities for self-accumulation, the ideal of what Brodie (2007) calls ‘the liberal abstract woman’. This practice operates through the identification of ‘women’s ways’ of doing Computer Science as a potential resource to attract more women to Computer Science studies and to widen the scope of the computing field. For other women CS students, however, the discursive disciplinary practices of ‘women in computing’ which identify ‘women’s’ suitability to specific areas such as Computational Linguistics and HCI prove an obstacle to self-possession and self-accumulation by drawing limiting boundaries of ‘community’.

Through management by ‘community experts,’ who might be institutional administrators, feminist academics outside of Computer Science, department faculty members, as well as men and women in the corporate sector engaged in mentorship programs and events, women CS students may have the opportunity to learn how to ‘market’ their particular identity as ‘women in computing’ as a profitable resource for academic and governmental practices. This appearance of self-possession serves to obscure some of the actual institutional and societal barriers women in the CS/IT field still face, barriers which become all the more apparent when they enter the workplace and encounter the appropriation of gendered attributes which organize male and female subjects differently.

*The appropriation of (women’s) emotional labour as a potential research/workplace resource*

In analysis of the economic shift from production to consumption in the family, from Marx and Engels onward, the gendered division of labour between visible productive work in the industrial workplace and the invisible unpaid labour of
consumption in the home (involving the aesthetic skills of selection for creating a not only functional but pleasing home, and the emotional skills of managing interpersonal relations) becomes the model for the gendered organization of work in the post-industrial workplace (Smith, 1987). The particular qualities attributed to women’s emotional labour in the domestic sphere, such as context sensitivity and relational skills, find their place in the gendered workplace; this is particularly true of the teaching profession, as many feminist studies have shown. As identity labour goes unrecognized in the workplace, so, too, women’s emotional labour becomes wedded to self: “…they are employed as ‘women’ with an assumed responsiveness” (Adkins & Lury, p. 605). My guilt in putting the women in this study under a bubble for viewing is perhaps because of this taken-for-granted emotional labour. When I asked the participants why they chose to be a part of the study, all replied that it was because they knew the difficulty of finding research subjects and they ‘wanted to help’. Most downplayed any personal interest in the topic of ‘women in computing’. All, including this researcher, were involved in the work of a public/professional performance of the self, and it was often challenging to shift the participants’ self-presentation from that provoked by the technologies of ‘feedback’ to a dialogic interviewer/interviewee relation. That being said, it is important to acknowledge that the latter relation is also not innocent of power, as I explained in more detail in Chapter Two.

To reiterate, unlike most women, men can claim to own their selves and accumulate the rewards of self-possession. I argue that in specific ways (as S has indicated) the identity category of ‘women in computing’ has allowed some women in CS

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77 See, for example, Grumet (1988) and Dillabough (1999).
to ‘accumulate the rewards’ of their self-identity in a targetted equity ‘community’. At the same time, this targetting undermines ‘self-possession’ by raising doubts in other women as to whether or not they are rewarded based on their merit as scholars or based on a ‘presentation of identity’ that is useful to the institution. For others, certain identity performances (corporeal and otherwise) as women may be seen as detrimental to their acceptance as members of a larger Computer Science student community. As one of the student respondents said about her undergraduate experience in Computer Science:

I wasn’t sure at first who my friends should be, you know, should I be hanging out with all the cool kids, and pretend to be a show, like the others who are supposed to be cool, or should I like, go to the other end, [and not to put on a display of ‘knowing it all’] and have them think that I’m dumb, you know, because I wear make-up. [Laughs]…[A]ctually they were guys…but the guys that I could talk to, the guys who weren’t obsessed and who had some other interests. … I don’t know whether they don’t have, or they pretend that they don’t have, or, I don’t know what it is, but they certainly don’t seem to have other interests. [A]nd the funny thing is, they’re not even that good. But they want to convince themselves that they are, and now they think that they are…That actually took me a long time to figure out, but actually I am better in this than them. Because they were putting up such a show.

This student, who was one of the top students in her class, felt pressure to ‘perform’ the ‘cool CS student’ because she perceived that her aestheticized performance of identity as a woman who wore make up would be read negatively against her own self-perception as a talented CS student. She did not identify with the male students who performed a ‘show’ of knowledge, but she realized ironically that while the male students’ performance gave the perception of ability, her ‘natural’ performance as a woman wearing makeup produced the perception of a lack of ability.

In work settings, feminine appearance is not seen as a performance, whether for positive or negative effect, but as a ‘natural’ expression of style or corporeal advantage, not connected in any way with a labour of identity or corporeality, and therefore not recognized. Male employees who take stress management courses or work out are seen as
preparing for a flexible and ready response when needed; they are often rewarded reputationally if not materially for this emotional and physical readiness in the workplace (Adkins & Lury, p. 611). For women similar processes of emotional self-improvement are not generally rewarded, but may be credited as a responsible effort by ‘problematic’ subjects to remediate low self-esteem (Cruikshank, 1996). The assumption is that women are always already embedded in their bodies and thus do not have flexible, mutable identities. They are encouraged to ‘help’ this limitation by managing their own self-improvement, but there is no guarantee of success or recognition for this effort; in fact, polished self-presentation is an expectation of ‘women in computing’ as entrepreneurial subjects, as we shall see in Chapter 5. Institutional ‘women in computing’ practices organize student groups to practice self-improvement as performative subjects through leadership seminars, conference presentations and networking opportunities. An international student from East Asia expressed her own self-improvement ‘learning’ this way:

SS: So it seems that you know quite about how to set yourself up for academics, all of the points you need to get to by a certain time...

Student: Oh… in the beginning I wasn’t ready, I wasn’t aware of what it meant. And, yeah… I know more people, and I think once you are in the program for four or five years [Laughs], you have a feeling – what kind of goal I want to reach, what kind of preparation I need to do for myself…[Laughs]

SS: Apart from just writing the thesis, what do you also feel you have to do in order to be a successful PhD student, to get hired later on?

Student: I think there’s a pressure you have, ok, first to be good at your research, and then you have to push yourself to go to talk to other people, make yourself known, make some connection. And then for me, I didn’t speak English before I came here, so I have to push myself to go to a lot of seminars and talk to other people. And I am really shy about asking questions, so if it’s a public question period, you will see… I’m so….silent. Hmm… there are some challenges...

SS: So do you feel pressure not to be silent?
Student: I feel pressure…yeah….I feel challenged…I challenge myself… I need to make myself public, I need to get more involved. [emphasis added]

This student’s experiences through the discursive practices of the performative university underscored the importance of performative self-possession in her future academic career. In her own acclimatization to cultural norms producing her as ‘other’, the student understood the need to ‘push’ herself to make herself known: ‘I need to make myself public’. She felt the pressure to do self-improving emotional work; she challenged herself to overcome her personal shyness. But, as with other aspects of women’s self-identity at work, this emotional work is also hidden. Unlike some of the public performance and presentation work mentioned earlier in the chapter with regard to leadership training, emotional work is seen as a private, intrinsic, non-detachable aspect of women’s selfhood, and thus is not recognized as a resource for material rewards. The student’s self-project is remedial work toward autonomous, self-possessing, self-accumulating subjectivity, but gendered (and racialized) identity means that difference will always stand in contradictory relation to equality.

In fact, in the CS/IT workplace and in academic institutions, the ‘innate’ qualities derived from theories about women’s ‘natural’ ability to empathize, communicate and connect with others (Gilligan, 1993; Margolis, Fisher & Miller, 1999) may actually serve to hold women back from career advancement, especially in technical areas. Contrary to the mandate of ‘women in computing’ communities to support women’s advancement in CS/IT careers, these gendered characteristics may also result in women’s ghettoization in certain research areas, or in teaching positions rather than research careers. In interviews, female faculty members admitted they often struggled with the desire to ‘do it all’, that is,
to excel in research, teaching and student support through mentoring and other activities, and to have a life outside of academe, which may include raising a family. As C recognized earlier in observing female faculty, this may lead to a life of chronic overwork, which certainly contradicts the ‘women in computing’ discourse about ‘work-life balance’. Rather than to challenge institutional practice, this faculty member frames her subject position through the university’s merit discourse:

Faculty: [As a new parent, it’s seductive to think about working part-time, but it’s not clear that it…it’s not clear that you don’t just do the same job and just get paid two thirds of what you were getting paid to do. Now, you’re your own worst enemy of yourself in all of this, that’s why we all work so hard -- it’s maintaining some standard of performance in research, and with respect to teaching, with respect to the care that you give your graduate students.

SS: Do you feel any kind of ‘accountability regime’ putting pressure on that, as well, or not?

Faculty: Well, I feel my own sense… I feel accountable to my students… but certainly, because the university has high research standards, and because my peers are excellent at what they do, I certainly feel the pressure of maintaining a certain stature within my research field because of that, which I think I wouldn’t feel at a smaller university…[emphasis added]

Here the intersecting discourses of accountability (institutional – to peers, to university research standards, personal – to students), performance in research, and care (in the quality of teaching, mentorship) are directed back to the self (‘I feel my own sense’ and ‘you’re your own worst enemy of yourself’) rather than to any external performative pressures. Again, this emotional work is hidden, and the aspect of ‘care’, especially in teaching, is highly gendered, linked to maternal characteristics (Acker & Feuerverger, 1996). In my interviews, several female faculty members directed criticism to the lack of care in teaching on the part of some of their more research-focussed colleagues (largely male); they felt a need to compensate for this deficiency in their programs by providing extra support to students. Again, this is invisible emotional work
that becomes attributed to innate gender characteristics and is therefore not detachable from self as a productive resource. Rather, teaching is devalued in the research hierarchy of the performative university, where it remains highly gendered. The retraditionalization of gender in the discourse of ‘women in computing’ reinforces this inequality, as the pressure for ‘improving student experience’ in postsecondary restructuring policy falls heavily upon teaching faculty, who often also feel the pressures of research performance reporting and budgetary discipline.

In the gendered performance of emotional labour in CS education, being considered a good ‘people person’ and communicator may also be a backhanded compliment when a technically skilled woman student is asked to ‘manage’ a team of fellow students or a department research project rather than being able to develop her own research through practice, as was true of the undergraduate student interviewed in Chapter 2. 

However, a new strategy concurrent with effective ‘community management’ in several university CS/IT and business programs is the introduction of these ‘emotional skills’ as teachable resources made available to a largely male CS student population, who will be able to benefit from their self-betterment as good ‘team players’ when they go on to the CS/IT workplace. These courses have been developed as a response to the stereotypical ‘anti-social geek culture’ of computing, and for male CS students, this voluntary self-improvement is seen as evidence of individual self-possession. A female faculty member and administrator at one of my research sites explains the development of such a course in her department:

Faculty: We actually have a new course at the undergrad level, and it’s on oral, written and interpersonal communication. It’s actually got a huge block of interpersonal stuff, which I think is really cool. And it tries to apply all of these things to a

78 See also Tierney (1995) for an CS/IT workplace example of this.
**Computer Science context.** So they’re actually looking at documents, and presentations and so on, and meeting situations that you would encounter, in your working life. So I think that’s a really positive thing.

SS: How did that course happen?

Faculty: Well, for decades I think we’ve all been moaning about the fact that students have communication issues – especially writing is where it shows up the most, because that’s what we see the most of from students. And it’s not where it should be, and it’s been very difficult to find a way to deal with that. It’s a very resource intensive kind of thing to deal with. And it eventually came down to one CS prof who said, ‘Ok, I’m going to put my money where my mouth is.’

I’ve been moaning about this for a long time, and I proposed a course. And we approved it…[H]e’s teaching the course. And there’s a woman co-instructor who’s a communications training expert. And the interpersonal part of it came up because of those two people really caring about that. And I think if I’d been proposing such a course I wouldn’t have probably even thought of it. A lot of these things would come up in any department, too. It’s just when you throw in a layer that there’s so few women in Computer Science, it maybe makes it more of an issue.

SS: What do you mean?

Faculty: I think as a student, the experience of studying Computer Science, there are just so many more male students, male professors, everybody around you is more male, so that can have a big influence on how…what the experience is like as a student. So, that’s what’s different between here and French, or Psychology, or Biology, or Physics, or something – well, maybe not Physics [Laughs] – a lot of disciplines are more even, and some are very female-oriented – if you’re in Nursing, it’s got the opposite problem.

SS: So you think that because it’s a virtually one-gender population, more of these issues are likely to be there?

Faculty: Well, as a student, it’s really different. And every person reacts differently to an environment. But I think overall, when you’ve got a fairly low percentage of women, it’s going to probably have an effect on a lot of people. Which is separate from the actual curriculum, but it might…it’s what differentiates us anyway from other departments which may need to deal with students’ communication, and may have issues with work-life balance – a lot of those issues carry across other departments, but the ratio of men to women is definitely not a problem everywhere, not an issue everywhere. [emphasis added]

The implication in the faculty member’s comments is that the presence of more female CS students would encourage more communication or at least would permit more modelling of communicative skills for male students. For female CS students, however, these skills are taken for granted and not rewarded; if anything, because they are
considered innate and inseparable from self. They may even be thought to interfere with the development of rational problem-solving and desired flexible subjectivity required in the shifting environments of a neo-liberal, technoscientific economy (see Adkins & Lury, p. 611). Several of the women I interviewed negotiate multiple subject positions including those of student, worker, homemaker and sometimes mother, indicating a flexibility that could more than manage this market-induced stress. In the demand for ‘economic personhood’ (p. 612), however, the latter two identities cannot be claimed as ‘countable’ resources of the self. This lack of recognition retraditionalizes binary public and private spheres by reinscribing the omission of women’s domestic and emotional work from productive labour (see Fraser, 1989; O’Brien, 1981).

In exploring the institutionally managed category of ‘women in computing’, I begin to make visible some of the contradictions experienced by a diverse group of women Computer Science graduate students in their self-identities as women in academic life: for some, also in the CS/IT workplace, and for still others, as family caregivers. Along with the attainment of valuable knowledge resources which enable the production (for some) of a self-actualizing, self-possessing identity, these women experience the appropriation and/or denial of their identity work and emotional labour. The apparent naturalness of the category of ‘women in computing’ as a collective entity allows for the mobilization of identity and emotion as a productive force in the practice of governance. In the next chapter I will investigate ‘women in computing’ further as a text-mediated social relation through which the production of an institutional subjectivity for female graduate students is made available and contested through government education policies and university ‘women in computing’ initiatives.
Chapter 5: Learning excellence: Policy as action and identity

I have attempted a history of the organization of knowledge with respect to both domination and the self. For example, I studied madness not in terms of the criteria of formal sciences but to show what type of management of individuals inside and outside of asylums was made possible by this strange discourse. This encounter between the technologies of domination of others and those of the self I call “governmentality.” (Foucault, 1997, p. 225)

This chapter examines how knowledge about graduate women in computing is organized by postsecondary reform policy in Ontario. Here I investigate how key neo-liberal policy discourses of regulation, accountability, progress and individualism organize Computer Science education at the two universities in my study. In so doing, I make visible the impact of these intersecting strands of discourse upon student experiences and identities, exploring how students both take up and resist these discursive practices. I bring into view how particular liberal feminist discourses about ambition and individualism serve both as a reinforcement of neo-liberal government and private sector goals and as a way for young women to fashion and negotiate the self in academia and in potential careers.

As I will show, this negotiation between neo-liberal discourses and individual identities produces a contradictory and ‘messy’ path, often a place of disjunction for the women graduate CS students in this study. I focus here on how policy functions as an organizing text which produces both action and identity. The question of identity has been vital to feminist analyses across many disciplines (see Chapter 2). Although Institutional Ethnography (IE) as a mode of feminist inquiry generally eschews

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79 This chapter title paraphrases Alison Griffith’s (1992) article title, “Education as Text and Policy.” Griffith, a key practitioner of Institutional Ethnography, describes her research into how educational knowledge about single-parent families was structured by the Toronto Board of Education’s Inner City Policy as focusing on “the knowledge about families and schools that the Inner City Policy organizes” (p. 419). See also Griffith & Smith (2004).
discussion of identity, I focus on it in my use of IE in this thesis. In Smith’s analysis of how discursive practices shape social relations (1999), she shows her connection and debt to Foucault’s work on discourse; however, she pays little attention to how discourse shapes subjectivity.

In the writing of institutional ethnographers, I find Alison Griffith’s work helpful in understanding how institutional practices produce and organize textual knowledge about subjects. In her description of how knowledge about “single-parent families” (and the category itself) is produced by the practices of public schooling (1992), Griffith shows how ‘single mothers’ are measured against theories of child development and institutional demands for mothers’ unpaid work in schooling. Griffith compares this process to Latour and Woolgar’s account of *inscription* in the production of scientific facts (Latour & Woolgar, 1979), where facts are reified social relations. Similarly, ‘women in computing’ are inscribed by educational, government and industry practices as entrepreneurial subjects set to serve national goals by entering global competition for innovation in the knowledge economy. As Kenway and Epstein have noted (1996), “at the very heart of the states’ political program is the desire to make industry more productive, diversified and innovative in the context of global economic competition; education and particularly training reform are regarded as crucial in this process of ‘tooling up’” (p. 303).

The triumphal launching of the policy report *Ontario: A Leader in Education* (Rae, 2005, subsequently referred to here as the Rae Review), the provincial budget

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80 See Chapter 3.
81 Their abilities and desires are also measured against these expectations.
82 This document is a review of postsecondary education in Ontario coordinated by former Ontario premier Bob Rae. Universities and colleges were asked to prepare responses to the Review, and it provided a model
announcement of “Reaching Higher: The McGuinty Government Plan for Postsecondary
Education”, and the opening of the MaRS Discovery District research-business
convergence centre (at which Premier McGuinty appointed himself head of the new
Ontario Ministry of Research and Innovation) all took place in Toronto, Ontario, Canada
within a few months of one another between February and September 2005. This
seamless flow of ‘innovation’ events obscures the network of social relations which
produce both policy ‘problems’ and their solutions. Reminiscent of Old Testament
patriarchal begetting, or Athena’s emergence from the head of Zeus, new policies emerge
from one another as a motherless new birth and textually beget both actions and the
subject categories of those who are organized by them.

The pervasive discourse of innovation and global competition in the knowledge
economy not only informs neo-liberal state economic policy but also intersects neatly
with liberal feminist projects towards women’s greater involvement in higher level
technoscientific production, both in the academy and in industry. A current and local
example of this discourse is the inaugural speech by the chair of Toronto CATA-WIT, a
women-in-technology group under the umbrella of a national advanced technology trade
organization:

In her welcoming comments, Dr. Ilse Treurnicht, CEO of MaRS and Chair of the nascent
Toronto chapter answered her own question: “Why bother” with an effort like the CATA
WIT Forum? She cited the amazing network of women in Ottawa who started the Forum, her own personal experiences of sometimes “feeling like an alien” especially in
the venture capital world, and the vital importance of the “bigger picture” - as Canada

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Government Plan for Postsecondary Education. Largest Multi-Year Investment in 40 Years. Retrieved
84 Canadian Advanced Technology Alliance – Women in Technology (CATA-WIT).
becomes more focused on competing in the global knowledge economy, it will have to ensure it optimally uses its human assets to the fullest, which means ensuring that women are more integrated into technology and innovation for the future of the country. 

A great part of this discursive formation of networked women entrepreneurs for the ‘knowledge economy’ – another powerful discourse – is present in neo-liberal education policies, particularly in the reshaping of the university under globalization (Magnusson, 2005). Here Wendy Larner (2000) provides a sharp analytical lens, building on Foucault’s concept of governmentality to show how the self is governed by neo-liberal policies and their discursive practices, which function locally and also travel globally (Larner & Le Heron, 2004; Ozga & Jones, 2006). Specific to feminist theories of identity, Larner contends that “economic identities have come to be posited as a new basis for political life” (2000, p. 17), noting that “there is an articulation between feminist claims for gender neutrality premised on the assumption that women have the right to autonomous personhood, and neo-liberal claims for possessive individualism” (p. 18).

Liberal feminism’s endorsement of an individualist perspective resonates with neo-liberal promotion of a de-gendered worker and consumer-citizen, with individualized rights and responsibilities (see Larner, 2000, p.19). In the university context, the increased and in some cases superior numbers of women enrolled in undergraduate and graduate programs, and institutional feminist promotion of gender equity policy, has largely closed discussion of affirmative action for women. However, governance through the market and the community has positioned a range of new gendered, racialized and classed subjectivities, including the disabled, as oppositional subjects with claims for

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85 MaRS webpage. “Women in Technology Forum launches at MaRS”.
86 This with the exception of some sciences, including Computer Science.
recognition in the “discourse of restructuring” (Yeatman, 1990 in Larner, 2000, p. 19). I argue that in this neo-liberal framework, the subject “women”, unmarked by race, class, sexuality or ability, paradoxically joins the ranks of the unmarked liberal subject, and takes up the gender-neutral subject position of the performative graduate student in the discourse of university restructuring. This move places feminist equity work based on social justice in a position marginal to the development of individualized economic personhood for women in the academy’s knowledge economy strategies.

Like classic liberalism, neo-liberalism endorses the rights and responsibilities of the individual. Liberal feminism asserts women’s recognition as autonomous individuals with equal opportunities. Through neo-liberalism’s diverse “strategies of rule”, which are found in workplaces, educational institutions and a variety of social agencies, people are encouraged “to see themselves as individualized and active subjects responsible for enhancing their own well being” (Larner, 2000, p. 13).

As we will see more explicitly in Chapter 6, the intersection of neo-liberal and liberal feminist interests opens up the promotion of ‘women in computing’ as self-possessing and self-accumulating entrepreneurial subjects. Here, institutional policy and procedures play a key discursive role as text-mediated governing action shaping individual identities.

I have demonstrated throughout this thesis how some of the women graduate students and faculty in the study have taken up the language of ‘women in computing’ discourses into their own self-description, a practice which Dorothy Smith refers to as

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87 Larner and other political theorists of neo-liberalism have used Foucault’s concept of governmentality to articulate neo-liberalism as a complex of discursive and dispersed technologies of rule. I have discussed their work more extensively in Chapters 3 and 4. For example, see Rose (1999); Dean (1999); Burchell, Gordon & Miller (1991); Barry, Osborne & Rose (1996); O’Malley, Weir & Shearing (1997); Valverde (1996); Cruikshank (1996).
Women faculty perform ‘women in computing’ through university discourses of excellence and accountability, and also through unpaid emotional work (Acker & Armenti, 2004; Acker & Feuerverger, 1996; Blackmore, 1996). The feminist discourse of ‘women’s ways’ reinforces feelings of responsibility to enact what Acker calls the ‘caring script’ (Acker & Feuerverger, 1996). Analysis of these discursive practices shows how women’s ‘emotional labour’ of the self is applied to maintaining institutional ‘regimes of truth’.

These regimes of truth, or as Smith would call them, ruling relations, organize people’s everyday activities. In the relations of university restructuring, policy moves discursively through the actions of national postsecondary administrators working together to attain standardized rationalization programs. Key areas of focus include cost recovery through internal ‘efficiencies’, external research awards and marketed research. Government postsecondary policy ties funding to the increased recruitment of graduate students, especially in science and technology, and to mandates for improving completion time. In what follows I will examine how these processes organize graduate ‘women in computing’ as an administratively actionable group.

Policy as a discursive technology for action

Women are significantly underrepresented in CSE [Computer Science and Engineering] academic departments. As computing technology becomes increasingly pervasive, this underrepresentation translates into a loss of opportunity for individuals, a loss of talent.

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88 Speaking of her own writing (and this would be true of ‘texts’ produced in any form, including speaking, reading and through visual media), Smith describes the process of institutional capture as “a felt disjuncture in texts in which an institutional discourse overrides and reconstructs experiential or descriptive writing” (2005, p. 154). Through this process, the women in this study (including myself) come to read ‘women in computing’ as a problem.

89 This refers to women’s hidden emotional labour, for example, the assumption that women faculty members ‘naturally’ take on emotional support work for students and colleagues.

90 For models of these procedures, see University of Calgary (November 2003) and University of Toronto (May 31, 2000). See also Rae (2005), pp. 87-88.
to the workforce, and a loss of creativity in shaping the future of society. While there are many causes of this underrepresentation...academic departments at the university level nevertheless can have an effect. In particular, an improvement at the graduate level in recruitment and retention (and thus in graduation rates) would enable more women to move into visible and influential positions in the CSE community. The increasing presence of these women would provide positive role models and mentors. \(^{91}\) (Cuny & Aspray, 2001, p. 1) [references removed, emphasis added]

Participation in the vital activities of a developing [knowledge] society...is necessary to foster a lasting transformation. Active involvement brings commitment to the lessons being learned and ownership of the results. Participation and involvement is not just a matter for government officials or managers; it needs to reach deeper to include those who are often excluded and who are key to the strengthening of social and organizational capital. Outside experts can encourage “ownership” of “best policies” through persuasion, but the degree of ownership is likely to be much greater if those who must carry out the policies are actively involved in the process of shaping and adapting, if not reinventing, these policies in the country (or company) itself. (Stiglitz, 1999, p. 5) [emphasis added]

As a tool of institutional administration, the purpose of policy is to organize a site in which a course of action may be carried out, and in that organization to enroll individual actors, a group of workers, managers, citizens, or members of a particular social grouping or category in an affiliation with the goals of the institution (Smith, 1990a). Policy is created by particular people in a specific time and place, but it has the quality of being autonomous, neutral, rational, objective and borne of natural laws or economic forces which are somehow distant from people’s intervention. Detached from the human activities which produce it, policy stands both literally and figuratively as an extralocal text which organizes social relations and people’s everyday activities. Thus it serves as what Foucault refers to as a ‘technology’ of governance, shaping both practical activities among people and individual behaviours and beliefs through expert knowledge.

As Shore and Wright (1997) explain:

\[^{91}\] This quotation comes from a research report on recruiting and retaining women CS graduate students, published by the Computing Research Association’s Committee on the Status of Women in Computing Research (CRA-W). I will refer to the document throughout this chapter.
Policies are most obviously political phenomena, yet it is a feature of policies that their political nature is disguised by the objective, neutral, legal-rational idioms in which they are portrayed. In this guise, policies appear to be mere instruments for promoting efficiency and effectiveness. This masking of the political under the cloak of neutrality is a key feature of modern power. Foucault identified ‘political technologies’ as the means by which power conceals its own operation. As Dreyfus and Rabinow (1982:196) sum up: ‘political technologies advance by taking what is essentially a political problem, removing it from the realm of political discourse, and recasting it in the neutral language of science’. Central to this process is the use of ‘expert’ knowledge in the design of institutional procedures. (p. 8) [emphasis added]

In her discussion of inclusion strategies for girls in Information and Communications Technology (ICT) education as part of Norwegian state policy through the ’70s and ’80s, Gansmo (2003) shows the institutional use of feminist ‘expert knowledge’:

[T]he Norwegian government institutionalized several general feminist interests. It established several gender equality institutions, including the Ministry of Education’s Equal Opportunities Secretariat, which has made a valuable contribution to the shaping of gender and ICT policies and related strategies that aim at getting girls included in the emerging Information Society. (p. 135)

This institutional shaping of gender equity policies for ICT also gives legitimacy to the “Information Society” discourse, marking information technology’s centrality to the organization of Western societies, and in turn marking ‘women’ as a category currently excluded from taking up a central position in the production and shaping of ICTs. I argue that textual ‘inclusion’ of marginalized subjects in policy documents like the Rae Review works upon social morality as a way of correcting social exclusion while it produces and regulates the subjects of that exclusion. It is a paradox that policy documents, as the symbolic production of educational equity performance, pay particular attention to recognition of excluded groups at the same time as the neo-liberal state

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92 In Chapter 3 I described the development of North American feminist ‘expert knowledge’ in the academy.
moves away from economic redistribution (see Fraser, 1998; Gewirtz, Ball, & Bowe, 1995).

Gender policy serves as textual recognition, which it also produces as forms of implementation or non-implementation. As Gansmo notes, “…the absence of girls has been regarded as a problem for as long as computing has been regarded as the key to prosperity” (p. 137). ‘Expertise’ in the form of institutional feminism is applied to policy-making or institutional gender equity directives from above; in the Norwegian context, Gansmo describes ‘state feminism’ as a ‘soft regime’ in reference to the lack of consequences for non-implementation of gender policy (see also Walker, 2003). Other forms of state policy, particularly those guiding the economy and the restructuring of public services such as education and health care, are more explicit and strict in their implementation. Under neo-liberalism timely implementation and monitoring is driven by the discourse and practices of accountability (McCoy, 1999; Spencer, 2006; Strathern, 2000). For the university, economic accountability imperatives dominate ‘soft’ policy like gender equity. In what follows I will show how institutional feminist initiatives to improve women’s participation in Computer Science intersect with neo-liberal postsecondary educational governance and knowledge economy discourses in the production of ‘women in computing’ as a target/problem. In so doing, I make visible how these institutional activities work for the women in my study. As well, I investigate the subject positions produced by these intersecting discursive practices.

**Policy as gendering practice**

Looking at specific policy documents such as the Rae Review, I take my lead from the way Alison Griffith has examined public school policy as the social relation
through which the organization of a particular ‘constituency’ may be seen. Although much has been written since the 1990s about public school reform policies and gender, both locally and globally, and about gender and the effects of neo-liberal economic reform in the workplace, little has been written about how the current postsecondary education reforms in Ontario have specific gender effects for students, especially graduate students. One rare example, the Canadian Union of Public Employees’ (CUPE) analysis of the Rae Review, points to hidden gender issues which the Review itself ignores, particularly in the areas of time to completion and student debt (CUPE.ca, 2005).

As one of Canada’s largest public sector unions, CUPE represents graduate students who work as teaching and research assistants, as well as a wide range of postsecondary staff and sessional teaching faculty, many of whom are women. Here is one example from CUPE’s critique which illustrates how gender is produced by the Review:

Bob Rae says:

“The ‘Graduate Benefit’ would be repaid by graduates, but the repayment amount would be linked to income and could even be paid through payroll deductions.” (Rae, 2005, p. 22)

“Flexibility and affordability are of real value to lower-income Ontario graduates.”

“I am recommending income-sensitive repayment tied to payroll deduction not because it will cost government less, but because it is more flexible and affordable for graduates who are paying it.”

What this means for CUPE members:

We are very concerned about the proposal to institute “income-sensitive” loan repayments through a geared-to-income payroll deduction. This proposal looks progressive. It is accompanied by a grants program for low-income students. As well, Rae recommends that loans would be written off by government if low-income persists.

The problem here is that income-contingent loans are a right wing alternative to a progressive taxation policy. It means that lower-income people will be paying a user-fee like a mortgage for years after they graduate, and will end up paying more interest than higher income earners who will pay off their loans earlier. **This is particularly disadvantageous for women.** It is not clear what the specific impact would be on
graduate students. It is small consolation that the payback period should not exceed 20 years. (CUPE.ca, p. 80) [emphasis added]

These issues of debt load are of real concern for the women in my study, several of whom had exhausted or were not eligible for university funding (because of part-time enrolment).93 Even students with guaranteed funding needed to top up their funding with extra Teaching Assistant (TA) work, which then slowed down their completion time, in some cases past the funding eligibility period. Another of the students in the study was a part-time Master’s student with two young children and a husband in graduate Computer Engineering who also worked in technical support at the university. As a part-time student she was not eligible for guaranteed funding; she worked as a TA for two undergraduate CS night courses per term in order to avoid loan debt. Also because of her part-time status, she had no access to an assigned lab or office where she could do her thesis experiments, and she had to work at home. Working as a TA, she could use an office and felt that she was “more productive”, despite the additional TA workload, because she could do her experiments there between teaching, office hours and marking while her husband looked after the children at home. The extra workload delayed her time to completion, and despite a sympathetic supervisor, she had to apply for several extensions. Accelerated time to completion pressures for graduate students, which are tied to government graduate student funding,94 have definite gender effects.

93 CUPE’s argument here is that because women often go into the workforce after their education at a lower wage than men (some may only work part-time or have reduced maternity leave pay if they are having children), it will take them longer to pay off student loan debts; thus, they will have an unfair burden of interest.
94 From the Rae Review (1995):
Under the new funding formula, targets and funding would be based on agreed upon enrolment levels and would also reflect the number of graduate degrees awarded. To encourage timely completion of degree requirements, funding would be capped at a maximum length of study for each student. The final payment would not be made until the student graduates. At the end of each
Thus, gendered differences are obscured by the Rae Review and other policy framing of graduate students as gender-neutral “promising scholars of the future” (Rae, p. 1). Making visible how the subject category of graduate ‘women in computing’ is created for administrative applicability serves “to locate a set of ideological practices” (Griffith, 1992, p. 419) embedded in the implementation of neo-liberal postsecondary reform. In what follows I investigate policy both as action (organizing how people do things) and as identity (organizing the knowledge about people which becomes part of how their work is organized). While I have divided up the two sections into ‘action’ and ‘identity’ for heuristic purposes, I do not mean to suggest that action and identity are two inert categories in binary relation to one another; rather, as I will explain throughout, they are both organized through a dialogic relationship and produced discursively.

**Policy as action**

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<th>‘ini: Information Networking Institute</th>
<th>Carnegie Mellon</th>
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<td>Professional Graduate Degree Programs</td>
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**Confident. Connected.**

**Going places.**

Graduates of the Information Networking Institute at Carnegie Mellon have what no other engineering professionals can offer – a blend of leading-edge technology expertise, in-depth policy understanding and senior leadership savvy that sets them apart from their peers.’

[emphasis in original] (Picture of graduates on poster has a racial mix, male and female)

planning cycle, institutions that met their expansion targets would have their expansion funding rolled into the base, and their corridor increased accordingly. (p. 87)

95 I will continue with examples from the Rae Review later on in this chapter in comparison with institutional feminist texts targeting graduate ‘women in computing’.
We are not maximizing our potential…We don’t graduate our share of PhDs in engineering and science…Innovation is the pathway to our competitiveness.

…
This country is doing dismally in the critically important area of innovation…And the implications of that failure…show up in the absence of creative policy and investment decisions across all other domains.  

— Ann Golden, CEO, Conference Board of Canada

The poster featured above was part of a display at the 2006 Grace Hopper Celebration of Women in Computing, an annual international gathering of Computer Science faculty, students and industry professionals. The displays and the people who accompanied them to promote their institutions were there to attract international graduate students to a variety of universities and colleges, primarily in the United States. In fact, the doctoral students I accompanied to the conference were looking around the room for possible postdoctorate, internship and teaching opportunities just as various universities were scouting them. It was a highly competitive atmosphere in which the universities were working hard to sell their institutional brand.

The consumer-driven text of the Carnegie Mellon poster promotes the university’s role in the formation of ‘the best’ entrepreneurial subject as an institution which will attract the top students, those who know they want what the institution has to offer. The message is ambiguous, because the poster, which features a young, attractive, multiracial group of men and women, appears to be hailing a constituency who are already ‘confident’, ‘connected’ and ‘going places’. Yet, the institution promises them an education that will make them even more successful. The triad of ‘technology expertise,


A more detailed account of The Grace Hopper Celebration is found in Chapter 6.
in-depth policy understanding and leadership savvy immediately moves these graduates into a higher management role, and the underlining of diversity is significant. This is an example of how identity markers such as gender and race are made actionable, separated from everyday situated activities. More will be said of this textual production of identity later in the chapter.

Compare Carnegie Mellon’s self-directed self-improvement model with Conference Board of Canada CEO Ann Golden’s deprecation of Canada’s innovation deficit. In the policy document cited above, which calls for action in a number of economic spheres, Golden points harshly toward the job Canadian universities are doing, and urges them to promote research and commercialization by increasing the number of graduate degrees in science and technology. This directive is to be monitored by an ongoing set of performance benchmarks, a business-driven measurement system that has been in place in educational management in Canada since the 1990s (Bakker, 1996).

Carnegie Mellon University is a benchmark for successful graduate (and undergraduate) CS student recruitment and retention; the text promoting their professional program fits well into the commercialization-innovation model which is part of the new policies driving Canadian higher education. As noted in Chapter 3, another area of Carnegie Mellon’s ‘expertise’ is in the enrolment and retention of female undergraduate and graduate students, and they have internationally promoted their success in making Computer Science ‘female-friendly’ over several decades (see Blum, 2001; Margolis & Fisher, 2002). Several of the faculty I talked to in Ontario mentioned Carnegie Mellon’s work as a model for their own enrolment initiatives. In fact, faculty from Carnegie Mellon who originated the curriculum project for expanding female
enrolment in Computer Science have promoted this initiative globally (Frieze & Blum, 2002). Like policy and other extralocal texts, the Carnegie Mellon plan can be detached from its local origins and the everyday work of particular people embodied in time and space, and circulated to many different sites. Through electronic media and other forms of dispersal, the distribution of information on how work is to be done from one place to many is what Dorothy Smith calls an extralocal textual relation; circulating standardized procedures is a key practice in organizing institutional power.

**Policy as identity**

[T]echnologies of the self…permit individuals to effect by their own means, or with the help of others, a certain number of operations on their own bodies and souls, thoughts, conduct and ways of being, so as to transform themselves in order to attain a certain state of happiness, purity, wisdom, perfection, or immortality. (Foucault, 1997, p. 225)

I have previously referred to the work of several scholars who have examined Foucault’s concepts of governmentality and conduct in relation to an analysis of specific local and transnational state forms. Following from their work on the shifting state and self-identities under the ‘new’ neo-liberal state and through globalization (Larner & Walters, 2004), I will now shift from a concentration on policy as an action on state forms to consider how policy produces identity, and more specifically, how it organizes knowledge about ‘women in computing’ as both a social category and an identity. Specifically, I will examine how that subject position is organized for the students in my study. As a starting point, I continue the thread of neo-liberal governance, and ask: What are the discourses which encourage people at the university to take up responsibility for national success? How are graduate women in CS organized to become entrepreneurial subjects in this context?
If we understand the neo-liberal state through the intersection of dynamic nodes rather than as a monolithic entity (Larner, 2000), we can see how the Conference Bureau of Canada’s national report card, women-in-technology networks, the Rae Review, ‘Reaching Higher’, the provincial budget, MaRS and other areas of commercialized research serve as a call to citizens to play a role in the nation’s goals for global competition. But as texts for implementing institutional action, they organize people in different ways. As Griffith notes, policy is structured to effect action, but it is also a structuring process, and it is important “to bring that structuring process into view through an analysis of policy as a textual discourse shaping knowledge and action” (1992, p. 415). On an institutional level, and here specifically for the university, the distribution of resources depends on knowledge about students and in determining how to set criteria for the distribution of those resources. Walkerdine (1988) notes the usefulness for educational analysis of Foucault’s insight into “the way in which actual social practices may be discursively regulated by the production of ‘truths’, ‘knowledges’ about children.” In turn, these knowledges “produce the possibility of certain behaviours and then read them back as ‘true’, creating a normalizing vision of the ‘natural child’” (Walkerdine in Griffith, 1992, p. 417). Similarly, the ‘truths’ about ‘women’ in general, and ‘women in computing’ in particular create a discursively produced knowledge about them; these ‘truths’ not only are structured by – that is, derive from everyday social practices - but also structure them.

In the United States, publications by national educational organizations, universities, and the National Science Foundation explicitly link women’s advancement in technology with the economic and political well-being of America. These are
disciplinary texts (in a Foucauldian sense) and they also shape the ways in which knowledge about female students, faculty and administrators is organized. Similarly, my respondents’ accounts of their experiences are organized by feminist discourses about ‘women’s ways of knowing’ and speaking, texts which also inform educational policy and liberal feminist educational initiatives for increasing female participation in university Computer Science programs (Belenky, Clinchy, Goldberger, & Tarule., 1986; Cuny & Aspray, 2001; Gilligan, 1993; Tannen, 1994). These extralocal texts about women are generalized from the experiences of individual women in relation to institutions, but those experiences have been crystallized into ‘facts’ or ‘truths’ about women’s essence and stripped of their social context (Oakley, 2000; Riley, 1988; Smith, 1987). The idea of ‘female-friendly science’, or the more recent ‘female-friendly Computer Science’ (Rosser, 2005)\(^98\) depends on this crystallization, or inscription, of ‘facts’ about women.

As I have made visible throughout this thesis, my interviews with students challenge these communalities of experience, which Scott (1992) critiques as essentializing and a denial of difference. ‘Difference’ and ‘differentiation’, however, fit into the Rae Review’s agenda, where the slogan ‘one size does not fit all’ makes operational the discourse of consumer choice in institutional competition for students. The Review targets students from low-income families, students with disabilities, Aboriginal students, Francophone students, and students who are the first in their families to pursue postsecondary education. These target categories all seem socio-ethically sound, while ignoring the production of gender difference in each. Perhaps current

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\(^98\) See a more detailed analysis of this concept in Chapter 6.
‘truths’ about women’s high academic achievement in the university (and male flight) have repositioned the category ‘women’ to a category of advantage (see Brown, October 30, 2006). Alternatively, perhaps social and legal discourses around these targets are more readily available and quantifiable than is the more nebulous category of ‘gender’.

Mariana Valverde’s (2003) insights about the elision of ‘law and life’ provide another clue to the working of policy upon identity. The law (which links to government policy) requires “a neutral, formalistic term indicating a basis of classification but without appearing to privilege a specific, substantively defined class” (Valverde, 2003, p. 114). This neutral term, for instance, ‘gender’ for women and ‘race’ for African-Americans, enables a claim against discrimination. But in order to stake a claim, “particularly in those jurisdictions with a great deal of judge-made equality law, elaborate epistemological strategies have to be concocted by any group seeking novel juridical decisions. And when seeking to have courts force governments to recognize a certain identity as a social fact, one has to emphasize its ontological pre-legal solidity” (Valverde, p. 114). Wendy Brown (1995) makes a related point about the dangers of inscribing women a victim identity in rights claims. Identification with the category ‘women’ as part of a claim for equity, a contested theme which runs throughout this thesis, is an area of ambivalence for many of the women CS students in my study.

Making students up

I do not believe there is a general story to be told about making up people. Each category has its own history. If we wish to present a partial framework in which to describe such events, we might think of two vectors. One is the vector of labeling from above, from a community of experts who create a ‘reality’ that some people make their own. Different from this is the vector of the autonomous behavior of the person so labeled, which presses from below, creating a reality every expert must face. (Hacking, 1986, p. 234)
I turn now to examine the production of the performative category ‘good graduate student’ through Ontario’s postsecondary reform policy for the knowledge economy. This de-gendered category becomes a site for quantifiable attributes related to economic targets. Its interplay with both the discourse of neo-liberalism and with liberal feminism is articulated in contradictory and complex ways through the sign of ‘women in computing’.

The development of Reaching Higher’s\textsuperscript{99} five-year funding plan to increase the number of graduate students in ‘eligible’ Ontario universities depends firstly on the measure of institutions through performance indicators as productive research centres. Key to the perception of ‘eligibility’ is the university’s potential for research commercialization, particularly in the sciences.\textsuperscript{100} As part of the five-year plan, in order to ‘maximize’ the flow of graduate students (and therefore revenue) through a program, tied funding encourages time to completion targets for graduate student funding.\textsuperscript{101} The discourse of ‘timely completion’ also renders a student ‘eligible’ or ‘ineligible’. As an administrator in charge of university budget planning explained:

\begin{quote}
SS: I notice on the reporting sheets you list two categories…what does ‘eligible’ and ‘ineligible’ mean? Is it the years they’ve been in the program?

Administrator: There are three reasons why an individual student might be ineligible for grant funding: if you’re an international student, it doesn’t matter what you’re taking; if you’re a domestic student, but you’re in a program that has not yet been approved for funding…And the third reason is you’ve lost your flavour on the bedpost overnight…You’ve maxed out on the amount of money the government will send you. The point I was going to make is: 25 to 35\% of graduate students, domestic graduate
\end{quote}


\textsuperscript{100} For a critique of York University’s recent move to reinvent itself as a site of biotechnology innovation, see Noble (2007).

students in programs the government will pay for, are no longer providing grant funding to the institution because the government says, “You’ve had it too long”…Those numbers are quite large…They’re certainly costing the university in terms of grant revenue, because grant revenue’s gone down. Most universities have policies in place that say, “You can have graduate-type scholarships and other institutional funding until two or three terms after your government funding runs out. So it’s kind of… think of it as a soft landing, if you will. The screws start to get tightened down on you, because if you don’t start moving out, your revenue sources start to dry up on you.

On the flipside, and I’ve heard this suggested - I have no evidence to corroborate it - “Wow, you’re a great graduate student, and we’re moving really well with our research, aren’t we? And, you know, in two years we’ll have the answers to the tests we’re putting in play -- no, you can’t go next year, I need you to help me get into that second year”. So there’s a bit of a cross purpose for faculty members to move graduate students out quickly, because then you have to train new ones [Laughs]…[G]raduate students [as TAs and sessional instructors] are [also] part of the undergraduate delivery process…If you’ve got someone who’s been with you for three years and now knows the course really well... all I’m really pointing out is that, anecdotally, there are cross purpose pressures for faculty members to move you out quickly. [emphasis added]

Neo-liberal restructuring policy produces the ‘good graduate student’ who finishes in a timely manner and who draws revenue and reputation into the university by doing award-winning research work (assisting on a supervisor’s research grant project, receiving graduate NSERC or OGS awards). The student who falls into the ‘ineligible’ category is then positioned as an unproductive drain on the institution to be ‘moved out’ quickly. In Chapter 3, C’s experience of intensified reporting after her category changed from ‘good’ to ‘ineligible’ is an example of how this discursive differentiation is produced for the students. Like gender, the exigencies of lived experience become invisible through the ruling re/structuring discourse positioning students as neutral revenue ‘units’. The administrator’s comments show how the de-gendered ‘good student’ and its Other are tracked and measured in performance indicators, and are thus taken out of social embodiment and everyday life contingencies. For the administrator, the complexities and contingencies of ‘moving out’ in the examples of keeping good students
are still connected to the neo-liberal discourse producing graduate students as commodities, as ‘value added’ to the university.

**Care of the enterprising self**

The discourse of the ‘good graduate student’ also becomes taken up as the student’s individual responsibility for self-governance. It is part of her self-concept as an autonomous, ambitious and self-actualizing subject. One of the graduate student participants, L, describes a problem of initial graduate over-enrolment after the ATOP grant policy funding was brought in to build the new Computer Science centre on campus. This funding was tied to increasing CS enrolment, particularly encouraging enrolment at the graduate level. The money was to be divided up to cover both building costs and new faculty hires. Certain specializations, like Software Engineering, saw a huge increase in graduate enrolment. As the student explained:

Student: In two years, they went from 54 enrolled to a hundred and something. Supposedly it [the over-enrolment] was an accident, in that they had a certain percentage of people who normally declined offers, but acceptance was higher due to the bust in the Computer Science industry. There was an increase in graduate students because there were no jobs. But it was also because of the ATOP numbers. They were trying to be super-generous so they got their money, their ATOP money – you have to have a certain number of undergrads, a certain number of Master’s, a certain number of PhDs according to certain rules, and then you get extra money from the government based on these numbers. And if you didn’t meet them, you wouldn’t get the money.

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102 In 1998, the Conservative government under Ontario premier Mike Harris continued its radical restructuring of Ontario’s public services and education system with the announcement of a fund to educate the labour force needed for the knowledge-based economy. The government’s postsecondary education policy targeted education and training geared to the high-technology sector, which was deemed the centre of growth for the local economy. Universities were to receive money for the development of new high-technology facilities and hiring, particularly in the areas of Computer Science and Electrical Engineering, through the $150 million Access to Opportunities Program (ATOP). The program was to generate 17,000 additional spaces at Ontario universities in each of three years to meet the then-high demand for computer science and engineering programs. Both Mackenzie and Pearson applied for the funding, building new complexes for Computer Science and engineering, as well as hiring a number of new faculty members. During this time, a number of women who were among the pioneering classes of CS graduate students in the ‘80s were hired, probably the largest number of women hired at one time in the history of the province’s CS/IT academic sector (Wolfe & Gertler, 2001).
So they wanted to be super-sure that they got the money, and they accepted more people in certain areas than they could supervise…There were certain students that were accepted that had, like glowing recommendations from…mostly international students…where they got here, and they really couldn’t portray themselves…although they…their…people had written wonderful reference letters for them, they came here, and I guess they didn’t have a lot of self-confidence and they didn’t feel comfortable in our culture…I mean, the Chair at the time…or the Grad Chair…said it was partly due to the role of a female in other countries compared to here…there was a couple of people who couldn’t stand up for themselves…, whereas, like, if I wanted a supervisor, I’d go in and say, ‘Hey! I’m a student! I need a supervisor! I’m a really good student!’

SS: How did you find this out?

Student: Because I was President of the Student Society that year. [Laughs]…And we were trying to help people who didn’t have supervisors…But eventually, you’re supposed to do a thesis, and if you don’t have a supervisor, you can’t do a thesis. And then you sort of have to either drop out quietly, or you go past your funding deadline and then you start paying more money. All those people supposedly were found…supervisors….But it was a personality type - where the people who were more aggressive were the ones who got the supervisors, the people that weren’t aggressive were the ones that didn’t...And whether or not that ended up splitting, like, a male-female problem…it might have partially been the case, although I have no…like, that’s just hearsay, and it’s not good for any, like, [Laughs] statistical purposes or anything. [emphasis added]

L’s comments make visible her affiliation with discourses of liberal feminist progress in the West. As well, her own assessment of herself as “a really good student” positions her against those whose individual personality types (and racialized identities) make them ‘ineligible’ for recognition. She is active in both taking up and promoting the discursive practices of neo-liberalism in her active self-(im)provement, positioning herself aggressively for global competition while at the same time working to ‘help’ the marginalized international students to assert themselves. Like the international student in Chapter 3, the female international students in this account are hailed by both liberal feminist and neo-liberal discourses of individualism, global networking and self-

103 To repeat part of her comments here: I think there’s a pressure you have, ok, first to be good at your research, and then you have to push yourself to go to talk to other people, make yourself known, make some connection. And then for me, I didn’t speak English before I came here, so I have to push myself to go to a lot of seminars and talk to other people…I feel challenged…I challenge myself…I need to make myself public, I need to get more involved. [emphasis added]
promotion to make themselves visible, and therefore ‘countable’, or, as Valverde puts it, to practice the regulating ‘despotism of the self’ (1996).

The Rae Review encourages universities and colleges to pursue “marketing efforts…to ensure that Ontario remains an important ‘educational destination’ for international students”:

Students from other countries who study in Ontario help promote our international reputation, contribute to future trade and economic development opportunities, bring expertise – including high quality researchers and graduate students – to Ontario, and enrich the postsecondary experience for all students. (Rae, 2005, p. 57)

According to the administrator, performance indicators for what I call here the ‘good graduate student’ are rendered ‘gender-blind’, even though numbers of male and female students are tracked in enrolment statistics. The good graduate student is differentiated by the acceptance of a ‘new’ discipline for funding – the category ‘international student’. While the category ‘international student’ does not generate government revenue, it is valuable ‘social capital’ for reputation, for global networking and competition, and for potential research benefits. School fees and guaranteed funding are based on the government funding differential (the higher ‘cost per unit’ of these students is weighed against potential ‘value added’). In the administrator’s budgetary projections, the university had as an objective:

[to have ] about 30% international students, and those reasons are predicated on a whole bunch of things, one of which is the international perspective…[the university is] best in the world, all of those wonderful things you can find. And we’ve quantified it and so – guess what? If you’re going to set a target, you’ve got to monitor it and see how you’re doing. [emphasis added]

Thus, policy positions the ‘good graduate student’ and the ‘international student’ as targets. As previously mentioned, the Rae Review also ‘targets’ first-generation university goers, Aboriginal students, low to middle-income students, Francophone
students and students with disabilities. These categories underline what is not targeted in the government policy, ‘gender’ more generally. As I argued earlier, ‘women’ as an unmarked category may fold a student into the neutral category of ‘good graduate student’, or she may drift into ‘ineligibility’. If she is marked as an ‘international student’ or an ‘Aboriginal student’, she is likely also to be racialized and gendered, though in policy, these identity categories are neutralized, obscuring their differentiating effects in lived experience.

L’s story of ‘helping international students’ displays how neo-liberal policy texts position ‘women in computing’ discursively, and how that positioning circulates certain knowledges about ‘women in computing’ back to the people who produce and monitor organizing texts. Thus, as liberal feminism performs what Bronwyn Davies calls “category maintenance work”\textsuperscript{104} by reinforcing the “obvious meaning of the categories” (Davies, 2000, p. 23), L’s ‘knowledge’ about the ‘good graduate student’ (in her own case, “really good”) is that she had to be assertive and take her own interests in hand by promoting herself to potential supervisors. As well, her ‘knowledge’ about the female international students, though not substantiated by “statistics”, is productive. By positioning them as “not being able to stand up for themselves”, she inscribes them as not only communicatively incompetent graduate students, but she also ascribes them to a culturally differentiated category within ‘women in computing’ under the common banner of “our culture”. In both cases, like the Graduate Chair’s assessment of the two women international students, these knowledges may be transmitted as extralocal texts for ruling. As with M in Chapter 2, L’s remarks as an ‘insider’ serve to strengthen

\textsuperscript{104} The student’s narrative is also a performance of the ‘caring script’ (Acker & Feuerverger, 1996). Thanks to Dr. Kari Dehli for this observation.
dominant and contradictory knowledge about women’s attainment as good graduate students and their marginal status as ‘women in computing’.

**On gender blindness**

The administrator’s claim that the statistics he worked with are “gender-blind” and therefore gender-neutral is part of the discursive practices of a system of domination in which ‘equity’ produces a myth of equal opportunity. In this environment, contradictory messages represent, first, diversity and free choice at the same time as neo-liberal restructuring practices enforce the rigorous rationalization and standardization of institutional managing techniques through performance indicators. In their discussion of the myth of equity in public schooling, Bryson and de Castell (1993) put the clash of discourses this way:

[The] compulsory submission of all children to extensive and intrusive state “standards” is the process whereby the state constitutes the subjects to which it then accords the rights that it then goes on to represent. This is what “equity” in education seems to have meant for minority students: the right to try but inevitably to fail to become white, male, and middle class. And this is what institutional “gender equity” policies seem to signify most often for girls and women: an impossibly contradictory injunction, on the one hand, to enact a series of characteristics designated as “gender-appropriate” in educational feminism’s project (for example, to legitimate “women’s ways”) and, on the other hand, to embrace and participate ever more “equally” in the set of rules, roles, and relations established and maintained by a predominantly masculine power-elite. In this “impossible dream” of gender equity, rights are accorded institutionally in virtue of, and to the degree to which, subjects approximate, instantiate, or simulate that which they can never in fact become. What kind of equity is that! (1993, p. 343) [emphasis added]

The rules for tracking and disciplining ‘time to completion’ are part of the monitoring of ‘student experience’. However, the “rules, roles and relations” which produce the ‘good graduate student’ never consider the everyday lives of the student who

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105 As Rae says of the importance of differentiated consumer choice in higher education options, “the age of ‘one size, one price fits all’ should be over” (Rae, 2005, p. 24).
studies part-time while working and raising two young children, or the working class 
student who, despite her guaranteed funding, needs to work at extra TA positions over the 
summer in order to survive in an expensive environment. These uncounted and 
uncountable parts of their student experiences are certainly gendered and classed, and 
they are not ‘neutral’. Like the invisible ‘caring’ work, mentoring hours and other service 
activities that women faculty often perform, the students’ paid and unpaid institutional 
work goes uncounted.

The fact that accounting practices obscure the differences in social conditions for 
students means that the responsibility for solving these ‘problems’ falls back upon the 
students themselves. Like standardized testing in the elementary and secondary schools in 
Ontario, performance indicators as contests of strength set up a competitive regime of 
truth about differentiated students in the system, and mark (literally and figuratively) the 
ones that fall off and often fall out as ‘not up to standard’. Similarly, the hazing rituals in 
first- and second-year undergraduate Computer Science described by the faculty member 
in Chapter 3 are set up unabashedly in order to weed out ‘ineligible’ students. And lastly, 
in its category maintenance work, ‘women in computing’ discourse also positions women 
students outside the normative subjectivity of Computer Science; women are told that 
they are not ‘ambitious’ or ‘assertive’ enough, hence their prolonged completion times.

Within the enterprise culture of university reform reaching to improve the 
‘student experience’, strategies for self-help are technologies for shaping and promoting 
the entrepreneurial student. The neo-liberal doctrine of individuality and personal choice 
pushes aside any suggestion that conditions of systemic inequality are at play. In response

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to feminist challenges to expand opportunities for non-traditional CS students, such talk is often dismissed as evidence of women’s lack of commitment to the hard work of Computer Science. In other contradictory discourse, ‘women in computing’ are told that although women work hard at Computer Science or Math and are good rule followers, they lack the independent initiative and creative spark of their male peers, who are ‘naturally’ brilliant at technoscientific subjects without having to work at it (Mendick, 2005; Walkerdine, 1990b). They can “be a show”, as the student in Chapter 3 described it, perform the ‘good graduate CS student’ without appearing to try, and be the ultimate “cool nerd”. Some of the young women in this study try on this subject position as well in disidentification with the ‘women in computing’ discourse: for example, M’s blog performance in Chapter 2.

It seems impossible to ever win at this discursive game if one can simultaneously work too hard and not hard enough, so it is not difficult to understand why young women’s attrition rates in first- or second-year undergraduate CS programs continue to be high. Now that low enrolment and retention is becoming an almost proportionally equal problem for male undergraduate students, university CS programs are starting to consider how to redesign their undergraduate curriculum. Moral panic about boys’ failure in high school and their flight from university has de-centred other discussion of gender. As for ‘women in computing’, when in doubt, work on the self. As one student explains:

I think as a grad student you kind of have to be ambitious to do that…I don’t know…maybe it will be different when I go and actually get a real job [Laughs] – maybe then ambition will seem, like, kind of a strange thing, but, I mean, here, you have to be ambitious to read all of the stuff you have to read, and try to publish papers. If you’re not a little bit ambitious, unless you’re brilliant, which I’m not, then, you’re probably not going to do particularly well…. [emphasis added]
Like the international student described earlier, she is compelled through technologies of the self to attain the subject position of ‘good graduate student’. In the next section of this chapter, I will explore how policy directives and institutional feminist projects aimed at improving the ‘student experience’ work as a regulatory regime for the students and faculty in my study.

**Postsecondary reform policy in Ontario: Reaching higher, reaching past gender**

Universities do not only generate new knowledge through primary research, they also provide technical support and specialized expertise and facilities for on-going firm-based R&D activities. University activity is not confined to the process of knowledge transfer on a local basis, but also acts as a conduit of new knowledge through the “global pipelines” of international academic research networks. Finally, rather than acting as “ivory towers” insulated from their community, they act as “good community players” that facilitate local linkages and networks and create “anchors of creativity” that underpin the virtuous cycle of talent attraction and retention. (Bramwell & Wolfe, 2005)

The direction for postsecondary reform has been set in a number of institutional moves both nationally and locally, including the centralization and rationalization of Canadian scientific/technical research in Centres of Excellence (Atkinson-Grosjean, 2006), and the establishment of shared university and industry research centres, such as the aforementioned MaRS Centre (Uehling, October 7, 2005), as a gateway for the commercialization of biomedical and other biotechnological research. In the case of MaRS, rather than wait for government funding and implementation, representatives from the biomedical industry (including venture capitalists and start-up managers) approached the University of Toronto for support of the initiative, which also cast the publicly unpopular idea of public/private partnerships in a more socially beneficial light (see Natale, 1996). However, as policy directives from research institutions with a neo-liberal economic focus like the Conference Board of Canada and the Fraser Institute are taken increasingly into Canadian university planning, benchmarks for measurement of
performance and recommended revenue gaining activities like the marketization of research and the cross-institutional sharing of services are becoming more a part of university budgeting decisions (Ozga & Jones, 2006).

As part of neo-liberal governance beyond the State ‘at a distance’ (Rose & Miller, 1992) governments yield to the invisible hand of the market, but they also play an important role in setting out the legal framework for enabling documents such as international trade agreements, and more locally, education and health policies. Neo-liberal governments differ from neo-conservative ones in presentation though often not in kind when it comes to economic policy, but in that presentation they appeal to citizens’ concern for the national ‘public good’. This appeal is made especially in the area of education, which is in concert with democratic values and the nation’s progress. Citizens are produced as free, autonomous subjects who are also personally responsible for their actions. Through the notion of individual free choice compliance is more gently achieved than in neo-conservative regimes (for example, the previous Ontario government of Mike Harris\textsuperscript{107}), but nevertheless policies calling for social regulation through self-improvement operate as technologies toward these goals (Shore & Wright, 2000).

Neo-liberal governance, then, is defined as a strategy of governing technologies which replace a Keynesian social welfare state with a call for individuals to conduct themselves as self-reliant subjects (Rose & Miller, 1992). In place of a monolithic and powerful state apparatus, through policy, experts practice institutional discipline (Rose, 1999b) in measuring and posting performance indicators. Postsecondary restructuring in

\textsuperscript{107} Harris’s Conservative government was in power in Ontario from 1995-2002, and the Tories continued under his former finance minister, Ernie Eves for another year after Harris’s resignation. The government’s program of radical restructuring, which included major public sector cuts and privatization of services in municipal governance, health care and education, was known as the ‘Common Sense Revolution’.
Canada, as in many Western nations, has seen a tremendous intensification of the disciplinary practices of tracking institutional performance by appealing to individual responsibility for change. Specifically, the mandated collection and distribution of key performance indicators for global comparison organizes the entrepreneurial performance of the ‘good graduate student’ (and faculty member) as highly productive of measurable (and rewardable) outcomes. In the next section I will follow the links between these accountability techniques in neo-liberal university reform policy and the liberal feminist texts producing ‘women in computing’.

Measuring up

As an enabling document for postsecondary education reform in Ontario, the Rae Review is a text which lays out an actionable framework, setting up the specific categories under which reform will take place but presenting them as if they were pre-existing global economic entities, consistent with similar entities in the U.S., England, Australia and New Zealand. In fact, these categories have emerged as the result of a number of sometimes harsh institutional changes in the province, particularly in the public education and health sectors. In the following passage from the Rae Review, Bob Rae’s opening letter to Liberal Premier Dalton McGuinty and then-Minister of Colleges, Universities and Training Marilyn Chambers, I show through an informal textual analysis how the text performs a discursive rearrangement. By replacing people’s

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108 I implicate myself in this discourse, having been the recipient of a SSHRC Canada Graduate Doctoral Scholarship for this research in 2004. I am almost certain that the interpretation of my research project for the award was toward a usable, ‘what works’ policy direction. As one university administrator in charge of managing performance data said to me: “You’re going to solve this, aren’t you?”

109 In particular, these accounting technologies enable the dominant discourses of ‘evidence-based research’ and ‘knowledge transfer’ for academic entrepreneurship (see Dehli & Taylor, 2006; Ozga & Jones, 2006).

110 Rae’s own government was responsible for the intrusive and much disliked Social Contract, which involved wage freezes for public sector workers over three years; this policy was framed ideologically as a necessary tool in knocking down the provincial deficit through the discourse of the ‘social good’.
actual actions and their location in a particular place and time with a concept to stand in
place of these, a concept which then functions as ‘reality’ to enact the implementation of
policy, this text from the Rae Review represents what Smith (1990) refers to as an
ideological practice:

Postsecondary Review: Higher Expectations for Higher Education

Ontario is on the cusp of real reform. The higher education system is ready for change
and it’s going to get better with your attention... You understand the importance of higher
education to students, to the economy, to Ontario society - and the nation at large. You
also understand that it’s important to make change happen now - which is why we agreed
to do this over a compressed period of time so that decisions could happen as early as
Budget 2005. You are right - it’s critical to make a difference now. Education is what
drives us forward, inspires innovation and creates an engaged democratic society. (Rae,
2005, p. i) [original emphasis]

This excerpt of the Rae Review reveals six key aspects of neo-liberal governance:
1) Reform is already in process, and has been since Rae’s own term as Premier; this
representation is ahistorical and obscures the people actually responsible for
making the changes. This text fronts the discourse of innovation as a seamless,
self-contained project, but as Larner argues, in our analysis we need to make
visible “contested representations within what are putatively singular or common
cultures” (Yeatman, 1990 in Larner, 2000, p. 14). The claim of ‘real reform’, of
change, and of innovation in approach suggests a break from the past toward the
future, but it also disengages policy as text from policy as practice. It obscures the
work of people, as part of history, and also detaches policy from the actual
material conditions that both organize and are organized by these changes, a
series of political and social forces that are not seamless, but competing and
contradictory;
2) ‘[I]t’s going to get better’ presents a positivist view, grounded in scientific and technological progress. No reason is given to expect this; revealing neoliberalism’s ideological and material investment in change and innovation;\textsuperscript{111}

3) The phrase ‘make change happen now’ suggests that the urgency is economic, predicated by the imminent release of the Budget and the pressures to ‘tool up’ for the global knowledge economy. At the centre of this discourse is the notion of education as the key to a ‘competitive edge’. The Rae Review also suggests that although university administrators and faculty are ‘resistant to change’, the status quo is no longer acceptable to the taxpaying public. Hence the government, in response to these demands and through policy, will ‘make change happen’ in order to build “a culture of expectation and achievement” within “a framework of public accountability” (p. 13). Within this framework, the government puts more pressure on universities through regulation, and as the experiences of students in this study will show, the university puts more pressure on students to self-regulate;

4) The Review serves as an activating text for budget reforms, followed at the delivery of the 2005 Budget by the announcement of McGuinty’s ‘Reaching Higher’ plan to boost graduate enrolment. The text obscures the history of educational reform and makes it appear that Rae’s report was necessary in order to make McGuinty’s plan happen; in reality, both were conceived together and were part of a consolidated postsecondary restructuring plan that had already begun;

\textsuperscript{111} For a seminal example of this kind of discourse, see Stiglitz (1999).
5) ‘Education is what drives us forward’: again, this reinforces the discourse of scientific progress. The underlying message is that education also drives business forward and sets the stage for the innovation agenda. Investment in projects like the MaRS Discovery District is part of a conceptual network of higher education support, innovative commercialized research and economic progress which is made instrumental by the Reaching Higher plan;

6) ‘[A]n engaged democratic society’: this makes the policy a national mission, a project, inscribing the sense of personal responsibility for Canada’s success. As Larner explains, the “conception of a national community of citizens, made up of male breadwinners and female domestic workers, has been usurped by a new understanding in which not only are firms to be entrepreneurial, enterprising and innovative, but so too are political subjects” (2000, p. 11).

The subjects of ‘women in computing’ are hailed through institutional discourses to recognize themselves in a similar way as technologically savvy, active, self-actuating leaders contributing to the nation’s ‘knowledge advantage’. At the same time, they are discursively inscribed in a gender position which constrains them to marginality. I examine the different ways in which they alternately take up, resist and reframe this gendered discourse.

**Identity and student ‘experience’**

GOAL: Great Education

STRATEGY 2: Pursue quality and innovation to make the student experience rewarding and successful.

Recommended Actions

6. New Council
Establish a Council of Higher Education, reporting to the Minister of Training, Colleges and Universities to: advise government on how to achieve its learning mission, set targets and measures for improvement, monitor and report on performance and outcomes, co-ordinate research on higher education, and encourage best practices. (Rae, 2005, p. 51)

An important part of postsecondary reform, both in the Rae Review and Reaching Higher, is the generalized goal of monitoring and improving a vague category known as ‘student experience’. Here I contrast the category of ‘student experience’ as an institutional performance indicator with feminist ontological and epistemological claims for the importance of ‘experience’, the latter posited against the truth claims of disembodied rationality and putative objectivity. These claims provide a major rationale for the standardization of institutional forms, a discursive system of measurement practices organized by the current doctrine of accountability in postsecondary education. The authority of experience is itself not an unproblematic claim, however.

In her renowned essay, “Experience” (1992), Joan Scott troubles the notion of the authority of experience, of testimony, as truth, as an authentic and authoritative account of lived experience which cannot be challenged. For feminists, some of the appeal to the authenticity of experience is reflected in the idea that “the personal is political” or of “situated knowledges”, giving primacy to socially embedded and embodied knowledge over the normative call for ‘objectivity’ that sees knowledge as neutral and transparent. However, Scott points to a problem when experience is taken as a foundational source of knowledge, rather than as material for analysis of how socio-historical forces have produced certain subjectivities: “It is precisely this kind of appeal to experience as uncontestable evidence and as an originary point of explanation…that weakens the critical thrust of histories of difference” (p. 24).

Experience framed in this way naturalizes difference and essentializes the identities of those who were othered in the first place, rather than recognizing them as subjects who are socially constructed and who have agency. The evidence of experience as transparent “reproduces rather than contests given ideological systems” and doesn’t allow us to see difference as “constituted relationally” (p. 25). Scott proposes that we think of history discursively, and that we see narratives (including the narratives of testimony) as “discursive productions of knowledge of the self” (p. 35). A reluctance to accept ‘women’s experience’ as uncontested truth is particularly evident in participants’ feelings of ambivalence toward organized ‘women in computing’ groups at the university:

SS: Hmm. So, the fact that people are discussing problems in general [at the meetings] is something that you find depressing?

Student: I guess it’s because it’s problems that I’ve never run into. So it’s like you don’t even realize that there are problems, and then you go to the meetings and it’s like oh, I guess [Laughs] you know people are being treated differently. And I mean some of it I think is helpful, it’s just that I probably do some of that. Like if I think about it hard there’s probably been times where I’ve tried to underplay my own achievements. And so to be aware of that and to try and help that again from like therapy, is probably a good thing. Because it’s all like you know stories about oh, you know, it’s really rough out there and all that. It’s and I you know it’s almost kind of you know almost are more aware of it and more sensitive to it. Whereas if I hadn’t gone to a meeting like that, I might not even notice. So it’s hard to explain. I mean I think there are definitely good reasons to go, but I just find it kind of depressing, you know [Laughs].

Scott’s critique of feminism’s claim to the indisputable authority and authenticity of ‘women’s experience’ in order to establish women as people with agency resonates with the experiences of the student above. She did not identify with ‘problems’ she’d never run into, but felt depressed rather than agential when she imagined a future in which the ‘truth’ of ‘women’s experience’ inscribed her as always already a victim, in fact stripping her of her own sense of agency. In keeping with the liberal feminist
discourse of ‘women in computing’, she read the meeting’s message of self-improvement as “probably a good thing”, possibly as an individual strategy to manage future risk. However, she remained ambivalent. Of the women students I interviewed, many questioned the supposed collectivity of their experience as women in Computer Science, despite the fact that they chose to participate in my project as such a group. The diversity of their countries of origin, their educational backgrounds, their family responsibilities (or not) and many other aspects of their lives often made the idea of shared ‘experience’ seem alien to them. Thus, essentialized identity claims underscore a place of disjuncture between the ideological framing of experience as feminist knowledge about ‘women in computing’, and their own lived experiences.\textsuperscript{113}

\textit{Essentially speaking}

Drawing upon this ‘experience’ and ‘authenticity’ discourse, there is a suggestion in institutional feminist approaches to women’s inclusion in Computer Science (CS) that women play to our ‘natural’ strengths as communicators and collaborators. Certain areas of CS are deemed more ‘female-friendly’,\textsuperscript{114} more in tune with ‘authentic’ femaleness, with its virtues of communication, flexibility, and respect for ‘human’ over machine life (Rosser, 1990). This discursively produced knowledge finds its way into academic

\textsuperscript{113} Scott argues that this ideological position universalizes the identity of women, and this oversimplification of experience precludes the understanding that “[e]xperience is at once always an interpretation and is in need of interpretation” (p. 37). The notion of lived experience as the foundation for political action, as in “the personal is political,” draws a straight line from women’s experience of oppression to resistance. Thus, “the possibility of politics is said to rest on, to follow from, a pre-existing women’s experience” (p. 31), one which Scott criticizes as ahistorical and decontextualized. It is indeed the simple message that can be repeated globally, and it has great currency in concert with the discourse of educational reform. I contend that the active promotion of essentializing knowledge about ‘women in computing’ within the academy does not follow a straight line to resistance but to institutional inertia. Throughout this thesis, I articulate how this knowledge is both structured and structuring.

\textsuperscript{114} The notion of ‘female-friendly’ science and more specifically ‘female-friendly’ Computer Science will be discussed in more detail in Chapter 6.
planning in CS education, and in turn determines how knowledge about ‘women in computing’ is organized for the students in my study. This production of women’s identity for and by ‘women in computing’ also engages with neo-liberal management discourse about the ideal communicative, flexible workers in the global knowledge economy.\(^{115}\) It positions women in a gender binary opposite those who really ‘know’ and run the machines.

As I detailed in Chapters 2 and 3, in several interviews with faculty and administrators as well as with students, and in readings from the literature on Computer Science education for girls and women, fields that favour language skills, human interaction, interests in life sciences and concrete application are said to be more appealing to female students. These fields include Computational Linguistics, Requirements Engineering, Human-Computer Interaction, or Bioinformatics. Although some of the student participants rejected this stereotypical classification, others embraced it. Once again, women who align themselves with what they see as the general goals of feminism for gender equity face the dilemma of a desire for community affiliation as women while at the same time resisting an essentialized ‘identity’.\(^{116}\)

In addition, I argue that in the ‘women in computing’ discourse, there is a disjuncture between an active process in the representation of liberal feminist interests in computing and the lack of institutional change in women’s equitable participation in the


\(^{116}\) A useful shift from the idea of affiliation through essentialized, fixed identity comes from Young (1997) and from Weir (1996), who theorize contingent coalition politics (Young) and identification rather than identity (Weir). However, it is important to remember that these shifting identity positions are still tied to material conditions based in geographical locations and historical events, a point which transnational feminist theorists have brought into view (Grewal & Kaplan, 1994; Ong, 1999). Attention to this historical and temporal situatedness, and to the everyday practices which are a part of it, helps to keep the discursive practices of rule in view, and is key to examining how institutions work through us.
Computer Science field. In intersection with the ethics of neo-liberal university reform, institutional ‘women in computing’ practices produce women as enterprising subjects who strive to change themselves rather than to engage in a collective feminist project, but this individualized engagement paradoxically seeks an affiliation with essentialized ‘women’s ways’. It is the latter claim that many of the young women in my study reject. For many of them, the ‘community’ of ‘women in computing’ functions very much like the relations of globalized Computer Science and IT work, which are generally project- and contract-related rather than permanent (Shih, 2004). These contingent social networking practices attach themselves well to the requirements of a high-skills worker in the global knowledge economy, and to the practices of neo-liberal governance. As Rose (1992) explains, through the diffuse governing technologies of neo-liberalism, “[r]egulatory practices can be transformed to embody the presuppositions of the enterprising self, striving for fulfillment, excellence and achievement” (p. 146).

Managing expectations: Student experience of ‘student experience’

A salient yet opaque topic in neo-liberal postsecondary reform policy is the creation of opportunities for improving ‘student experience’. Locally, this is a key but vague target area in both the Rae Review and Reaching Higher, and it is used in national and international surveys as a comparison benchmark between universities competing for customer satisfaction in a marketized education system (see Dehli, 1996). As part of ‘improving student experience’, a policy directive from the Rae Review that had already been in many institutional plans, universities scramble to promote mentoring programs, and graduate students are often given the responsibility for mentoring undergrads, in addition to their RA and TA activities (for example, this was part of the University of
Toronto Provost’s suggestion list, which is posted for public viewing on the Internet). Graduate students also supervise undergraduate research projects (another suggestion on the U of T list), in order to provide a vital ‘research experience’ to senior undergraduates which may encourage them to consider graduate school. This fulfills another university target for increased graduate student enrolment, tied to space expansion and capital expenditure funding.

Graduate student responsibility for undergraduate teaching, mentoring and supervisory tasks is also part of identity building and a contribution to the institutional management of ‘student experience’; it is part of the graduate student’s growing affiliation with the university’s academic community. However, as critics (CUPE, for example, and the Graduate Students Union) have pointed out, this obscures the social relation of graduate students as employees of the university - a relation which demands fairness in workload and compensation - and opens up an intensification of student delivered services and academic labour quite apart from the institutional expectations of academic progress in their own thesis work.

For the female graduate students in my study, skill in managerial tasks is often linked by administrators to ‘innate’ qualities of women as good communicators, collaborators and consensus-builders, attributes which are also discursively produced through liberal feminist theorizing about gender characteristics (Gilligan, 1993). As well, these characteristics find their way into professional business management discourse as gendered ‘soft skills’, which are highly in demand by corporations in addition to ‘hard’ technical skills (Alsop, 2003); the latter are largely the domain of male workers but are increasingly taken up by women as well. However, these gendered characteristics, like
communication or competitiveness/ambition, can be rationalized as de-gendered and detachable commodities, as tools in a package for higher advancement. Universities are increasingly offering courses and workshops in communication and writing skills for students in Computer Science and other highly technical programs to take advantage of their professional appeal.

As I noted in Chapter 4, while women are expected to possess these soft skills innately, men are rewarded both monetarily and through cultural capital for improving themselves in these areas. I would suggest, however, that women may also be rewarded materially in this neo-liberal management of the self. In the computing field, particularly for those who aspire to high-level managerial positions, possessing a combination of hard and soft skills is highly desirable (Alsop, 2003). Not surprisingly, women are being discursively managed to assume such roles, by the university, by government, by feminist academics in the CS and Engineering fields, and by industry.

This discourse once again surrounds the management of the self; in particular, women are asked to examine their own attitudes about competition and ambition, and to manage their often ambivalent relationships to them in order to ‘reach higher’. For example, the following excerpt from a policy document from the Computing Research Association’s Committee on the Status of Women in Computing Research (CRA-W) reinscribes gendered characteristics in strategies for recruiting women into graduate Computer Science programs:

In order to treat all students fairly, educators must pay attention to gender-based traits. Although in characterizing behaviors one must be careful to acknowledge the existence of individual differences and to avoid stereotyping, there is a large body of information on gender traits. There is strong evidence, for example, that women, even though they perform at the same levels, have less confidence in their abilities and individual accomplishments than men. **Women are often less aggressive than male students in promoting themselves, attempting new or challenging activities, and pursuing**
awards or fellowships. There is evidence that females come to computing as only one interest among many, and are thus less single-minded than their male counterparts. Often women report feeling “out of place” in the male-dominated, hacker culture. In light of such differences, some of our recommendations are gender-specific. Most, however, are not. The adoption of our recommendations would improve the educational environment for all students. (Cuny & Aspray, 2001, p. 2) [references removed, emphasis added]

Drawing on similar constructions of gendered identity, a female training consultant at one of my research sites suggested in a workshop for female CS graduate students that women could benefit from managing their own negative attitudes toward ambition or competition. At the same time, they could learn how to manage the negative attitudes of potential colleagues or employees. Commented one of the student study participants:

Student: We had a really good one [a monthly meeting of Computer Science women graduate students and faculty] like last month where we had I don’t know 40 like I don’t know if you know who showed but there was a talk which was really good.

SS: Who gave the talk?

Student: It was someone that lectures in this Department I can’t remember her name but she’s been hired…she’s got her own company I think and she’s I think on faculty over at another university where she’s doing a program for them…The whole talk was…about the question: “Are females ambivalent to ambition?” What does ambition mean? And she said that females tended not to strive as much for praise and sometimes feel uncomfortable with praise and that that put them at a disadvantage. She gave several examples of women like the Lieutenant Governor General of Alberta, or a President of a university and how they, by being not as ambitious or not taking responsibility for what they did and saying, “I did this, I’m a great person,” put themselves at a disadvantage.

SS: Not as much self-promotion?

Student: Yeah, they’re not promoting themselves and by doing that not only do they weaken their own position, they make everyone else look better …The whole idea is that you have to promote yourself because the females below you that are looking at you want to see a strong female leader. They don’t want to see a female that is saying, “It’s really all these guys here that work below me that did all the work”; there tends to be one female and a bunch of guys. So if it’s really the woman that should get the credit they should be saying “I’m a strong woman, I deserve to be in this position of power and this is what I’ve done.” So it was a really interesting talk…

SS: Did you agree with what she said?
Student: Uhm…some aspects. I mean…so I thought for myself…so she asked like if someone said to you “boy are you ambitious”, how would you feel? What would be your response? A lot of people, like more than half there felt that was insulting or derogative or that this person would be at least upset by this. I mean, my opinion is that yeah I am pretty ambitious…but a lot of people felt that perhaps that meant you were trying to reach further than the person thought possible, thought you could possibly do, so you were sort of ‘this is where you’re supposed to be’ and by being ambitious you were trying to grab the fruit that you weren’t allowed to have, like you’re trying to go beyond your status or beyond your level by saying that. And they felt that that was especially based on different cultures, since in some cultures that wasn’t a nice thing to say to someone. [emphasis added]

It is interesting to note how the student recognizes and identifies with the institutional discourse producing women in technology as role models for other women, to act as “a strong female leader”. Here liberal feminism once again mirrors neo-liberal technologies of the self. To the extent that women do not promote themselves, they are asked to monitor and self-correct their own lack of ambition, countering a ‘cultural’ discourse which is meant to discourage women from ‘grab[bing] the fruit’ that they aren’t supposed to have. They are also instructed on how to use ‘soft’ communication and negotiation skills to diffuse the possible resentment of others:

SS: Well maybe it might imply that someone’s basically telling you you’re being pushy, and that you shouldn’t be pushy.

Student: Yeah or something like that. Yeah. Someone used the B-word too [Laughs], bitch or bitchy.

SS: Some people are just ambitious.

Student: Yeah that’s me [Laughs]. So it was interesting and then she was saying for people that did feel upset by that well maybe what they should say instead of trying to be defensive, like, “oh I’m so…I don’t mean…”, to instead direct it back to the person — techniques like that work. If you feel uncomfortable make sure you understand first what they mean, were they really trying to be mean to you, and if they are by saying like “what do you mean?” That person as well becomes aware like what do I mean? Then you actually have to think: what am I saying to this person? So, sort of techniques for how to resolve it without getting into an argument or without getting upset. [emphasis added]
The workshop leader’s suggested strategy fits well into the managerial discourse of the “virtuous circle”, a work environment with a collegial atmosphere where highly skilled workers (high level computing workers and academic researchers are prime examples) are highly productive and innovative. Managers in such an environment are advised to “lead by example” through effective management of hard and soft skills, to “be encouraging and supportive…, [to] reward success and learn from the difficulties they encounter to identify opportunities for improving performance”.

Neo-liberalism’s focus on self-performance shows how it is individualized and works upon an embodied self-regulation that is complex and contradictory. The above conflict resolution technique of directing a question or comment back to the sender is typical of ‘soft leadership’ training for managers. This coaching for and against gender characteristics echoes the inclusion strategies in the CRA-W document cited earlier. The interweaving of contradictory discourses is especially apparent in the ‘women in computing’ theme of work/life balance. The student related workshop discussion of this issue:

Yeah and you tend to think that guys had fewer problems during that group talk about ambition. They like recognition like there was some study that she quoted where females…there were four things. You want money, recognition, and what was the other one? Sort of like acceptance and a happy family life and the guys picked the money and recognition and the girls picked the acceptance and the family environment like the family life or a family outside of work. [emphasis added]

The illusory goal of work/life balance, introduced in Chapter 3, again moves ‘women in computing’ discourse away from political activity for better material working conditions to an individualized psychology-based call to improve behaviour and attitudes (both personal and institutional). Hennessy (2000) refers to W.E.B du Bois’s concept of

a “compensatory psychological wage” in the Reconstruction American South, in which white laborers, “while they received a low wage, were compensated for by a sort of public and psychological wage” through “public deference and titles of courtesy because they were white” (Du Bois, in Hennessy, p. 92). Similarly, women in ‘women in computing’ discourse receive “an imaginary compensatory wage of normalcy” (Hennessy, 2000, p. 92) by embracing ‘work/life balance’, which reinscribes heteronormative “family life” as a compensation for inequality in the Computer Science workplace. ‘Work/life balance’ stands in binary gendered relation to an undesired identification with the work-obsessed male ‘nerd’ who has ‘no life’.\footnote{In discussions with several of the students in this study and with some of their women friends in the lab or at other social occasions, self-identification as a ‘nerd’ was not negative for them.}

Here is how the CRA-W document promotes the work/life balance discourse:

**Recommendation 15:** Broaden the institutional culture of the department to accept a range of personal choices in balancing work and life. The default culture in an institution is often defined by its majority constituents. To broaden access to your department, broaden that culture. Understand as valuable a variety of attitudes and approaches to academic life. To broaden access to your department, broaden that culture. Understand as valuable a variety of attitudes and approaches to academic life. CSE graduate programs have accepted, and indeed promoted, certain kinds of behavior and attitudes as highly desirable, such as a fierce single-mindedness of purpose, competitiveness, and aggressive assertiveness in technical discussions. Many women are uncomfortable with these behaviors. Faculty should show, by words and action, that it is acceptable for students to have a life outside academics. They should recognize the individuality of students and the fact that many different kinds of behavior and attitudes can lead to success. (Cuny & Aspray, 2001, p. 11) [emphasis added]

This discourse plays in contradictory relation to the discourse of ambition, which implies that women need to improve themselves by being more attentive to public recognition and career advancement. Demands for the recognition of work/life balance issues are considered in the dominant male CS culture as a ‘personal choice’ to take a less committed (and therefore less materially compensated) role at work; this is also true for men in CS who want to take a more active role in parenting. The self-improvement...
discourse of ‘women in computing’ posits work/life balance as yet another performance indicator, suggesting that women should strive for high performance goals in both work and family life. This discourse seemed a contradictory and exhausting path for many of the women faculty members I interviewed, who balanced the demanding research performance that was expected of them at their universities with a heavy teaching and service workload and, in some cases, young children as well. A student interested in having children got mixed messages about managing her own expectations when she observed women faculty in her department:

Student: I think it’s perhaps the way things are now. It seems like if you’re a woman in Computer Science, it’s either you don’t do much research and you take care of children…. Basically you’re much better off not becoming a professor but getting a position of a lecturer, just teaching. I would like to do research. [I would work as a lecturer] only if I absolutely have to and I can’t get any other position. I love research. I want to do research, but I’m not willing to spend 16 hours a day on it, which is what you’re expected to do in a lot of cases.

SS: What gave you this idea?

Student: By talking to any professor around here. Everybody will tell you it only gets worse. It’s research in your spare time, but you have to do research. Everybody’s discouraging. I don’t know, everybody’s so career driven, so well just maybe it’s right for some people, it’s just not right for me….

And you know I tried to look at women in our department to try to see how they work. And uhm, I don’t know. My project head works 16 hours a day, and she works weekends. She teaches here. She’s in our group. She’s very successful. G just came here. She has a three-year-old daughter right now, and I think she works … I remember TA’ing for her when her daughter was one year old. I think she was sleeping for an hour a day or so. I don’t know how they do it. And it certainly scares me, but I’m willing to try [Laughs]. [emphasis added]

And again, from CRA-W:

Recommendation 11: Also on a positive note, take time as a faculty member to tell your students about your satisfaction with your career choice. Share your passion for the intellectual life. Emphasize the potential of a computing research career for social impact, creativity, and interdisciplinary activity. (Cuny & Aspray, 2001, p. 10) [emphasis added]
Once again, the discourse of ‘women in computing’ focuses on the individualized promotion of ‘choice’ and ‘career satisfaction’ away from any analysis of a need for structural change. The student is also caught up in what she recognizes as an impossible position of balancing inequitable pressures of work and life, but she will enlist the technologies of the self in order to ‘try’.

**Bodies that matter: ‘Student experience’ that counts**

Teaching and learning are at the core of college and university missions. The degree of meaningful contact with faculty, the quality of teaching, mentoring and academic counselling, and the attention to unique learning needs, are all key factors that contribute to student satisfaction and success. Recent results from student engagement and satisfaction surveys, such as the National Survey of Student Engagement (NSSE), have heightened system-wide awareness of the importance of teaching excellence and of quality faculty-student interaction. NSSE provides comparative benchmarks for determining how effectively universities are contributing to learning experience. (Rae, 2005, p. 54)

In this last example of the disjuncture between policy as text-mediated social relation and everyday life, I examine how the ‘good graduate student’ structures and is structured by the discourse of ‘student experience’ in the neo-liberal intensification of regulation through discourses of freedom (‘choice’ and ‘student satisfaction’). This textual accountability in the tracking of student and faculty performance and progress is yet another example of the diffused power of neo-liberal governance, which depends on the production of self-regulating and entrepreneurial selves.

As policy which demands both student engagement and faculty engagement, ‘student experience’ serves as a regulatory framework, a technology of accountability in postsecondary restructuring policy. Through the Rae Report and Reaching Higher, ‘student experience’ is quantified with the addition of yet another layer of reporting contact with faculty, which tracks student-faculty ‘contact time’ as a form of quality
control indicator measuring students’ progress through their studies by numbers. In addition, students are asked to participate in a consumer rating scheme, the National Survey of Student Engagement (NSSE), an Indiana-based benchmarking questionnaire which tabulates a series of questions about teaching delivery, curriculum satisfaction, faculty contact and mentoring, accessibility of student services, student evaluation of their own academic work, and other performance indicators. The results are then posted for public viewing on university websites, to be compared against the results from other competing universities. This consumer accountability model encourages universities to ‘brand’ their offerings to distinguish themselves from competitors, and some programs use diversity targets to ‘focus’ their brand on a particular constituency (as the administrator’s discussion of ‘international students’ indicated).

Powers of freedom

Ontario needs to expand significantly the number of skilled workers and apprentices it trains, as well as increase opportunities for Masters and PhDs. At the same time, universities can strive to do a better job of ensuring that graduate degrees are completed in a timely fashion. Graduate students and their teachers need to take this job seriously. The mandate of both colleges and universities can be renewed to respond to these two challenges. (Rae, 2005, p. 10)

Academic freedom is also an important value. So are self-government and institutional flexibility. This means that the institutions themselves need to make sure that they have got their own internal governance right. Universities and colleges need to ensure that their own internal accountability structures and business practices are well understood and well monitored. At the same time, the federal and provincial governments have a clear responsibility to ensure that their demand for review and accountability does not become too heavy-handed or too intrusive. In particular, with the ministry, federal departments, the Auditor General, a new Council on Higher Education and other external bodies all demanding information, there is a risk that institutions will be facing a regulatory burden that will be too expensive and cumbersome. This has to be watched carefully. (Rae, p. 16)

The above quotations shows that neo-liberal policy, like other forms of neo-liberal government, hails individuals (students, faculty and universities) to take active
responsibility in self-government through measures that appear to be consultative rather than imposed from above. Thus, the ‘good graduate student’ takes her job seriously and completes her degree “in a timely fashion”. The good faculty member mentors her.

The students in my study at both universities noticed an increase in their reporting tasks, and a shift from a four-year completion window for a PhD (with four years maximum for grant funding, including both Master’s and PhD years) to three-and-a-half years. Part of the new reporting requirements included mandated contact hours with faculty. In the case of students at one of the two universities, this includes new yearly meetings with a group of faculty who are not necessarily a part of their specialization area or even their program. To the students, these meetings seemed meaningless and intrusive, and they understood them as directly related to departmental time to completion pressures. These benchmark meetings are also an additional pressure on faculty, who already undergo an intensification of their own performance-based reporting. This reporting has increased both through their local institutions and through the restructuring of federal research funding agencies to promote evidence-based, ‘transferable’ research that can be marketed in the global knowledge economy (Ball, 2000; Dehli & Taylor, 2006; Ozga & Jones, 2006). A group of students had the following to say about these tribunals of accountability:

S2: **Here’s the process right now**: The process is…the idea is…that you have these annual checkpoints [to mark off stages in your thesis process]. …So, you as a PhD student will have the committee, and you are supposed to meet every year, even if it’s not a checkpoint, you have to do these annual meetings, where you have to then say [what you’ve accomplished]…. 

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119 For an account of how evidence-based research becomes cycled (and then recycled) into policy-making, see Ozga & Jones (2006).
Even if you can’t do your research proposal, you have to meet by the end of the year where you have to say, ‘Ok, I’m really so far away, or, I’ve only done so much.’ So, they still try to have these annual things, but nobody forces you to do it, so it doesn’t happen. But now what they want to do is to have these additional advisory committees.

SS: But where are ‘they’ getting the message that they have to do this?

S2: It’s ‘Time to Completion.’ We have a problem with the time to completion. So...I think the average right now for us is seven years for a PhD

S1: And the funding is for...three and a half...

S2: In the suggestions they’re making up, they’re saying: ‘Let’s create a new advisory committee, not a supervisory committee, but an advisory committee, that I think is composed of your supervisor, plus a couple of other people who aren’t on your committee, who may or may not be in your area at all, so they don’t necessarily know what’s going to be the judgement over your progress. And every year you give them your CV plus some explanation of what you were doing and how far you are, and so forth...That’s in addition to your other annual thing...[progress report]...So it’s different from the annual checkpoints, which aren’t enforced, and aren’t helping you, what makes them think that an additional set of annual checkpoints, with the same set of....

1: It’s accountability on paper...that’s what it is...

S2: Exactly......

S2: ....And what’s worse is, the people who disappear aren’t even on the charts, right? So the completion numbers are actually lower in that case... And we also had a five-year review, an external review...the department got an external review...and that came back also telling them, ‘Look, you’ve got to do something with your budget., and to lower the time of completion.’ And that’s why they started doing this....

S5: Is it really seven years, the actual time to completion?....So, it’s like....if you go over your time as a PhD student, how are you surviving?...I’m just generally concerned...if I’m not...if I don’t have funding, I don’t go to school. Like, there’s no other way for myself. So...I have to finish on time...

In this and in many other ways, neo-liberal regulating power works through the technologies of the self to produce the ‘good graduate student’. As for the students who become ‘ineligible’ and wind up leaving their graduate programs, they are uncountable for completion charts, but are tracked for attrition records.120 While time to completion

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120 Although the gender gap is shrinking on the negative side, with both male and female students leaving Computer Science, attrition rates are still higher for women (NSF, 2006).
rates have to be posted along with the university’s annual five-year plan review for the Higher Education Quality Council of Ontario (HEQCO), attrition records are very closely guarded.\textsuperscript{121}

**Policy as governmentality**

3. RETAINING WOMEN THROUGH GRADUATION

It is important to create a **women-friendly environment** that supports your students through graduation. We divide our recommendations on retention into those that **improve student relations** (and thus support within the department) and those that foster a more inclusive research environment.

**Recommendation 13**: Be diligent at mentoring women graduate students.

The relationship between the advisor and the graduate student is often the most influential relationship in the student’s career. **All faculty members need to take this duty seriously**. Mentoring is important to persistence and success in graduate school. **Both quality and quantity of contact matters**. Anecdotal evidence suggests that there may be **differences between men and women students** in what works best to motivate them. For example, when told that their **time for completion of studies** is running out, **males may respond by working harder** while **females, feeling that their insecurities have been validated, may feel the situation is hopeless**. Each student must be treated **individually**, and **women may need more encouragement**. Make good mentoring a high priority in your department. Make sure that incoming students have mentors as they enter the department, even before they choose a research advisor. Determine which faculty members have been more successful at attracting and advising women graduate students, and try to find patterns in their successes. Make sure that your faculty is aware of some of the excellent literature on effective mentoring. (Cuny & Aspray, 2001, p. 11) [ references removed, emphasis added]

To conclude, as the above example from CRA-W’s report reiterates, policy serves as both a guide for institutional procedures and for individual conduct in relation to those procedures. Mentors play a special role in modelling by their own performance the means by which individual women CS graduate students can effect “operations on their own bodies and souls, thoughts, conduct and ways of being” (Foucault, 1997, p.225) in order to succeed as ‘good graduate students’. All faculty members are told that they must ‘take

\textsuperscript{121} I had to apply and wait for several months in order to be granted permission to see one university’s records.
this duty seriously’, which links institutional time-to-completion targets to personal responsibility. Within these targets, female students are problematized; they are constituted as ‘insecure’ and in need of ‘more encouragement’ than their male peers in order to finish in a timely manner. But although “anecdotal evidence” leads to these generalizations about gender, student difficulties are individualized rather than seen as systemic.

As for the role of mentoring women graduate students, the ‘women in computing’ discourse adds another layer of self-governance to the institution’s already heavy demands upon women faculty members. The faculty member in Chapter 3 who described her ‘own sense’ of accountability both to her students as a teacher and mentor and to the university’s high research standards as an award-winning scholar exemplifies how institutional governance works through the self. Under the Rae Review, mentoring is mandated as a calculable marker of ‘student experience’, but considering the dominance of research performance benchmarks, mentoring tasks (as hidden emotional work) often fall informally to those faculty members who already have a greater teaching load, generally women (Acker & Feuerverger, 1996).

Thus the liberal feminist discourse of ‘women in computing’ produces as governable subjects both the ‘equal’ individualist, autonomous subject in charge of her own destiny and the ‘different’ subject of ‘women’s ways’. The intersection of this discourse with the policy texts of postsecondary restructuring, which produces certain students as ‘ineligible’ and others as ‘good graduate students’, leaves the rhetoric of ‘women in computing’ frustrating to some, irrelevant to others. While ‘women in computing’ initiatives may count the number of women who are in the field in
comparison to men, this accountability does little for women who are ‘ineligible’ except to continue the boundary work which excludes them. Through participation in neo-liberal discourses of regulation, accountability, progress and individualism, ‘women in computing’ practices sustain and continue positions of marginality at the same time as they promote ‘women in computing’ as self-accumulating, entrepreneurial subjects. In Chapter 6, I will continue my examination of these contradictory subject positions as I explore the promotion of graduate education and entrepreneurship for ‘women in computing’ on a national and global level.
Chapter 6: Technoscience education: Subject formation and feminist intervention

Around the world, women are not full partners in driving the creation of new technology that will define their lives. This is not good for women and not good for the world…Women need to assume their rightful place at the table creating the technology of the future. - Anita Borg, founder, Institute for Women and Technology

YOU will change the way the world [fill in the blank]. Global citizenship gives us the power to bring the best ideas in the world together. Working with different cultures, listening to different ideas, experiencing different ways of doing things. That’s the power of the global community. When individuals and communities connect, we share much more than technology. We share ideas that allow us to reach our full potential. Visit our website and discover how powerful your ideas can be. - recruiting advertisement, (Grace Hopper Celebration 2006 Proceedings, p. 14). [original emphasis]

In the previous chapter I examined the workings of neo-liberal postsecondary education policy as an extralocal text organizing the university and the people within it as subjects of the knowledge economy. In particular, I focused on the university as a site of global competition for technoscientific research talent and knowledge production, organized through managerial strategies of benchmarking and accountability. I also described policy as part of the discursive practices of higher education restructuring, global competition in science and technology research, and institutional feminist initiatives to increase the number of female graduate students in Computer Science. I argued that these initiatives produce the subject of ‘women in computing’ as a valuable symbolic resource. I made visible how these institutional practices work for the women in my study by intensifying faculty and student reporting, and by quantifying ‘student experience’ into a measurable series of outcomes with hidden gender effects. Finally, I demonstrated how the intersection of restructuring and equity practices produces a

123 This document is available at http://anitaborg.org/files/GHC06_Proceedings.pdf.
124 See Larner & Le Heron (2004).
disjuncture between how students and faculty perceive the quality of faculty-student
contact and student engagement in the university, and the statistical organization and
representation of ‘student experience’ in performance indicators distributed for national
and international comparison.

In this chapter, I draw these local practices into larger institutional equity
initiatives in Computer Science education and work for women. These initiatives position
‘women in computing’ as a social category within intersecting discourses of global
knowledge economy competition, nation, gender, entrepreneurship and technoscientific
expertise. I argue that in order to understand how the category women becomes a
‘problem’ in the disciplines of Computer Science and Information Technology, it is
necessary to go beyond the tabulation of rising and falling numbers. In fact, this
quantifying practice operates throughout the literature producing ‘women in computing’
as part of the “fellowship of discourse” (Foucault, 1971, p. 18) in technoscience which
constrains what can be known and what can be recognized as true. Analysis of the
multiplicity of organizing texts reflected in the intersecting discourses above brings
forward the following questions: Who is the subject of ‘women in computing’? How is
the category organized? How does this category operate in the organization of ‘women in
computing’ as a site of both social inclusion and exclusion, where women are located
within the discipline at the same time as they are positioned as not-Computer Scientists?

My discussion of university gender equity practices thus far has emphasized the
disjuncture between the constructed expectations of institutional ‘women in computing’
discourses and women’s everyday experiences as Computer Science graduate students
and faculty. This theme runs throughout my thesis. In the interviews discussed in Chapter
3, for example, several of the students indicate feelings of alienation and exclusion in relation to the organization of ‘women in computing’ as an institutional practice. To them, ‘equity’ does not feel like a practice of inclusion, and ‘community’ issues do not speak to how things happen (or do not happen) in their everyday work as women in graduate Computer Science studies. Some of the women express anger and frustration at this disjuncture, others are resigned or silent. Even the students who affiliate most with the feminist theoretical shaping of the discourse (for example, those who accept theories about difference in ‘women’s ways’ of doing Computer Science) are critical of how gender equity work in Computer Science is taken up by the institution.

In what follows, I connect local practices to larger North American initiatives to promote women’s participation in university Computer Science education. I then trace the subject positions made available by the interweaving of a multiplicity of discourses surrounding ‘women in computing’ in this milieu (see Davies, 2000). I show that contradictory and intersecting discourses position women in Computer Science, and that these discourses produce not only gender binaries but also binaries of equity and merit, collectivity and difference, collaboration and competition. Taken together, these binaries produce knowledge about ‘women in computing’ as subjects. Through interviews with students and faculty about their participation in gender equity work, and through description and analysis of a major event promoting ‘women in computing’, I will show both how these intersecting discourses work for the women in this study and how they, in turn, invest themselves in the subject positions made available. My particular focus is on the identity work done by ‘women in computing’ in producing subject positions within the boundaries created by intersecting discourses of gender equity, technoscientific
expertise and neo-liberal globalization. I make visible how it is that ‘women in computing’ becomes a textually-mediated set of interactions and practices which organize these young women socially.

To set the stage for this investigation I will first explain the terms I will use to discuss the production of ‘women in computing’ as a subject category. I find it helpful to refer to the post-structuralist analytic work of Davies and Harré (2000) on subjectivity and discourse. In their theorizing, discursive practice describes “all the ways in which people actively produce social and psychological realities” through “an institutionalized use of language and language-like sign systems”, or discourse. This institutionalized use of language can be present at a disciplinary, political, cultural and small group level. Discourses can develop around a certain topic, such as gender or class. Discourses can also “compete with each other or they can create distinct and incompatible versions of reality. To know anything is to know in terms of one or more discourses” (p. 88).

The important point is that discursive practices are social practices rather than fixed sets of pre-existing universal rules or essential truths. Discursive practices make particular subject positions available, which means that they provide “both a conceptual repertoire and a location for persons within the structure of rights for those who use that repertoire” (Davies & Harré, 2000, p. 88). Once having taken up a particular subject position, “a person inevitably sees the world from the vantage point of that position and in terms of the particular images, metaphors, storylines, and concepts that are made relevant within the particular discursive practices in which they are positioned”. Thus, the individual is continually constituted and reconstituted by “the positions made available within one’s own and others’ discursive practices, and within those practices, the stories
through which we make sense of our own and others’ lives” (p. 89). Through focus on participant experiences and on specific cultural events for women in Computer Science and IT (one in detail), this chapter will examine some of the different and contradictory stories told through the discursive practices of ‘women in computing’. Key areas for analysis will be how ‘women in computing’ is taken up in institutional feminist interventions to encourage female enrolment in Computer Science, the knowledges these discursive practices produce, the various subject positions they make available, and the complex ways in which the women in this study take up (refuse, adapt) these positions.

**Part I: Women, equity and merit: Discursive intersections in technoscience education**

In the continuing discussion about declining student numbers in university undergraduate and graduate Computer Science programs, and in the promotion of ‘women in computing’ in particular, the intersecting and conflicting discourses of equity and merit intertwine with institutional enrolment mandates and government funding policies for higher education. In much of the discussion around inclusion strategies in CS/IT education, the exchange often takes the form of a debate between those who point to the underrepresentation of women and targeted minority groups as not only inequitable but also potentially limiting to the development of future North American CS/IT workers, and those who argue against a ‘watering down’ of Computer Science as an academic discipline for the sake of filling enrolment targets.

The following text comes from an on-line discussion in the American journal *Chronicle of Higher Education*, in which the topic of declining enrolment in U.S. college and university CS programs is being put forth along with a question about the adoption of
an equity approach which promotes the inclusion of underrepresented groups in CS. In particular, the National Science Foundation (NSF), which conducts an ongoing study of the numbers of women and minority group students in U.S. Computer Science and Engineering programs, has suggested strategies for improving the participation of these groups in post-secondary CS education (National Science Foundation, 2007). The female professor’s response below follows from the ‘merit’ discourse, but it also makes visible institutional discursive practices in the promotion of ‘equity’:

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**Forums Moderator**  The empty pipeline in computer science  
**Date:** « on: May 19, 2005, 02:17:23 PM »

New data show that the number of computer-science majors has plummeted in the last four years, leaving technology companies scrambling to fill vacant positions. In response, the National Science Foundation and some colleges are examining ways to promote the field, especially to women and members of minority groups. Should the college curriculum be restructured to attract more computer-science majors? If so, how? If the problem is not with the curriculum, what can colleges do to raise interest in computer science?

**Women and minorities aren’t the answer**  
**Author:** female CS prof  
**Date:** « Reply #15 on: May 24, 2005, 02:13:39 PM »

I am getting sick and tired of this “let’s specifically target women and minorities” cry that seems to surface every time universities can’t get enough students.

“Promoting the field” is the absolute WORST thing to do. This is just more crap from the feel-good-let’s-all-get-together band of social “scientists”. I don’t want to teach anyone who isn’t interested in my field. And you aren’t going to get that by someone who decided on a major because it was “promoted” in the right way. Slick packaging doesn’t produce interested and prepared students.

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The above exchange illustrates some of the contradictions in the discursive practices which produce ‘women in computing’. In particular, the moderator’s question and the professor’s exasperated response highlight the contradictory discourses of equity and merit which swirl around strategies to enrol women in Computer Science as an area
of study and a future career path. By using the term ‘enrol’ here, I suggest both the conventional institutional meaning of joining a particular academic program of study, and the way in which Bruno Latour (1987) employs the word to describe the processes of persuasion through which scientists gather allies in the making of scientific facts (p. 90). Thus women entering Computer Science are similarly inducted into discursive practices which both inscribe the disciplinary boundaries of the field and make available the subject positions of those within it.

As Pierre Bourdieu (1975) theorizes, the “ideological strategies and epistemological positions” in the representation of the scientific field by its constituents entail, firstly, an inculcation into the “dispositions” and disciplines of the field through schooling (p. 34). Then, once a part of the field, subjects are positioned to tacitly set up the boundaries of “what is admitted by the mere fact of belonging to the field”. Members determine what is accepted as fact beyond discussion, and they also decide on what is outside of discussion appropriate to the scientific field. The above female professor’s derision of “social ‘scientists’” suggests that she holds such scholars outside of ‘true’ science. She also favours retaining the field of Computer Science for those who are already “interested”, rather than “promoting the field” to those who are presently excluded and who might become interested in pursuing CS through greater exposure and chances for participation. Perhaps she is right to critique the superficial “packaging” of equity to suit institutional enrolment demands, and, in the process, an underrepresentation of the skills and hard work needed in being a successful CS student, but her comments also illustrate the often contradictory institutional role that many women faculty in the CS field play as ‘gatekeepers’ for the discipline.
As feminist critical theorists of science and technology have shown, when women in the field take up subject positions produced by the discourses of technoscience, they experience the sense of being outside of full enrolment\(^{125}\) as participants. Though it is important to note that these discourses are multiple and intersecting rather than binary, female CS faculty and students told stories of disjuncture, taking up the subject position of ‘talented CS student’ (winning major external scholarships [e.g. NSERC], gaining graduate school acceptance in a very competitive field); at the same time, they experienced either direct or more subtle challenges to that competence through gendered discourses of ‘being/doing good at math’, which position women outside that category (see Mendick, 2005). As one female CS faculty member related:

I did have one experience – this was as a graduate student at Toronto – I was teaching a Computer Literacy course, so very low level material. And there was a student who came and asked questions in office hours, and was asking, ‘What’s this?’ ‘what’s this?’

SS: Non CS?

Faculty: Non CS. And he said, ‘Well, I was just checking to see if you really knew the material, because it wasn’t the same.’ [Laughs] This guy had made an error in transcription, something from the board, and his immediate reaction was it must have been that I was wrong, that I didn’t know the material, rather than that he’d made a mistake. Which is the more plausible, right? So, it was something that was humorous to me, that this is somebody who is going to be incapable of learning from a woman because he can’t understand where his own failings are [Laughs]. But it was an interesting, interesting moment [Laughs].

One of the PhD students in this study, who emigrated from Eastern Europe and entered Ontario high school math two grades above her age group, told another story of positioning:

I think I see more things. I’m not sure about how things are actually changing, but I see more and more things…Again, as I said, at first, I was skeptical about a lot of issues…I

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\(^{125}\) By being outside of full enrolment, I mean that while women are inducted into the CS field as allies, they are inscribed as outside the dominant group’s full powers and privileges.
am becoming less and less skeptical, all through my undergrad studies, and then, in particular, in my graduate studies.

SS: Now, what do you think has framed that change in thinking about it?

Student: I was just confronted with these issues that I wanted to avoid. And...I would go into a Mathematics class, third year...I had...I finished the specialist program in Computer Science and I also did a major in Math...So, when I would go to those advanced Math classes, I would see...I remember taking one summer course...I happened to arrive in a miniskirt. I remember the professor looking at me and going, “This is M-A-T 337.” And I would go, “Yeah, ok...,” and I would go and sit down. And, that just made me angry, so I decided, “I’m going to wear a mini-skirt to every class!”

[Pages on the table]

As previously stated, in their own accounts and through hearing the accounts of others, the participants recognize a disjuncture between their own lived experiences and the subject positions made available to them through institutional practices, including equity policies. As well, they are disciplined by the regime of accountability, which sets women as an exception outside the generic but gendered male ‘good CS student’ benchmark. At the same time, many of the student participants challenge and resist feminist inclusion strategies which suggest that women need a different approach to learning Computer Science in order to be successful (see Rosser, 1990; Williams, 2000). They also resist challenges to their competence, but understand these actions as the product of individual attitudes or behaviours rather than as part of institutional discursive practices producing ‘women in computing’ as a ‘problem’ subject category positioned against discourses of ‘boy’s room’ computing competence (Gansmo et al., 2003) or the sometimes heroic, sometimes threatening power of the hacker (Himanen, 2001; Jordan & Taylor, 2004; Turkle, 1995).

126 I have suggested in previous chapters how factors like time to completion and debt repayment have unacknowledged gendered effects for female graduate students.

127 Of these accounts, see Gansmo, Lagesen and Sørensen (2003), and also Håpnes &Sørensen (1995), for more nuanced views of the subject positions occupied by the category (male) hacker.
Valerie Walkerdine (1989), using school performance in mathematics as a lens, challenges the assertion that “femininity equals poor performance” in mathematics, concentrating instead on the ways in which femininity is read; by so doing, she demonstrates “the discursive production of femininity as antithetical to masculine rationality to such an extent that femininity is equated with poor performance, even when the girl or woman in question is performing well” (p. 268). Thus femininity is not an object with a set of pre-existing essential qualities but is discursively produced and read as “a constellation of signs which mark it off as antithetical to ‘proper’ performance to an incredible degree”. This dynamic co-production of gender and rationality/competence is also echoed in the co-construction of gender and technology in Computer Science practices (Gansmo et al., 2003).

Walkerdine warns of the empiricist trap in engaging in issues concerning the ‘truth about women’ framed as dichotomous to a male performance standard, in which we are led to ‘prove’ women’s equal competence (1990b). In many of the student accounts, slippage from institutionalized to individualized explanations for inequality in Computer Science echoes a problem with liberal feminist intervention strategies, which reproduce this co-construction of gender and rationality. Women in the CS field become engaged with the burden of proof through the meritocratic discourses of scientific, and specifically mathematic performance as the standard for computing competence, or by producing alternative truth claims through cognitive psychology discourses about women’s approaches to knowing as ‘different’ (Williams, 2003).

For some of the student participants, discourses of derision play into their disidentification with feminism (Kenway, in Blackmore, 1997). They chose to participate
in the study as an indication of their merit; this identity work as a discursive practice in equity management produces value for CVs and professional positioning. Equity work, while it is not considered a directly productive value within the current regime of university performativity (Blackmore & Sachs, 2003), has symbolic value\textsuperscript{128} for universities and for individual women in academe as making a positive contribution to ‘student experience’ and in fulfilling university policy commitments to equity. Other students were committed to what they considered feminist values and largely took up the discourses of ‘women in computing’ in their on-campus activism and in their academic career goals.

A woman professor who is currently very active in support of women students, and who was involved in feminist activities as a graduate student, remarked on student ambivalence toward feminism that eventually, they’d ‘see the light’. This is reminiscent of Marxist discussion of ‘false consciousness’, but it is perhaps more helpful to understand the female students’ positioning within and between the discursive play of advantages and disadvantages which makes their situations very diverse and complex. Many have male friends, primarily CS friends. Others told of clashing experiences with feminist discourses about ‘inclusion’ and women’s collectivity; they resisted the discourses of institutionalized feminism which claimed to speak for all female students. Several of the student participants felt that attitudes from women faculty (such as a notion that they’d ‘see the [feminist] light’) were out of touch with how women CS students were building their own mixed male and female networks of support. Many of the students felt that the help from women professors in the department that would be most

\textsuperscript{128} See Gewirtz, Ball and Bowe (1995), Chapter 5, for a discussion of the significance of symbolic production in the market environment of school restructuring.
useful to them was advice on professional paths for research careers, technical knowledge in the field, and personal mentoring and support. These individualized discourses which positioned them as ‘good CS students’ and potentially successful entrepreneurs of the self also interweave with the resistance of some women to a feminist discourse within the disciplinary truth of the neutrality of science. As Foucault writes:

Disciplines constitute a system of control in the production of discourse fixing its limits through the action of identity taking the form of a permanent reactivation of rules. (1971, p. 17)

**The feminist question in technoscience practice**

A number of feminist writers have addressed questions about women in science. Some of this work also speaks to the particular field of Computer Science. In a paper section entitled ‘The Matter of Women in Science’ (Longino & Hammonds, 1990), Evelyn Hammonds articulates some of the concerns that many women scientists have with feminist critiques of science. Hammonds suggest that part of the problem is that each group is asking a different basic question, depending on their location within or outside of feminism or science. Women in the field wonder what it is about women and women’s lives that keeps them from doing science, and feminists ask what it is about science that leads to social exclusion for women and other marginalized groups (p. 177).

Women in the field operate in a milieu which renders unthinkable the connection between individual difficulties and the wider historical and social formations of women as subjects in technoscience.129 Because they are already included in the field, their

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129 Dorothy Smith (1987) addresses this tension in her work (in what she calls ‘bifurcated consciousness’) and uses it as a starting point for analysis; in *The Sociological Imagination* (2000) C. W. Mills talks about a similar tension between ‘private troubles’ and ‘public issues’. Thanks to Dr. Kari Dehli for this observation. The tension between personal experience and social relations also comes into play in W.E.B. Du Bois’ concept of ‘double-consciousness’, the “sense of always looking at one’s self through the eyes of others” (2003 [1903], p. 9).
presence tends to support the liberal democratic view, which celebrates the freedom of
the individual, promotes the notion of equal opportunity, and rewards on the basis of
individual merit. From a critical feminist perspective, practitioner resistance to a
feminist critique of the science field shows what Evelyn Keller, referencing Jean Piaget,
refers to as “cognitive repression” (Keller, 1985, p. 140), which results in defensiveness,
denial, or a refusal to respond. However, feminists outside of science are excluded from
the practitioner’s embedded identity in science practice. From a practitioner perspective,
the issues feminists in the social sciences and Women’s Studies raise seem tangential, if
not irrelevant, to the concerns of science.

According to Hammonds, many women within science feel that the goal of
improving the status of women in technoscience can best be accomplished within the
rational space of the scientific field. At the same time, women in science feel that
feminist critics of technoscience, as outsiders, put forth an oversimplified characterization
of science that reinforces stereotypes both of women and science. Hammonds remarks
that although women in feminist studies of science may think their work will be of use to
science practitioners, that view may not be shared by some practitioners who feel that
feminist accounts of gender bias may turn other women away from the field. Another
factor that fails to convince women science practitioners of the immediate need for a
feminist re-ordering of technoscience is the fact that scientific practice is extremely
productive. Having absorbed the doxa of the scientific field, which asserts science as
value-free, and thus also gender-free, women in the field find it difficult to be convinced
that mathematics or physics could have a gender bias: “[t]hey argue that strict adherence

\footnote{As I will show later in this chapter, part of the impetus to promote the “sexiness” of the new IT entrepreneur hinges on the promotion of neo-liberal freedom of choice and the global reach of the corporate “electronic space” (Sassen, 2001).}
to scientific method makes mathematical science gender-free” (Longino & Hammonds, 1990, p. 187).

Also aware of the tensions between theorists and practitioners, feminist historian of science Londa Schiebinger asks the question: “Has Feminism Changed Science?” (2000). She argues that while some progress has been made in medicine and other life sciences, where the ability to track gender bias on a theoretical level has been linked to positive changes in the methods and the kinds of research being done, feminist critical theory in science has been less successful in the physical sciences in making the case for gender analysis. Both Hammonds and Schiebinger note that women in the field resist feminist critique even though they may individually acknowledge professional barriers. A dominant belief for practitioners is that getting more women into the field will change science; Schiebinger (2000) suggests that only feminist analysis alongside women’s greater participation within the field will bring that change about, as past history and current resistance to change indicates. I argue that more feminist analysis is needed of the social organization of technoscience and specifically, Computer Science education, both from within and outside the field. Critical to this is analysis of the specific socio-economic, socio-cultural, gendered and racialized conditions of exclusion produced by the discourses of technoscience. The dominant discourse of ‘women in computing’ centres around social psychology-based surveys of attitudes and preferences, reinscribing ‘women’s ways’ as a history of the same. The structures of technoscientific practice, which are highly productive of dominant male power, go largely unquestioned in these studies as the environments in which exclusion takes place are naturalized. It is also important that feminist scholars understand and articulate how we are implicated in the
reproduction of institutional practices which contribute to these conditions of exclusion. In the next section, which examines an event promoting ‘women in computing’, I will elucidate some of the contradictory discourses operating within institutionalized equity practices and the various subject positions they make available for the women in my study.

**Part II: The Grace Hopper Celebration of Women in Computing: Women, technology and text-mediated social relations**

Much of the public discussion about women’s participation in Computer Science in both academic and industry circles centres around how to ameliorate the still dismal numbers of women who are entering the field. The general purpose of these investigations seems to be to identify a cause-effect pathway and then to proceed with an equally linear solution. This strategy mirrors the methods of positivist science, and the reasoning is that a solution to this scientific/technical problem must use parallel scientific means. For example, in a U.S. women’s studies journal, a recent call for papers discussing solutions to ‘the problem’ of women’s low enrolment in Computer Science asks that submissions reflect scientific procedures, with appropriate and ‘rich’ quantitative research, recognizing only these methods as the proper and rational way to produce credible data.

The difficulty with this approach is that the subject of science is transparent to itself and tends to reproduce its own image iteratively. Thus the ‘problem’ of ‘women in computing’ bounces back to researchers without much in the way of new insights, let alone solutions. The ‘numbers game’ dominates, even as feminist proponents of gender equity in Science, Technology, Engineering and Mathematics (STEM) acknowledge its
failure. In this study, my goal is not to achieve a solution in the form of a direct strategy producing measurable results in increased numbers, but rather to investigate the many intersecting and overlapping practices and relations which organize the ‘problem’ of ‘women in computing’ as a productive institutional text. In my method of inquiry, I step away from the remote observational model into a co-investigative dialogue with the women actually experiencing the ‘problem’ in their everyday lives. I make visible the various practices under which their work happens and through which the social relations producing ‘women in computing’ as a problem are organized.

In the following pages I look at the intersecting subject positions created for ‘women in computing’ through three nodes: as the subjects of ‘female friendly’ Computer Science pedagogy, as desiring and desirable entrepreneurial subjects, and finally, as the subjects of nation in globalizing technoscientific competition. I argue that organizing the subjects of ‘women in computing’ across these three domains manages gender, race and technoscience so that the goals of institutional feminism (whether in the academy or the corporate world) join with the practices and goals of neo-liberal capitalist globalization coming from the West. This organization serves to contain challenges to structural and historically embedded inequalities posed by feminist and Third World studies in the academy by reducing experiences of domination and resistance to individual behaviours and attitudes, and by professionalizing ‘diversity’, using “the language of the corporation and the language of cognitive and affectational psychology” (Mohanty, 1993, p. 57).

131 At a panel I attended, Lenore Blum, a researcher at Carnegie-Mellon who earlier had promoted a female friendly CS curriculum as a successful way to attract more women to CS at her institution (2001), commented that, “it’s a mistake to think that if you just get the curriculum right, you’ll solve the problem.”
Part of my investigation of the ‘problem’ of women in computing took me to a site where I saw its organization laid out in all of its many contradictions: an event known as the Grace Hopper Celebration of Women in Computing. The Grace Hopper Celebration is an international conference initiated in the United States by the Anita Borg Institute, an organization for the promotion of women in computing in industry and education. The Institute set up the Grace Hopper event from a trust established by and continued in the memory of Anita Borg, a pioneering feminist IT entrepreneur who promoted women’s involvement in Computer Science and Information Technologies until her untimely death from cancer in 2003. In the ‘women in computing’ lexicon, Borg’s “50/50 in 2020” proposition to enact gender equality in CS/IT work and education by the year 2020 (in a primarily American context) centres the project around the contested concept of numeric equality.

The celebration itself is named in memory of another woman computing pioneer, Grace Hopper. Hopper, a mathematician and academic, was enlisted by the U.S. government to work on the development of computing technology in support of Cold War military systems. Hopper became an admiral in the U.S. Navy and worked on the development of the Mark I and II computers. She is credited with the invention of the first English-language compiler, an integral part in the development of high-level computer software. The fact that her innovative work was tied to military technologies resonates in many academic and corporate practices highlighted in the current Celebration. It also provides a backdrop to the many intersecting contradictions in this milieu, where academic, corporate and military interests converge to produce the

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organizing texts forming the category of ‘women in computing’ as a target group for inclusion, marketing and co-optation.

The discourses that fit the identity of ‘women in computing’

An important point to make in this chapter is the contradictions between the institutional practice of promoting the discourse of ‘women in computing’ as a group identity in order to organize how the work of women under this category is produced. The theoretical moves, or discourses, which set up/organize how the subjects constituted by ‘female friendly Computer Science’ are produced institutionally create a site of disjuncture for the the women students who are actually involved in studying Computer Science and in working in the field.

Part of this disjuncture occurs in the intersecting discourses of ‘women in computing’ as a group identity with the individualized subjects of CS/IT work and in the practices of flexible work and specialization which produce them. The former discourse derives from North American Second Wave liberal feminist belief in ‘universal sisterhood,’ and in the benefits of a political group identity for women in action for women’s equality in legal appeals to the State. The latter discourse supports neo-liberal political and economic practices which involve a decentralization of state organization and corporate governance, a move which has also led to a decollectivization of the workplace where formerly collective agreements protected job security. In this restructuring of work, contractual, temporary and self-employment has emerged as a dominant mode of work organization, particularly in the high-tech sector (Carnoy, Castells, & Benner, 1997). In such an environment, those in graduate Computer Science studies who plan to work in industry or university research are trained to become
‘entrepreneurs of the self’ who are individually responsible for ongoing education in the newest technologies and practices. These entrepreneurial subjects promote themselves as innovators and as self-starters who work independently, capable of following any schedule which the work (and/or the market) requires (see Shih, 2004).

For the women I interviewed in this study, the intersecting discourses which interweave a collective identity as ‘women’ with the individualized self-improvement model of the CS/IT professional produce these women as subjects who find benefits and alienation operating simultaneously under the contradictory sign of ‘women in computing’. The discourses which position them as entrepreneurs of a gendered and racialized self position them differently from the subject who is the ideal ‘talented CS/IT student/worker’. However, in institutional events and organizations which promote ‘women in computing’, such as the Grace Hopper Celebration of Women in Computing, and the CRA-W Grad Cohort workshops, women CS graduate students learn how to realize their identities as ‘women in computing’ as a marketable resource. Critical to this, and to the new work processes that are part of ‘flexible specialization’, is the practice of networking.

In ‘women in computing’ discourse, networking is an intersectional practice which joins two different meanings. In the CS/IT context of flexible specialization, ‘networking’ refers to the way that IT projects are organized, with a team of workers/scholars who have individual and specialized skill sets brought together to complement each other. Although all of the group members can work independently on parts of a project, they need to network in order to put the individual parts together. Another way in which the term networking is used is to describe a group of social
connections that each individual must establish in order to get information. This information includes employment possibilities and inside details on potential workplaces/clients as well as professional and technical knowledge in an individual’s specific field. Information networks also bring together teams of like-minded people for future projects. For CS/IT professionals who are outside the dominant white, male, North American culture of computing, these networks may involve gender and ethnic groupings (see Shih, 2006).

While some of the women students in this study were ambivalent about the current meaning and aims of feminism, they could understand the practical purpose of ‘networking’ with other women in their field; as the student mentioned in Chapter 4, ‘women in computing’ events were at least an opportunity to “meet other smart women who are interested in similar research problems, and form a mentorship/support network.” In this way, most of the participants understood networking as an operational function necessary to the work of CS/IT. On submitting her Master’s thesis the latter student went directly into a Software Engineering job in industry, where her ability to network and the skills she showed in group interaction and project management with her specialization peers at university would be directly useful to her career.

Networking in a North American White liberal feminist context has historically derived from the theorizing of feminist solidarity as a process of establishing universal sisterhood across difference, reaching toward other groups starting from an assumption of ‘women’s experience’ as already constituted and shared across diverse cultures (see Mohanty, 1995, p. 75). At the same time, Western liberal thought asserts the primacy of individual rights and responsibilities, and classifies subjects through individuating
measures of merit and achievement. For the aforementioned student and for several of the others, there was little or no identification with networking as a method of establishing solidarity or group affiliation as ‘women’; most understood the practice as instrumental in the establishment of professional contacts, but little more. In some cases, students expressed resistance to discourses in ‘women in computing’ which, from their subject positions within scientific discourse, they perceived as promoting ‘gender’ over personal merit. Some students questioned the call for numeric gender equality in computing, a major goal in ‘women in computing’ discourse, in discussion of Anita Borg’s ‘50/50 in 2020 goal’:

I don’t see why it should be 50-50. I see some benefits in having more women, but at the same time I don’t think we should try to reach 50-50 by increasing…just because of gender and then by sort of closing doors on men even though the quality levels are different…But some people think that 50-50 is so important that it should just be…if you’re going to take ten people, you should take five of the best men, five of the best women…but if you’re stuck on the 50-50 thing, it doesn’t mean that five of the best women are going to be as good as five of the best men. …But some people believe that there needs to be this equilibrium…I do believe there needs to be more weight on the quality of their work, especially at the graduate level because they’ve gone through so many years of training, right? In order to reach a meaningful 50-50, it has to come from earlier intervention.

It is interesting to note here that while the student’s comments are shaped by her positioning in the merit discourse of science, she does not reject a feminist strategy for ‘earlier intervention’ in order to improve women’s participation in Computer Science. However, she disidentifies with ‘some people’ inside the discourses of ‘women in computing’ and science who produce a fixed and unitary numeric quantity as a ‘truth’ gendering women as excluded subjects.

The Grace Hopper Celebration: The dream of a common discourse?

The sixth Grace Hopper event took place in October, 2006 at a resort hotel in San Diego, California. Two of the students in my study who were going down to present
papers encouraged me to attend the event, as they said it would be interesting for my project to see what went on there.\footnote{My original purpose for going to the Grace Hopper Celebration was through an invitation from one of the student informants to propose a panel together on generational issues/differences in attitudes toward university ‘women in computing’ groups and activities, an idea which came to her through our interview discussions. While four out of the five judges accepted our proposal, one woman rejected what she saw as a ‘negative’ view from ‘the social sciences’ that would discourage young women from coming into Computer Science; ironically, the idea came from the Computer Science student, not the student involved in ‘the social sciences’. Even after the proposal was rejected, the student encouraged me to come anyway in order to ‘experience’ the largest ‘women in computing’ event in North America; she and another student in my study were attending and presenting technical papers there.} As an outsider to the ‘community’ of ‘women in computing’ and as a feminist graduate student and researcher, I am both located in and resisting the discursive practices which produce the researcher as the neutral “listening subject” and “impartial spectator” (see Bourdieu, 1977, p. 1). At the same time, following the practices of Institutional Ethnography, I engage with the student participants as co-informants in the research, constructing knowledge together (Smith, 2006, p. 24). I acknowledge that for the feminist researcher, this is never an ‘innocent’ location; as I discuss in more detail in Chapter 2, I bring my own positioning in the discourse to my interactions with informants and to my “interpreting practices” (Bourdieu, 1977, p. 2).

Of the many pictures I took of the proceedings, I glance at a view from the upper balcony overlooking the main meeting area, where most of the corporate sponsors had their presentation tables and posters. The image of the milling throngs of diverse women is a curious mixture of the usual business convention in a posh hotel and some kind of second wave\footnote{I use ‘second wave’ here primarily as an historical and cultural marker for a period of North American feminist activity; I accept Ella Shohat’s (1998) criticism of the North American white feminist tendency to use such terms in a stagist representation of feminist thought and practice.} feminist tribal gathering like the Michigan Womyn’s Music Festival. Also present is the historical baggage of U.S. liberal feminisms of the 1970s and 1980s, with the colliding moves to collectivity and difference; through celebratory rituals towards a
unitary voice as ‘women’, we affirm that sisterhood is powerful at the same time as we celebrate diversity.

Yet as I will articulate, the generalized subject categories of ‘women in computing’ or ‘female friendly Computer Science’ exclude this diversity in practice or from the experiences of women ‘on the ground’ (cf. my respondents’ experiences). The overriding contradictions of politics as identity continue to provide both a meeting ground for action and a source of disunity. On an institutional level the category ‘woman’\(^{135}\) serves as an organizing text to produce a particular subject involved in a particular set of social relations (Smith, 1990b, p. 72). In addition to general comments about the Grace Hopper Celebration, I examine a specific workshop at the conference to make visible how a certain organizing text has been used to enable institutional practices for inclusion of women in science and technology education. Key to this example are the responses of women in the audience to this textual practice, a response which questions the universalist formation of ‘women in computing’ and addresses the need for examining specific contexts and genealogies.\(^{136}\) Once again, I take up the questions raised at the beginning of this chapter: Who is the subject of ‘women in computing’ at this event? How is it organized? How does this category operate in the organization of ‘women in computing’ as a site of both social inclusion and exclusion across a multiplicity of intersecting discourses?

\(^{135}\) Several post-structuralist and Third World feminist scholars have questioned the use of the category as a universalizing marker. See Scott (1992), Riley (1988), Mohanty (1997), Bannerji (2001).

\(^{136}\) Donna Haraway (1997) has examined ‘gender in the making’ and ‘science in the making’ (Latour, 1987) as co-constitutive practices. Transnational feminist theorists have particularly pointed to the need for geopolitical and historical specificities in examining genealogies of gender, class and race (Alexander & Mohanty, 1997). Kavita Philip (2007) has recently suggested the need to combine transnational feminist analysis with technoscience in order to investigate how the intersections of sexualized and racialized systems of knowledge have shaped science and technology.
**Snapshot 1: ‘Female friendly’ education?**

A particular session at Grace Hopper, ‘Female Friendly Education: Increasing Participation or Watering Down?’ provoked a heated response from audience members, many of whom were university students and professors. The topic unexpectedly made clear how the insertion of diverse women into a generalized female identity in ‘women in computing’ or ‘female friendly Computer Science’ is extremely problematic, constituting a unitary subject which also produces those it does not include as marginal. Among the panelists, Sue Rosser, a feminist scholar of science at Georgia Tech, had coined the term ‘female friendly science’ (1990) to signify a new approach to university science education which would take into account how science is gendered and would seek to redirect values and practices in scientific work to reflect the interests and experiences of women as well as men. Two of her panel colleagues, Jane Margolis and Allan Fisher, had written *Unlocking the clubhouse* (2002) to suggest a similar strategy in achieving gender equity in postsecondary Computer Science studies. Both approaches concentrated on revamping curricula to include ‘female friendly’ values and practices such as preferring interdisciplinary, non-competitive collaborative approaches, qualitative as well as quantitative research methods, and designing experiments which have application to social concerns rather than military or corporate uses.

Although more used to working with students in the natural sciences rather than Computer Science, Rosser rightly perceived the negative reaction to the idea of ‘female friendly’ Computer Science from the computing community. Certainly, in the group of female graduate CS students I interviewed, the majority resisted the characteristics ascribed to them in a ‘female friendly’ Computer Science approach, characteristics which positioned them as gendered subjects, read as less competent and less able in relation to
the dominant unmarked male subject of Computer Science. The panelists presented their questions to the audience in an attempt to get feedback about why ‘third wave’ (their term) feminists and younger CS women in general responded negatively to the term ‘female friendly’. Was it the term itself? Computing as a field different from natural sciences? Were these approaches specifically related to gender, or to inclusivity in general?

The practices of ‘female friendly’ science assemble a subject which is the Other, as the term ‘female friendly science’ itself acknowledges that the discipline of science limits the right of women to participate in its laws of discourse. Thus ‘female friendly science’ performs a reinscription of social exclusion. The existing forms of scientific discourse, or what the presenters described as masculinized STEM values, ‘an emphasis on truth, beauty and puzzles’, determine the limits by which femininized values of ‘time spent on community and social impact’ can be uttered as a ‘truth’ about women through the gender binary. Moreover, the discursive formation of ‘women in computing’ as a unitary ‘community’ of identity places certain subjects outside of this ‘sisterhood’ of discourse. A professor in the audience pointed out that in her education in Sri Lanka educators made no distinction between genders in scientific competence and inclusion; it was a non-issue. ‘Female friendly computer science’ is a North American discourse which controls ‘women in computing’ with an assumption of unitary ‘experience’. For many of the women in my study whose formative education in science and technology is non-Western, and for other racialized women in the field, this discourse produces them as excluded subjects. As the student informants who also attended the conference remarked:

We’ve discussed problems about being women in our departments [at the two universities] – neither of us had experienced anything like it before we came [to Canada]…. 
So we’ve had a few long discussions before….

The students commented on the disjuncture between what they’d read or heard about Canada or the U.S. before their arrival, and once in Canada, their actual experiences of exclusion through the textual organization of gender equity in the university. More specifically, they were positioned in institutional ‘women in computing’ discourses which reinscribe ‘women’s’ difference from the dominant subject of computing. To revisit Dorothy Smith’s analytic approach, this textually-mediated (1990b) organization of ‘women in computing’ reproduces a form of detachable and universalized institutional equity practices. These practices may be initiated textually and reproduced across a wide range of sites in a consistent and unitary format, and, in the context of Computer Science in particular, as globally transmissible electronic texts. Here, the ‘problem’ of ‘women in computing’ is used as a unifying text across diversity. However, unpacking the language of inclusion reveals structural problems which terminology will not correct.

One of the students at Grace Hopper acknowledged her resistance not only to the discourse of ‘female friendly Computer Science’ but also to the general equity approaches reflected in the proceedings at Grace Hopper, whether the plenary sessions, workshops, panels, posters, institutional displays or even parties. She had a similar resistance to the ‘women in computing’ activities run by female faculty in her department and funded by the Dean’s Office at the university. She wondered if the problem was generational, cultural (i.e. tied to North American feminism), and also institutional:

Our interviews have made me reflect on some issues about women in computing, and one that I’ve been thinking about is that different ‘generations’ have different needs. I’m interested in knowing what the current needs are at large, not just for myself and what my
limited experience says. I’m also interested in knowing whether my experience is [a]typical for the current generation.

Although this student did not attend the ‘female friendly’ Computer Science session, she may have seen some of her views confirmed by the reactions of her peers. The student’s very perceptive comments address a concern for an examination of generational [and other forms of] difference, not in a way which supports institutional discourse about feminism’s irrelevance to the current generation of university students, but as a means to trace a genealogy of feminist discourses. In such a look back, which recalls Walter Benjamin’s method of sifting through historical artefacts in a reassembly of the past and the present (Benjamin & Arendt, 1999), the institutionalization of feminism in the academy, and its specific form in the organization of ‘women in computing’ can be drawn from liberal feminist psychology texts which theorize gender differences through individual behaviour (Belenky, Clinchy, Goldberger, & Tarule, 1986; Gilligan, 1993).

The discourse of ‘women in computing’ embraces ‘women’s ways’ [of knowing] as a dominant feminist epistemology and ontology in response to male dominated Computer Science. I argue that in so doing, the discursive practices which produce ‘women in computing’ as a category in the pursuit of equity paradoxically serve to reinscribe and retraditionalize the gender binar(see also Bryson & De Castell, 1993)y (see also Bryson & De Castell, 1993). While some of the women I interviewed actively take up the discourse in their own accounts, others reject both the concept of epistemological gender differences in CS and the practices which seek to provide a counter-identity for ‘women in computing’. In response to ‘women in computing’ discursive practices to
attract more young women to CS by dispelling the stereotype of the computer geek or
nerd, one of the female student participants said:

I don’t see a need to get away from the [geek] stereotype, just because I don’t think the stereotype’s a problem, because… in reality we do stare at the computers a lot, and we do work a lot there. And I remember when I tried to choose… trying to say, ‘What should I choose as my major?’, because at the end of my first year, I liked all my courses, I liked all this kind of stuff – what should I do? And I constantly got comments like, ‘You’re a girl – don’t go into Computer Science. You’re going to be spending all your time in the lab. You shouldn’t be doing that, and, it’s really hard….’ And I’m just thinking… it didn’t make any sense to me, because you’re going to have to do homework anyways, how doing your homework in the lab made any difference. And, to them, it was just… girls shouldn’t behave in a certain way… I don’t know… it didn’t affect my decision… I’m not sure if the stereotype is the thing that’s affecting your decision. I’m not sure if girls are saying, ‘I don’t want to be a computer scientist because I don’t want to sit in from of a computer in a dark room…’

The student’s comments illuminate how the discourse of ‘women in computing’ produces women through the binary negative, in which other expectations of gendered behaviour and identity actually discourage their participation in the field of Computer Science. The student in fact challenges these gendered expectations and stereotypes, and argues for a recognition of the material practices of Computer Science work, work which does involve long hours in the lab or in some other computing environment. The attempt to attract more women to the field by positioning women as an exception to the male ‘geek’ norm is an ideological practice which, by continually reinscribing ‘women in computing’ as different from the normative subject of Computer Science, serves to maintain conditions of exclusion in CS and in general.

‘Women in computing’ conferences and workshops, as I will show through the Grace Hopper Celebration in particular, are often involved in the marketing of a hyper-feminine and even ‘sexy’ image of women in CS/IT in order to promote the field to ‘women’. Institutional texts (in posters, pamphlets and workshop presentations) continually stress the importance of countering the ‘nerd’ or ‘geek’ stereotypes in order
to attract young women to study CS/IT in college and university. This institutional promotion to a target market through images and texts organizes women as potential participants and beneficiaries in the global CS/IT field as both producers and consumers of educational as well as industrial goods, but not necessarily as primary actors in the production of computing knowledge. At the same time, these discursive practices serve to inscribe the gendered and racialized boundaries of that participation and to produce the subject who inhabits ‘women in computing’.

**Snapshot 2: “We are the new sexy!”: ‘Women in computing’ as entrepreneurial and desiring/desirable subjects**

“It’s not so much a question of making [Computer Science] more accessible or lowering the standards. It’s an issue of making it more attractive! We’ve got a big sales and marketing problem here.”

- Allan Fisher, at ‘Female Friendly Education’ panel

In the second part of this section, I will discuss how ‘women in computing’ is organized at the Grace Hopper Celebration toward the production of women as entrepreneurial subjects. This production is two-fold: women are organized in this site...
both as the producers of technology/technology education for consumers and as target markets for technology education and industry recruiting. The previous discussion of ‘female friendly Computer Science’ education suggests some of the conceptual paths behind the commodification of ‘women in computing’ as an identity, a textual practice which produces events like the Grace Hopper Celebration. Like any other product which is marketed, the image of ‘women in computing’ must be constantly reinvented and promoted. Through the poster above, young [primarily white] women are hailed to become the sexy new subjects of graduate Computer Science, attracting and desiring ‘cool’ non-geek white men, and calling underrepresented African-American and Hispanic men and women to join them ‘into CS’. This interpellation produces these groups discursively as the desired and desiring subjects of institutional diversity discourses and increased enrolment targets, and joins them to intersecting discourses of ‘women in computing’, ‘community’ and ‘innovation.’ Excluded from the picture are the ‘old’ faces of Computer Science, which by omission are majority (non-cool) White males, and also Asian men and women. This latter exclusion is significant for reasons which follow in this chapter.

Ironically, while women are being presented as ‘the new face of computing,’ the types of women being represented are not new to the consumer market: they are generally young, white and conventionally attractive. Occasionally, a woman of colour may be featured to promote an image of diversity, but she is also young and attractive. A major push in ‘selling’ Computer Science as a possible career path for women, whether it be to high school or college and university aged women, is to banish the geek stereotype through hyperfemininity. One of my conference roommates, an engaging twenty-
something undergraduate CS student from southern Ontario, recounted her experience of the Thursday night disco, at which the male DJ pulled women in skirts and ‘sexy’ clothes up on stage to dance. Throughout the conference, there was a lot of talk about countering the geek image, supported by print and visual media; essentialized female identity appeared to shut out those who didn’t conform.

The young women I observed at the conference generally patterned themselves after the corporate entrepreneurial model, coming to sessions dressed for business. I wondered about what kind of mentoring they’d received, if any, and what kind of career ‘sculpting’ was encouraged. Both of my undergraduate roommates seemed to be well aware of what was expected. They participated in volunteer activities at the conference and did intensive networking, seeking out recruiting representatives from Google and other high-stakes employers. The promotion and stalking was by no means one-sided: as I shadowed one of the study participants while she inquired about possible doctoral internships, her NSERC scholarship made her an attractive candidate for several large American universities, whose representatives followed her around the room. While enrolment in most North American Computer Science programs has dropped for both male and female students, female graduate students eligible for scholarship money are sought after both in compliance with organizational directives to increase the number of grant-generating graduate students in Science and Technology programs and to fill gender diversity quotas. Thus, ‘women in computing’ represents a valuable commodity in higher education.

In addition to its focus on women’s individual desires and performance, ‘women in computing’ discourse summons young women to join their personal ambitions with
corporate and government goals for global technological innovation; the quotation from Anita Borg and the recruitment advertisement at the beginning of this chapter are examples of this interpellation. As Anita Harris (2001) has suggested in her study of young Australian women in their late teens and early twenties, who are cultural markers for national aspirations, young women in North America are carriers of North American (particularly U.S.) anxieties about global competition, especially in the IT field.

Much of the educational literature at the conference reflected concern that young women will be ‘left behind’ because they are not pursuing Computer Science or IT as career paths; this is produced through a discourse of fear that America will be left behind in the face of global IT competition, particularly that coming from Asia. In the media representations at Grace Hopper, young women at the conference are heavily encouraged to be leaders in the field, icons for innovation, change, diversity, flexibility and collaboration; this supports an essentialized cataloging of women’s ‘inherent’ strengths in working with people and across difference. Young women in the North American context are situated at intersections of multiple discourses, told that they are strong and no longer in need of ‘second wave’ critiques of structural and gender inequalities through ‘victim feminism’, favouring self-actualizing ‘power feminism’ (Wolf, 1994) to clear up the few equality bumps that are left. At the same time, as weaker players in the dominant culture of science and technology, they are even more ‘at risk’ of falling behind. Thus they become the focus of North American cultural anxiety (Harris, 2001) as ‘the new face of computing,’ inscribed through multiple intersecting discourses of gender, risk and fear, entrepreneurship, globalization and nation.
Performing gendered and racialized identities in computing

While the presentations and displays promote the rich array of well-paid and prestigious IT careers open to young women who follow this path, many of the entry level jobs formerly available to new graduates are being outsourced to offshore workers for considerably lower pay than their North American counterparts would expect. This is reminiscent of the promotion of non-traditional trades training to women in North America just as those skilled industrial jobs were disappearing, either replaced by technological advances or again, sent offshore. Concurrent with the mobility of global economies, international Computer Science and IT workers and students travel to North America both for education and to fill jobs.\(^\text{137}\) Transnational feminist researchers have begun to track some of the complex socio-economic and socio-cultural relationships of this global high-tech labour mobility by offering analysis of the multilayered identity positions this migration and technological mediation produces (Grewal, 2005; Ong, 1999, 2003b).

As much as the ‘female friendly education’ discourse obscures the specificity of educational and geo-political social histories, and produces non-White and non-North American-born women as excluded and racialized subjects, another workshop abstract seemed both to talk back to this omission and to capitalize upon particular racialized identities as a marketable resource in computing careers. The abstract for the workshop, entitled ‘Embrace your duality as an Asian woman to lead’ reads as follows:

As Asian women in computing, we often find ourselves struggling with gender difference in this male-dominated field, but we also face the culture difference of a largely western environment. \textbf{Do we have to change our identities in order to excel and lead in the}\(^\text{137}\) A salient example of this global economic migration in CS/IT work is given in Payal Banerjee’s (2006) study of the racializing and gendering experiences of Indian IT workers hired in the United States as temporary workers under the H-1B visa.
computing field? In this session, we will discuss the unique issues that Asian women face and explore various skills and resources we can use to address them. We will brainstorm how to leverage our gender strength to excel, and to embrace our cultural advantage to lead.138 [emphasis added]

The authors, who work at three of the top U.S. software and financial firms, have clearly embraced strategies promoting the commodification of identity, which fits with the texts organizing ‘women in computing’ as entrepreneurial and desirable/desiring subjects. All through the presentation rooms, the industry and academic display rooms, as well as in myriad corporate and educational brochures, posters and handouts, ‘diversity’ and ‘global community’ as a text in IT enterprises was illustrated through the faces of women of colour, and of those, largely Asian women. This representation of the category ‘diversity’ points to what Chandra Mohanty refers to as “the institutionalization of difference within feminist discourses” (1995, p. 68). Is this a picture of ‘gender strength’ and ‘cultural advantage,’ or co-optation? Words like ‘leverage’ ‘strength’ ‘excel; ‘advantage’ and ‘lead’, so familiar as part of corporate texts, weave discourses of global neo-liberal corporate competition through ‘gender’ and ‘cultural,’ more typically part of mainstream feminist discourse. Yet this seeming incongruence was naturalized in a variety of textual practices at the Grace Hopper Celebration, as it is in many other academic and corporate interventions which organize ‘women in computing.’

Like the unitary subject of ‘female friendly Computer Science’, the discourses producing ‘Asian women’ in computing as racialized desirable and desiring subjects are tied to Western historical and popular culture discourses which commodify Asian women sexually. Discursive practices also produce mobile and flexible Asian subjects (Ong,

1999) as dominant participants in the global economy, in particular, Asian women capable of accessing both ethnic and gender networks in CS/IT work (Shih, 2006) and in the production and consumption of surplus capital. Also intersecting with Western discourses of Asian desire, capitalist self-accumulation and global competition are discourses of risk and fear, through the enactment of trade rules and immigration policies as “practices of qualification that limit the rights of individuals to participate in certain discourses” (Dant, p. 129). The categories ‘international student’ and ‘migrant Asian IT worker’ are subject to these limiting texts, which work to exclude them from the privileged category of ‘Canadianness’ (Sharma, 2001), and from the desired subject position of the Asian women professionals above.139 These categories accomplish Asian Computer Science students (the majority of international students in Ontario Computer Science programs) as the ‘new face’ of postsecondary restructuring in Ontario, and produce migrant Asian IT workers as the ‘new face’ of flexible indentured labour (Banerjee, 2006).

In the Rae Review (2005),140 as a text which organizes neo-liberal postsecondary restructuring, ‘Canadians’ are hailed to recognize the market benefits of attracting more ‘international students’ (in order to increase enrolment numbers at the graduate level, and at all levels for Computer Science). The categories of ‘citizen’ and ‘non-citizen’ are accomplished to set the limits of rights for each (Sharma, 2001). In this call by the State to support more international students, ‘citizens’ are assured that these non-citizens will not be an economic burden on Ontario universities, who do not receive government grant

139 Compare this, too, with L’s comments in Chapter 5 about the international students without supervisors who “couldn’t stand up for themselves” or “didn’t feel comfortable in our culture”.

140 For a more detailed discussion of the Review, entitled Ontario: A Leader in Learning (Rae, 2005), see Chapter 5.
funding for these students. To this end, Rae’s text produces Ontario’s economic self-interest as colonizing benevolence:

To assist international students with meeting the cost of their education [which is approximately double that of resident students] federal rules make them eligible for on-campus work permits while they are here to study. It would be helpful to extend eligibility to off-campus jobs as well. [emphasis added]

Since the Report, rules governing off-campus work have been relaxed in Ontario so that now international CS/IT students can join the flexible (precarious) workforce of entry-level ‘foreign’ contract workers in IT. Non-student IT workers in certain categories are now subject to a speeded-up work permit process, which may be rescinded in the event of a market slump. Traditionally, women have not been a large part of the migrant IT workforce (Shih, 2004; Banerjee, 2006), but as students already in Canada (and there are a larger number of Asian women in CS/IT than from any other group) they will now be more available to participate as flexible labour. In Canada, as in other ‘Western’ nations, international students, like migrant workers under temporary employment and/or visas, are not subject to the same rights as citizen students or workers, and their position is produced as a category of exclusion in relation to the Canadian nation (Sharma, 2001).

These subject positions of difference naturalize differentiated rights and set up the category of difference from the Canadian norm as a ‘problem’. For the female international student studying Computer Science in a Canadian university, this difference resonates with the discursive positioning of ‘women in computing’ as a ‘problem’ in relation to a naturalized male norm. Outside of a ‘women in computing’ discourse which produces ‘Asian women’ in CS/IT as a unitary identity category, it is hard to imagine that this gendered, racialized and classed subjection produces ‘gender strength’ and ‘cultural advantage’.
The international student I interviewed was put in the situation of having to relocate with her supervisor to a university in another province, while remaining tied to her host university for progress reporting and final evaluation. (We arranged the interviews at her original university.) She had come from the Far East on a university-based scholarship which was not transferable to her new location. Like many students in doctoral studies, she had exhausted her eligibility for graduate funding; she was financially dependent on her supervisor’s project support and on TA work with a lower wage and a much heavier workload than at her host university. The student had been accepted on an accelerated BSc to PhD program (more common in the U.S. but increasingly more common in Canada), so she was under more pressure to complete the PhD; otherwise she was concerned that she would not have even a Master’s degree.

The student commented on her precarious status as an international student, and she expressed gratitude for her supervisor’s support and guidance under this ‘flexible’ arrangement. Like other students at her university she was institutionally disciplined by reporting practices to complete ‘in a timely manner’ before she had to be subject to a more frequent reporting regime. However, her subject position as an international student accomplished her location differently not only as a student but also as indentured and flexible labour in the Canadian university system:

141 Although several of the student participants had come to Canada from other countries, only one was formally an international student. The others had come with their parents as landed immigrants and had obtained Canadian citizenship.

142 According to a university equity officer I interviewed, this shift of resources and faculty away from Master’s programs and the reduced availability of these programs discourages women from entering graduate school.

143 For a doctoral student, this generally means a limit of 4 years, though at the time of the interviews there was increasing pressure at both of the universities in this study to shorten Computer Science doctoral programs to 3 ½ years. Students found that Masters programs were also under pressure to shorten completion time, and one student was participating in an accelerated PhD program which she entered directly from her undergraduate studies. Though more popular in American universities, this latter option is gaining acceptance in Canada as university funding policy promotes increased graduate enrolment.
Student: For me it’s six years of funding, for a PhD without a Master’s degree. It’s six years. After six years, I need to file an extension form every term [Laughs]. I will do that in September.

I will do it just once, and I will defend at the end of the year. It is so much pain…you have to extend it every term, every term…I think I already got very pressured, when I moved to Camden.

SS: Why was that?

Student: Why? Because I…when I moved to Camden, I was still officially eligible to graduate here, work here, I had a scholarship here for international students. And then when I moved with my supervisor, everything was gone. I have to get whatever he can help me with there. And life is just not as comfortable as before, so I feel pressure.

SS: You don’t have anything, you don’t have any paperwork you have to do for Camden, too?

Student: No, they don’t ‘own’ me, basically. [emphasis added]

The student also understood her subject position in relation to the practices of the Canadian performative university, which increasingly restructures its operations and aims to suit the flexible accumulation strategies of a global market. Universities respond with differentiated student ‘flows’ as the categories of Canadian citizenship and non-citizenship are redrawn to suit a differentiated labour force which accomplishes “a gendered racialization of class” to the benefit of employers (Sharma, 2001, p. 435). As an international student, like the migrant IT workers Banerjee (2006) describes, the student informant performed to the expectations of flexibility and contingency which accompany the neo-liberal global market economy in the governance of university restructuring.

Snapshot 3: ‘Women in computing’ and nation-building

Lastly, amid the talk of global communication and diversity, the women at the Grace Hopper Celebration were also reminded of their valuable role as leaders developing technology to serve the nation. Through this interpellation the unitary subject
of ‘women in computing’ is produced discursively through texts of technological innovation and entrepreneurship, global knowledge economy competition and security. A series of keynote speakers modeled different aspects of computer science and information technology in the academy, in industry and in the U.S. Space program. This ‘intentional role modeling’ is seen by many promoters of women’s participation in IT as “a way to overcome the negative effects of stereotypes by increasing self-ratings and by inspiring and motivating achievement”. The idea is to incite young women to “compare themselves with and adopt a role model as a ‘possible self’…” (Barker & Cohoon, 2006).

Once again, this places young women in the dual role of being both strong and ‘at risk’ (Harris, 2001), strong in that their participation in IT work drives the national economy, but at risk of not living up to the expectations set by the role model, and potentially failing their own expectations for a high-paying and meaningful career. These intentional role models, as living\(^{144}\) motivational texts, organize work\(^{145}\) for those with already high self-expectations, like my two roommates (part of a generation of “Can Do Girls”, as Anita Harris [2004] calls them), and to push them to achieve further as self-actuating, self-(im)proving subjects. Not only is their own self-worth dependent on their achievement, but, they are told, so is the success of the nation: “Women’s lack of participation in IT has deep implications for our country’s preparedness, competitiveness, economic wellbeing, and quality of life” (NCWIT, n.d.).

An unspoken undercurrent of national ‘preparedness’, at least in the American context, was participation in military IT work, at times nodding to Grace Hopper’s own

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\(^{144}\) One of the conference presentations also suggested ‘virtual mentors’ in the form of avatars which resembled the desired image and interests of the user.

\(^{145}\) Here I use Dorothy Smith’s “generous concept of work”, which extends to “all the things people know how to do and that their daily lives require them to do” (Campbell & Gregor, 2002, p. 72), not just the institutional language which describes their work as students.
history. Most military participation at the conference was not explicit but took place through conference sponsorship and through financial support of some of the featured research. Presenters regularly thanked military sponsors of their projects, many of which had nothing to do with military research but required extensive funds not easily obtainable through other means. One notable project was a nationwide three-year multidisciplinary study of gender differences and cultural and ethnic models in the computing disciplines, undertaken by researchers at four American universities. Other presentations were more specifically linked to ‘security’ issues, but did not refer directly to military uses of the technology. One of the keynote speakers was Sally Ride, the first American woman in space, a physics professor at the University of California, San Diego, and the President and CEO of Sally Ride Science, a national program to encourage girls’ interest in science, math and technology. While she subtly critiqued space militarization and the current war effort, the introduction to her talk and other attention circling around her framed her in patriotism and in her commitment as an American woman to the betterment of the nation through role modeling and promoting the education of girls in science, math and technology.

More explicit in fronting the military interest in IT was the final keynote speaker, a robotics engineer and entrepreneur whose company had designed a popular floor vacuuming robot. She talked about further developments in the ‘domestic line’ of her company. At the same time as she narrated humourous video clips of the device and talked about ‘bridging the gender gap in science and technology,’ she unintentionally underlined several gender splits. The other robot she displayed, again in a video clip, was developed for her company’s line of military products; she rather enthusiastically
demonstrated: “This little fellow can climb over rocks, up and down mountains, can move through water and into caves – it can also blow itself up”; it had been used in Afghanistan and Iraq. After her presentation, a group of young men from her company brought in a bunch of robots for the audience to ‘play with’ and to purchase (the vacuum robot). For the rest of the morning, the final workshops of the conference were split in a gender binary between those tied to community and social activism and those dealing with robotics, with the implicit message that young women looking to ‘the future’ of IT would (and should) be more interested in playing with the robots, which was clearly what the young men modeling the normative (and desired) gender position in computing were interested in doing. In yet another way, ‘women in computing’ becomes a textually-mediated set of interactions and practices which organize these young women socially.

Finally, events such as Grace Hopper and the national and transnational educational networks which promote institutional equity programs for ‘women in computing’ present a multiplicity of organizing texts, an array of ‘choices’ which are contradictory for the women in this study and for young women in general who may be considering entering the field. The marketing of these choices – the discourse of choice itself being a key part of neo-liberal governing practices – makes certain subject positions available for young women while it makes others unthinkable or at least less desirable. For example, the separation of technological innovation from social justice issues in the above vignette demonstrates one way in which this is accomplished, recalling the ‘power feminism’ discourses of derision around ‘second-wave victim feminism’ as retrograde, a look back instead of a vision of the future.146

146 As in the examples of CRA-W policy in Chapter 5, ‘women in computing’ discourse derives from liberal feminist (and scientific) narratives of progress.
Women who do not choose the educational path through Computer Science and Information Technology studies to high-technology careers are discursively positioned as victims of their own personal failure to achieve, and worse, they fail the nation. If they do choose Computer Science, but do not (im)prove themselves as sexy, desiring and desirable subjects, they may fail in their own self-marketing and in promoting the field to other women. Yet, the student stories in this study where makeup and mini-skirts were read as female incompetence in math and computer science contradict this discourse, as does the female CS professor’s angry response to ‘promoting the field’, or the undergraduate’s discomfort at the Grace Hopper disco.

While the main focus of this marketing strategy is upon individual self-identity work and self-accumulation, the institutional discourse of ‘women in computing’ elicits (and in fact depends upon) an identification with ‘community’ – a ‘sistership’ of discourse – as a means of assembling and organizing its subjects. Student participant comments in Chapter 5 about ‘women in computing’ meetings and events make visible the students’ ambivalence about identifying with this ‘community’, if indeed they felt it was one. The student (and faculty) responses to the ‘female-friendly Computer Science’ workshop in this chapter also reveal challenges to the assumptions of ‘community’ in the ‘women in computing’ discourse. Yet, whether or not the women in this study identify with the discourse, resist it or adapt it to their own needs, institutional ‘women in computing’ practices organize their positioning as women in Computer Science studies in complex and contradictory ways.
Chapter 7: Conclusion

Representation works as much through what is not shown as through what is.
- Stuart Hall (1997, p. 59)

...[S]ome assumptions are not perceived as such by any members of the community. When, for instance, background assumptions are shared by all members of a community, they acquire an invisibility that renders them unavailable for criticism. They do not become visible until individuals who do not share the community’s assumptions can provide alternative explanations of the phenomena without those assumptions...Until such alternatives are available, community assumptions are transparent to their adherents. In addition, the substantive principles determining standards of rationality within a research program or tradition are for the most part immune to criticism by means of those standards.
- Helen Longino (1990, p. 80)

I do feel like most people have an expectation that if you’re a female in a technical field, you’re going to be a feminist of some sort, which isn’t always true – and I would say I’m definitely not the type of feminist that some people would expect me to be.
- student participant

In concluding this thesis, I look back to the range of questions and issues raised in my study, trying to make sense of its many interweaving and often contradictory threads. The administrator’s joking, ‘You’re going to solve the problem, aren’t you?’, and the professor’s challenge to my ‘sample size’ are useful to have in mind as I write this conclusion, for they keep the problematic present. In investigating women’s under-representation in Computer Science education at the graduate level, and indeed, their limited participation in the field, ultimately my research is not about finding a ‘solution’ to the problem as it is discursively given, nor is it about justifying macro-level assumptions about a population generalized from large amounts of data. I do not present a narrative of progress and continuity, although I find myself struggling with a learned habit in order not to do so. Rather, I have tried to connect different threads to the problem’s historical and present production through the accounts of student participants describing how their lived experiences take shape as women in graduate Computer
Science. Although my thesis is first of all a micro-study of particular practices surrounding the everyday work of particular women graduate Computer Science students at two local universities, grounded in its time, place and the people who participate in it, the social organization of the students’ work extends far beyond those specific sites. In what follows I review the study’s threads of investigation.

Reinscription and prescription

As I have shown throughout this study, the problematic ‘why’ of ‘women in computing’ texts is a resilient framing question, reproduced in the literature for over twenty years. It is a dominant question shaped by a grand narrative of cause and effect, progress and continuity, borne of calls for individual rights and freedoms in late twentieth century Western liberal democracies (Rose, 1999b). For institutional feminist literature in the field, it is conservative in two senses of the word: it reproduces received knowledge about ‘women’ as the diminished half of a gender binary, and it reinscribes women’s marginal position in the field. What I have named the ‘women in computing’ discourse is a practice of differentiation centred around the subject of liberal feminist rights claims, a subject which, as Wendy Brown (1995) has theorized, depends upon reproducing a ‘wounded’ subjectivity. Positioning ‘women’ as always already injured or deficient contradicts the experiences of the women student and faculty participants in this study, who have a sense of personal agency147 and self-accumulation as highly skilled and

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147 I use the word ‘agency’ with caution, acknowledging feminist and post-structuralist critiques of the term substituting a pre-given ‘thing’ for a practice. I prefer to think of the word as Lois McNay does in her ‘generative concept of agency’, in which she understands “gender as a lived social relation” (2004, p. 175). In her critique of the limits of post-structural theorists like Butler when taking up the concept of agency, McNay writes:

Agency refers to an individual’s capacity for action and cannot be simply understood as a property of unstable discursive structures. Therefore, in order to understand some of the changes within sexual practices and gender norms that have occurred over the last forty years or so, an idea of
knowledgeable technoscientific actors. Through their work they express creativity, pleasure and power in their knowledge of computing. However, this is not to say that gendering effects are not present through the practices of Computer Science education and work, and that they are not harmful. As the opening quotation from Stuart Hall indicates, representation happens through what is not seen as well as through what is. Feminist theorists of science and technology have long sought to open the black boxes of gender in the discourses of scientific objectivity and neutrality.\(^{148}\) Instead of ‘why’, I have argued here, ‘how’ is a more useful question for elucidating the micro-levels of everyday lived experiences and institutional practices which shape knowledge about ‘women in computing’. Among other examples, students’ detailed descriptions of the disciplinary practices of reporting and the hidden work of self-im(provement) show how these social practices have different gender effects.

**Gender in action**

The black-boxing of gender happens not only in normative accounts of science and technology, but also in critical constructionist work like that of Bruno Latour (1987), which understands science as a practice, ‘in the making’.\(^{149}\) Science is a site of struggle over what Latour calls ‘controversies,’ the struggle over who can claim dominant scientific knowledge at a given time. However, the gendered (and gendering) practices in

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148 For example, see Cockburn (1992); Cockburn & Ormrod (1993); Haraway (1991, 1997); Keller (1985); Longino (1990); Ormrod (1995); Wajcman (1991).

149 Latour rejects a pre-existing entity called ‘the social’ in favour of tracing the associations between heterogeneous elements (human and non-human) assembled together in scientific practices.
these spaces are invisible in Latour’s work, and in other largely malestream accounts of
the sociology of science and technology.\footnote{Even in works which self-consciously focus upon examining ‘the social’ in the relations of scientific practice (for example, Shapin & Schaffer, 1985), the production of gender passes without comment, when gender is in fact produced by women’s very absences from these social spaces. See Haraway (1997) for a critique of this omission.}

Also absent from these stories of science and technology is the work of emotion, which stands in a gendered binary relationship to scientific rationality. Pleasure and self-efficacy, as well as feelings of inadequacy, are not only experienced in relation to the self but are also part of social relations, where emotion is a form of social interaction which is shaped by social institutions like schooling (see Boler, 1999). These structured formations are the vehicles for power dynamics which operate for and between individuals in everyday life, what Raymond Williams refers to as “structures of feeling”, which may “enact palpable pressures and set effective limits on experience and on action” (Williams, 1977, p. 132, in McNay, 2004, p. 187). In Chapter 4, I examined the contradictions between the students’ efficacy as entrepreneurs of their self-identity and the hidden emotional identity work that they were expected to do as women in computing and in the reproduction of ‘women in computing’ discourse, work that often set limits upon their experiences and their actions.

Like other forms of science in the making, the formation of gender in the social space of Computer Science is always present and certainly has the potential to act as a limiting relation for the students in this study. However, it is also clear in some of the student accounts that gender as a lived experience interacts with other relations of power in ways which may connect them to advantage. Perhaps one of the most interesting aspects of their understandings of ‘gender advantage’ is the way in which students
understood a difference between their connection to the ‘community’ of ‘women in computing’ (often negative) as an identity and their interest\textsuperscript{151} in affiliation and networking with other actual women in computing. The latter connection or identification, rather than identity, seemed to provide a better fit with the ways in which they understood their particular subjectivities.

The students saw themselves as part of a self-responsible, self-governing “community of people in Computer Science”, as K put it in Chapter 4, who are most effectively positioned for networked projects and ‘flexible specialization’\textsuperscript{152} in the post-industrial social relations of the computing field (see Harvey, 1989; Shih, 2004). This is different from the experiences of women faculty members whose feminist activism in the 1980s centred on collective action in what they perceived as a chilly climate for women in Computer Science. In Chapter 3 I examined these different understandings of ‘identity’ and ‘community’ and the translation of feminist activity through the practices of the performative university (for example, the development of feminist expertise and the production of ‘women in computing’ as a disciplinary discourse), in order to show points of rupture and transformation in the liberal narrative of continuity and progress which also shapes institutional feminist stories of a generational order.

\textsuperscript{151} Here I use the term ‘interest’ to mean both a shared concern and a stake in resources for self-accumulation.

\textsuperscript{152} As Shih (2004, p. 224) writes: “Flexible specialization is typically seen as a shift away from the mass production and large, hierarchical organizations of the Fordist era, and is characterized instead by small batch production, decentralized and specialized organizations, flexible technologies, and densely woven inter-firm networks.” Piore and Sabel (1984) characterize flexible specialization as a “strategy of permanent innovation: an accommodation to ceaseless change, rather than an effort to control it” (Piore and Sabel 1984, p. 17 in Shih, 2004). [emphasis added]
Feminist contentions

What makes gendering processes especially difficult to unravel in this milieu is the tendency for women students and faculty in Computer Science (and in other scientific disciplines) to identify with the individualized, abstract, autonomous and free subject of liberalism, traditionally gendered male. Pedagogic practices in science and technology reinforce these characteristic as part of the disinterested and objective subjectivity of the scientific knower. Through Western discourses of progress and the global domination of scientific knowledge, the women are taught to see themselves as meritorious individuals who, regardless of gender, are entering the technical and scientific knowledge elites of Western society. This self-production, coupled with a distrust of ‘feminism as we know it’, makes gender analysis irrelevant and even incomprehensible to some of the women graduate students in the study. Though their disidentification with ‘women’s’ positioning appears a challenge to gender norms, it actually reinforces the gender binary by failing to challenge dominant ways of ‘being’ male or female (Walker, in Markwick, 2006, p. 273). I contend that the discourse of ‘women in computing’ rests on the opposite (and diminished) side of this binary and like the students’ processes of disidentification, is “severely constrained by the sedimented structures of gender power” (Walter in Markwick, 2006, p. 272).

Perhaps because I anticipated student resistance to questions about feminism, I included them in both the individual and group interviews in order to get a sense of each woman’s location to and in the ‘women in computing’ discourse. I acknowledge that their

153 See Longino & Hammonds (1990) for examples of this in science.
154 This was a student phrase, used (somewhat negatively) to describe what she took to be the ‘women in computing’ view.
answers may have been partially a product of ‘ventriloquation’ and perhaps provoked by what they thought I might want to hear, but that was more likely in the individual interviews than the group interviews where the students were talking more to each other in animated discussion of/arguments about question topics. At any rate, I was looking for the institutional discourses present in their answers rather than for a supposed ‘authenticity’ – so ventriloquation was evidence of the discourses working through them.

In discussion with women faculty who were sympathetic to the ‘women in computing’ discourse, they admitted that they generally tried to avoid any mention of the ‘f’ word at ‘women in computing’ social gatherings. One faculty member who was more proactive around equity issues was the object of some derision from students for being what they considered ‘extreme’. For most faculty, the idea was to build a ‘community of CS women’ rather than to have any direct affiliation with what they considered feminist aims, though faculty members told me they did feel that their own efforts to encourage more women to enter Computer Science could be seen as feminist. Faculty clearly had the perception that younger women rejected ‘feminism’. As I discovered, though, for several of the students the rejection was not of ‘feminism’ but of the way it was being understood and promoted by some faculty members and more

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155 There were a few women faculty members who, by the accounts of other women faculty who did participate, rejected feminism. They did not respond to my interview requests.
156 Students didn’t feel that these ‘support’ groups were really meant for support on the level of personal complaints of harassment or other issues of gender discrimination if they occurred, but they also said that they wouldn’t want to ‘push’ issues to an institutional equity process. This would require the naming of a ‘victim’ and a ‘perpetrator’ and the activation of a legal process as the means of redress, which they felt escalated a ‘personal’ issue. This recalls Smith’s (1997) report of a chilly climate brief submitted by women in the Political Science department at University of Victoria. Smith traces the brief’s ‘translation’ through the juridical framework of institutional gender equity policy, which resulted in the threat of a defamation of character suit by male faculty.
157 See Adkins (2004) and Brown (2001) for their theoretical disruptions of the ‘generational’ narratives of feminism which shape this perception of rejection or resistance.
generally, in institutional ‘women and computing’ activities within and outside the university.

**Keeping controversies open?**

One of the unexpected discoveries in the research was in discussion with students about feminism. A faculty member, when she discussed her own feelings about being one of the few women in her program as a student in the ‘80s, said the following:

’83 I graduated. And there was a very small fraction of women. And I wasn’t really aware of that – I felt ‘one of the guys’, I guess. I think a lot of women in Computer Science revel in being one of the guys – sort of – and sometimes they’re almost anti any kind of feminist thing….that’s sort of out of fashion anyway these days, it seems…**Feminism is out of fashion for large margins of young women**…. …I don’t have good factual information or background of it, that’s my impression…But I think a lot of women don’t want to believe there’s anything going on…they’re just having fun, and they meet lots of great people and they’re part of all that. And sometimes things dawn on them that there *are* issues …and sometimes not. [*emphasis added*]

I was struck by the operation of two different narratives going on simultaneously: one, the faculty member’s own ‘discourse of derision’ against feminism (Kenway, in Blackmore, 1997) as a student in Computer Science who “felt one of the guys”, and then another comment, as a now-feminist faculty member, deriding young women who were not anti-feminist but looked upon feminism as an out-of-date fashion they declined to wear. However, if it ‘dawned’ on them that problems existed, they might come to consciousness, or not. That was not the only time I heard about female students’ resistance to feminist issues from a faculty member, and in the other instance I heard a similar, almost evangelical comment, ‘They’ll see the light!’, as if feminist truths were inevitably to be revealed to students.
For all this dawn and light it seemed the students were fairly apprehensive about what they might hear at ‘women in computing’ meetings. Some resisted going at all – “The stories will just depress me” – and others said they had no connection to other women’s experiences of difficulty because they hadn’t had similar problems. Though faculty members were inclined to see this as denial (they “don’t want to believe there’s anything [bad] going on”), it raised a question. What does it mean that students are ambivalent about claiming themselves as feminists, or at least the ‘kind of feminist’ people expect them to be?

Centering the study on the students, I was made aware of a much more fine-grained response to the ‘f’ question from students than some of the faculty members presupposed. The students were not about to ‘see the light’ because it wasn’t their light – they had different ways of negotiating feminisms (or not) in their worlds and in what they saw in their lives, present and future, beyond the university. For their part, however they affiliated or disidentified with feminisms writ large or presented through the ‘women in computing’ discourse, none of the women students I interviewed would accept the representation of women as the ‘diminished category’. This reaction was also in evidence at the Grace Hopper workshop in Chapter 6 with the student audience’s rejection of ‘female-friendly’ Computer Science.

These responses raise the question: What is at stake in women graduate students’ care of the self as self-accountable, autonomous subjects when they take up the discourse of ‘women in computing’? In Chapters 5 and 6 I examined how the texts of national responsibility for technoscientific innovation and economic competition and the ‘branding’ of ‘women in computing’ as a desiring and desirable entrepreneurial self act
as governing texts. These texts intertwine with the production and governance of the self as a “good graduate student” and an institutional resource. To the extent that ‘women in computing’ could be seen as beneficial in an entrepreneurial sense (for networking, for job prospects where an equity focus on recruiting more women was at play), some students embraced it, but they also weighed the amount of involvement in cost/benefit and risk terms: too much (being “too extreme”, spending too much time on it) was risky and was potentially “costly to your career”. The important thing was finding a balance; as one student said, “I have to make sure that I get the balance right, that I don’t portray myself as only doing that...”. In the logics of the performative university, this is perhaps a survival strategy against the endless draining of women’s energies in unrecognized emotional work in the academy,\textsuperscript{158} which the ‘women in computing’ discourse reproduces. It is not a ‘rejection of feminism’ by younger women, as the faculty member assumed, but a translation of neo-liberal university accounting practices into institutional feminist performance.

In analysis of the assessment of younger women’s ‘flight from feminism’ in the West, particularly in North America, Adkins (2004) sees the dominance of a ‘generational’ form of feminist history where feminism is seen as a ‘family property’ passed on from one generation to the next with a continuation of its legacy, and with a sense that the current generation of young women refuse to inherit its values. In this model:

\textbf{feminist consciousness is imagined as passed on through time, a sequencing of events which is made possible via a cause and effect logic} whereby elements which come first are positioned as causing the elements which come later[;]...this results in a very reproductive and almost automatically familial understanding of a change through time,

\textsuperscript{158} In Foucauldian terms, this appraisal of personal costs and benefits could be seen as a strategic practice of the self. Thanks to Dr. Kari Dehli for this insight.
whereby the past reproduces the future and **the present and the future are positioned as being in constant debt to the past**. Indeed this logic casts the past as legacy – almost a form of familial property – which may (or may not) be endowed on the next generation. (p. 428) [*emphasis added*]

I reinterpret Adkins’ statement that younger ‘post-feminists’ are being blamed for being unreflective and ignorant of a feminist past, and for “making available feminist ideas to the service of neo-liberal imperatives” (p. 428). If anything, I have shown in my argument that the interconnections of feminism with neo-liberalism have been the legacy of ‘second wave’ feminisms passing through the academy. Neither were the young women I talked to unreflective about feminism. The students’ responses revealed that they had certainly thought about ‘feminism’ more than some of the faculty acknowledged. Some did define themselves as ‘feminist’ but had different ways of explaining what that meant, from a more liberal ‘equality’ perspective to an activist orientation based on ‘women in computing’ ideas, to a sense of feminism as a lived experience as opposed to what they saw as feminism “in words, but not in act” – their assessment of the ‘women in computing’ practices on campus. However, I would also caution against a blaming of ‘second wave’ feminisms without looking at the other institutional actors and the diffuse governing technologies through which neo-liberalism shapes the performative university.

Others were more directly resistant, understanding feminism as “too extreme” or a part of a bygone era, something that “should have changed by now”. Still others were agnostic, were new to Canadian culture and claimed they didn’t yet understand its meaning here, or wondered why women in Canada ‘needed’ feminism. But none were indifferent to feminisms or gave the impression that they “just wanted to have fun” and pretend that gender issues did not exist. Some, though, raised the merit/equality issue
over numeric equality/affirmative action as a resistance they had to ‘feminism’, particularly in discussions of numeric equality initiatives like Anita Borg’s “50/50 in 20/20” target. One student, who had been a research assistant on a ‘girls and math’ project with Grade 4 students, had the strongest reaction to Borg’s project and was the first to raise the issue of earlier intervention. From her own experience learning mathematics outside of Canada and her observations of the Grade 4 girls, she felt the 20/20 target was meaningless unless gender attitudes in North American education changed much earlier.

Their responses raised many questions about the operation of ‘women in computing’ discourses in their everyday lives. Are the students being disciplined by the discursive practices of ‘women in computing’ to accept certain areas of study, aspirations and pleasures as ‘female-friendly’, reproducing a subjectivity borne of pre-given ‘women’s ways’, which they do not accept, as part of familial allegiance to their CS women foremothers? Are the faculty members nostalgically seeking the lost objects of ‘women’s’ community, identity and solidarity in institutional social relations which produce women CS graduate students as individualist autonomous desiring subjects? And what relationship does this feminist nostalgia play to a perceived (and real) loss of institutional power at the same time as ‘intentional role models’ are put forward as a representation of women’s advancement in Computer Science and other male-dominant disciplines?

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159 See Adkins (2004).
160 Wendy Brown (2001) criticizes institutionalized feminism in the academy (Women’s Studies) for its conservative attachment to ‘women’ as a unitary category. Hence the essentializing notions of ‘women’s identity’, ‘women’s ways of knowing’ and ‘women’s consciousness’.
Finally, what does this discourse of ‘identity’ and ‘community’ as fixed objects mean to women who are conversant with the flow of networks and contingent ‘project time’ associations in their present and future lived experiences? In a “new postindustrial modernity”, feminist mourning for the loss of ‘women’s ways’, ‘feminist consciousness’ and or even ‘masculinity’ and ‘femininity’ as stable objects of analysis contribute to “a vision of women as lost (and trapped) in industrial time” (Adkins, 2004, p. 441). Indeed, ‘women in computing’ as a discourse is locked in 1980’s relational feminism, an ironic location for women who are interpellated to ‘invent the future’. I agree with Adkins that it is important for feminism “not to view socio-cultural change (such as the change from industrial to postindustrial society) as always harmful to feminism and women” (p. 441). But I would argue that we should also continue to use a gender lens to ‘follow the controversies’, as Latour suggests, before they become black-boxed. The women graduate CS students in this study show through their everyday experiences that their new postindustrial forms of life and work are complex and contradictory. It is important for feminist scholars to recognize our implication in rapid social and cultural change, and to move with it. In so doing, we must consider how feminism is co-determinate with other ‘strategies for permanent innovation’, while critically examining this new socio-cultural order for its gender effects.¹⁶¹

¹⁶¹ See also Bryson & De Castell, 1993.
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Appendix A

Call for participants, interview consent letters

Original University of Toronto Educational Research Ethics Board approval:

Poster for participants

PARTICIPANTS NEEDED FOR RESEARCH ON
WOMEN’S PARTICIPATION IN
GRADUATE COMPUTER SCIENCE STUDIES

We are looking for volunteers to take part in a study of Women in Graduate
Computer Science Programs

As a participant in this study, you would be asked to:

• participate in 2 individual interviews and 1 group interview about how
  you as a female MSc or PhD student in Computer Science understand
  your everyday educational experience in Computer Science and the
  larger institutional and social perceptions of ‘women in computing’

• fill out a short questionnaire regarding your educational background

For more information about this study, or to volunteer for this study,
please contact:
Susan Sturman, PhD candidate
Department of Sociology and Equity Studies in Education
Ontario Institute for Studies in Education, University of Toronto
by e-mail: [e-mail address]
or by phone: [phone number]
Student Letter of Consent

(interviews started December, 2005)

To the student participants in this study:

The purpose of the present study is to explore how female graduate Computer Science students understand their everyday educational experiences; in particular, the research will examine the institutional practices and social relations which shape these experiences. The participants will be selected to reflect different stages of progress in both MSc and PhD programs (i.e. year 1-2 in MSc, year 1-4 in doctoral studies).

This study will be accomplished through interviews with a sample of twenty students carried out at two university sites in Ontario. The study will be carried out under the supervision of Professor Megan Boler, Department of Theory and Policy Studies in Education, the Ontario Institute for Studies in Education, University of Toronto. The data is being collected for the purposes of a PhD thesis and perhaps for subsequent research articles.

A pre-interview questionnaire will be provided initially to collect background information. This will be followed by a series of interviews carried out over a two-year time span. During the interview you will be asked questions about where you locate yourself in the Computer Science programs of study you are undertaking, about your personal and career goals in pursuing these studies, your satisfactions and concerns, and how you perceive the institution’s inclusion of female students and faculty in computer science studies. As the interviews progress, I may ask questions for clarification or further understanding, but my part will be mainly to listen to you speak about your views, experiences, and the reasons you believe the things you do. After the interview, I will write brief notes which will be used to assist me in remembering the surroundings of the interview (i.e. the characteristics of the site).

It is the intention that each interview will be audiotaped and later transcribed to paper; you have the choice of declining to have the interview taped. You will be assigned a number which will correspond to your interviews and transcriptions. Your transcript will be sent to you to read in order for you to add any further information or to correct any misinterpretation that could result. The information obtained in the interviews will be kept in strict confidence and stored in a secure location. Although members of the group will be known to one another, all information will be reported in such a way that individual persons, universities, schools, school districts and communities cannot be identified. All raw data (i.e. transcripts, field notes) will be destroyed five years after the completion of the study.

You may at any time refuse to answer a question or withdraw from the interview process. You may request that any information be eliminated from the project, whether in written form or audiotape. At no time will value judgements be placed on your responses nor will any evaluation be made of your effectiveness as a student. Finally, you are free to ask any questions about the research and your involvement with it and may request a summary of the findings of the study.

Thank you in advance for your participation.

Susan Sturman
PhD Candidate, Sociology and Equity Studies in Education
OISE/University of Toronto
Telephone: [phone number]
Email: [e-mail address]

Dr. Megan Boler
Professor, Theory and Policy Studies in Education
OISE/University of Toronto
Telephone: [phone number]
Email: [e-mail address]

By signing below, you are indicating that you are willing to participate in the study, you have received a copy of this letter, and you are fully aware of the conditions above.

Name: ___________________________ University/Program (MSc, PhD): ___________________________
Signed: ___________________________ Date: ___________________________

Please initial if you would like a summary of the findings of the study upon completion: _________
To the Faculty/administrative participants in this study:

The purpose of the present study is to explore how female graduate Computer Science students understand their everyday educational experiences; in particular, the research will examine the institutional practices and social relations which shape these experiences. The participants will be selected to reflect different stages of progress in both MA and PhD programs (i.e., year 1-2 in MA, year 1-4 in doctoral studies). Following the method of Institutional Ethnography chosen for this study, student interviews will direct further inquiry into institutional organization and procedures through interviews with various faculty members and administrators regarding curriculum, program structure and practice. These interviews will be brief and conducted at the subject’s convenience. As well, I will be examining curriculum and policy documents as part of this research, and will request permission for the use of these documents.

This study will be accomplished through interviews with a sample of twenty students and a selection of faculty members and administrators carried out at two university sites in Ontario. The study will be carried out under the supervision of Professor Megan Boler, Department of Theory and Policy Studies in Education, the Ontario Institute for Studies in Education, University of Toronto. The data is being collected for the purposes of a PhD thesis and perhaps for subsequent research articles.

Faculty/administrators will be contacted for brief in-person or telephone interviews in order to engage them in questions about program delivery and planning, and in particular in the implementation of program improvements and reforms based both on internal departmental concerns and on larger university mandates and governmental education reforms. Other questions will emerge from the student interviews, as it is part of the practice of Institutional Ethnography followed in this project to start from the standpoint of the student respondents.

It is the intention that each interview will be audiotaped and later transcribed to paper; subjects have the choice of declining to have the interview taped. As a faculty or administrative subject, you will be assigned a number which will correspond to your interviews and transcriptions. Your transcript will be sent to you to read in order for you to add any further information or to correct any misinterpretation that could result. The information obtained in the interviews will be kept in strict confidence and stored in a secure location. Although members of the student group will be known to one another, all information will be reported in such a way that individual persons, universities, schools, school districts and communities cannot be identified. All raw data (i.e., transcripts, field notes) will be destroyed five years after the completion of the study.

You may at any time refuse to answer a question or withdraw from the interview process. You may request that any information be eliminated from the project, whether in written form or audiotape. At no time will value judgements be placed on your responses nor will any evaluation be made of your effectiveness as a faculty member or administrator. Finally, you are free to ask any questions about the research and your involvement with it and may request a summary of the findings of the study.

Thank you in advance for your participation.

Susan Sturman
PhD Candidate, Sociology and Equity Studies in Education
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Telephone: [phone number]
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Dr. Megan Boler
Professor, Theory and Policy Studies in Education
OISE/University of Toronto
Telephone: [phone number]
Email: [e-mail address]

By signing below, you are indicating that you are willing to participate in the study, you have received a copy of this letter, and you are fully aware of the conditions above.

Name: ___________________________ University/Program (MSc, PhD): ___________________________
Signed: ___________________________ Date: ___________________________

Please initial if you would like a summary of the findings of the study upon completion: ___________________________
Appendix B

Methodological details

Note that in this section, and in the thesis as a whole, I give only a general description of student and faculty participants in order to protect confidentiality.

Number of student interviews:

Pearson: 7 interviewees Master’s: 3*; Doctoral: 4, plus 1 undergraduate and 1 pilot interviewee (in CS workforce)

*One Master’s student ended her participation in the study after the first interview because of time constraints; another did not respond to a call for a second interview.

Mackenzie: 6 interviewees Master’s: 2; Doctoral: 4

TOTAL: 14 students

Number of faculty/administrator/staff interviews

Pearson: 3 faculty, two of whom also served in administrative positions in the university

Mackenzie: 3 faculty; 4 administrators/staff

TOTAL: 10 faculty/administrators/staff

Originally, I proposed 10 students from each site for a total of 20 students (see the Letter of Consent), aiming at groups of 6-10 students each. The number of faculty and administrator interviews was not predetermined but would depend primarily upon student responses. Following the methods of Institutional Ethnography (IE), I looked to the students and other interviewees as people who were informed participants in the everyday practices of the institution. IE practice does not seek to generalize representative samples but rather, it recognizes and incorporates into its ethnographic methods “the actual diversity of perspectives, biographies, positioning” of participants. Thus, “people’s
experience of and in what they do” and the knowledge based in their everyday work are integral resources for analysis (Smith, 2006, p. 125). Participant accounts of their experiences as women students and faculty in graduate Computer Science led me to other faculty and staff whom they mentioned in interview discussions, or to others whose work intersects in a less direct way, but often profoundly, with the working lives of students and faculty.¹⁸⁴

Once the ethics review protocols were in place, I initially approached faculty at both sites in order to get my call for participants out to students, and in order to make other faculty contacts. For my initial contacts, I specifically looked for women faculty who were involved in the promotion of ‘women in computing’ activities in some way, thinking (correctly) that they would be interested in what my research might uncover. These faculty members were also helpful in suggesting how I might get the call for participants out to students; they sent out the call on internal graduate CS mailing lists, displayed posters. One faculty member invited me to present the project to students in a ‘women in computing’ group meeting. They also directed me to other faculty, staff and administrative contacts.

The most successful way to recruit student participants seems to have been through the on-line posting. Some students who had been at the presentation e-mailed other friends who had not, and several students who had no contact with ‘women in computing’ groups of any kind chose to contact me about the project. One student was also recommended to me by a faculty member, but as the student she mentioned was already involved in a number of ‘women in computing’ activities, I waited until the

¹⁸⁴ For example, those in charge of tracking student and faculty research progress through annual progress report forms, and/or those who draft university budgetary projections based on that information.
student contacted me herself so as not to add further pressure. Response was generally fairly swift, as the students and faculty were used to working on-line for a large portion of their days and nights.

The student interviews were held at the two sites over a period from November 17, 2005 to July 31, 2006. The students participated in two individual interviews of 90 minutes each, and a final group interview, also approximately 90 minutes long. The faculty and staff interviews began in October of 2005 and were completed in August, 2006. These were single interviews of an hour’s length, with some follow up e-mails for clarification. I transcribed the interviews and coded them for analysis based upon recurring themes and topics of interest. The transcripts were sent back to students and faculty/staff for their comments and corrections before final analysis and writing began.
Appendix C

*General interview questions*

I gave these questions and discussion topics to participants at the beginning of each interview in order to initiate discussion and to give the interviewees a sense of my specific interests in their experiences as women in Computer Science. I posed the questions very generally in the hope that they would lead to more open-ended discussions determined by the participants’ own interests and concerns. As is the practice of Institutional Ethnography, participants act as co-investigators (see Chapter 2). Participant knowledge about how their work gets done in local institutional settings leads researchers to other people and practices, and to the social relations organizing how that participant lives and works.

*Pre-interview questionnaire*

[the first two are for PhD candidates only]

1. What year of your PhD program are you in, and what is your area of specialization?

2. Where did you do your MSc (or MMath), and what did you major in?

3. Where did you do your BSc (or BMath)?

4. Where did you attend secondary school? Elementary school?

*Student individual interview #1 discussion topics*

1. Your educational history, background

2. Your interest in Computer Science – history

3. Your current projects, interests (general)

4. Your thoughts about your studies
5. Your professors, colleagues

6. Are there any feminists in your program? What are the issues they see? How do you understand ‘feminism’?

7. Your own interests in feminism (if any) – your investigations

8. Further interviews, follow-up; Friends?

**Student individual interview #2 discussion topics**

1. description of your present MA or PhD project (specific)

2. your progress

3. your relations with/support from faculty, relations with other students

4. funding and work issues, scholarships, reporting

5. technical considerations – description of a project (be explicit)

6. what you like about doing computing work – “the pleasure of the interface”

7. your work space, other people in your program, your office – tour if possible

8. work/life balance issues (if any)

**Student group interview questions for discussion**

1. How did you come to decide that you would participate in this project? What did you hope to find?

2. Do you feel a pressure to “perform” in a certain way? How?
   (when applying to graduate school, in your role as a ‘woman in CS,’ as a CS student in general, with peers, with professors, in these interviews)

3. Do you see yourselves as part of a ‘community’ of ‘women in computing’? What has been positive about that? Negative?

4. In retrospect, what have you come to think about over the time you’ve participated in these interviews? Do you think any of your opinions/perceptions have changed since the first interview? Has the process been useful to you in any way? Why/why not?
Faculty interview topics (these varied according to particular faculty involvement with undergraduate program, curriculum, equity work)

- educational background

- professional interests

- your work in the CS department – what is it? how does it happen?

- student make-up of the Department of Computer Science (undergrad, grad)

- your involvement with women’s issues, groups

- your perceptions of student attitudes toward feminism

- curriculum decisions - (your analysis of high school CS curriculum, if applicable)
  - your thoughts about the university CS programs - strengths, weaknesses, gaps
  - gender issues related to these decisions (recruitment, etc.)
  - your professional involvement in curriculum

- larger policy decisions - your relationship to:
  - the department’s programs
  - gender equity work in Computer Science
  - larger university initiatives
  - government policies
  - How do these affect your work? (again, related gender issues)

- final thoughts, comments, other people to talk to
Appendix D

Enrolment and degree completion statistics for Computer Science
Undergraduate and graduate levels, Canada

Table 1. Undergraduate enrolment and Bachelor’s degrees awarded in Computer and Information Sciences (CIS), Canada (Vegso, 2006)

Statistics from both Canada and the United States show a leveling off or decline in the number of undergraduates enrolled in Computer and Information Sciences (see Zweben, 2008; NSF, 2008), though the number of degrees awarded has had slow but steady growth. Vegso (2006) predicts a further shrinkage in the future, and notes: “The biggest decline in bachelor’s degree enrollment has been among women: 30 percent fewer women were enrolled 30 percent fewer women were enrolled in 2003/04 than in 2001/02, compared to an 8 percent drop among men for the same period” (Statistics Canada, in Vegso, 2006). [emphasis added]
Table 2. Women’s Share of CIS – Canada (Vegso, 2006)

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Table 3. Proportion of doctoral students who are women, by field of study (King, 2005)