Engendering ICT: Emerging women ICT professionals in Aotearoa–New Zealand

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Abstract

A significant challenge to Aotearoa/New Zealand’s involvement in the global knowledge economy, especially in recession mode, is enabling the participation of women from a range of socio-economic and cultural backgrounds in Information and Communication Technology (ICT) training and education. Women are significantly less involved as ICT specialists in business and academia, earn less, yet represent diverse households. Multiple pathways to training and retention need to be traced and understood, as well as formulating possible strategies to enable counter-discourses to emerge. A better understanding of these complex interactions between women’s subjectivities, agency and power may benefit women, the wider community and economy through transformative change.

This thesis seeks to make sense of ways that emerging and new ICT professionals took up, resisted and/or subverted masculinised training discourses in two Te Wai Pounamu (South Island) polytechnic institutes of technology (ITPs). Participants volunteered from three of the four diploma and degree programmes of study that led to employment in the ICT industry in 2007. Data was gathered through semi-structured interviews in focus groups. Comprised by their year group, or as recent graduates, six groups met up to three times for about an hour. Groups met face to face or online in chat mode in the Moodle Learning Management System. Individual in depth interviews took place with a significant group member once these sessions concluded. NVIVO 7 was used as a repository to manage the large amount of data, and to identify and code the discourses from transcripts. The referencing format is APA version 5.

The overarching research question, guiding this research project, is:

How do emerging women IT professionals in two ITPs in Te Wai Pounamu (South Island) of Aotearoa-New Zealand experience their education, training and initial workplaces?

Specific research questions include:

In these local institutional settings, what are the demographics of all of the students who have taken up training and education in ICT?
What are the dominant discourses underpinning women students’ attempts to make sense of their undergraduate setting of ICT training and education in a New Zealand polytechnic environment?

How does subjectification as a woman student/new professional in ICT constrain, empower, and/or modify her agency?

How can these educational institutions do better to encourage a greater participation of women students in ICT?

The 2007 mid-year student demographics were used to provide background quantitative data about the characteristics of the intake as a whole, and to contextualize the participants. Discourse analysis was used to interpret how women students’ and graduates made sense of their subjectivities, agency and power as emerging ICT professionals within their training programmes and workplaces. This analysis was informed by a blended technofeminist poststructuralist analytical framework.

The dominant discourse of “Constraint” and the counter discourses of “Resistance and Resilience,” and “Empowerment” were taken up by the participants to make sense of their training and employment. Co-created femininities and masculinities in these settings were analysed as subjects-in-process: mobile, lack, deferred, constituted and performative. The interplay between subjectivity, discourse, agency and power in taking up ICT training and employment was interpreted. Possible strategies to make ICT training more accessible, enjoyable and meaningful to women in neoliberal times were explored as well as further research.
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Chapter 1: Introduction

As a very private person, it is not easy for me to engage in reflexivity. Through this thesis, I am re-engaging once more with issues around the gendered nature of inclusion and exclusion of women: our subjectivities, agency and power.

As a first born child with South Island born parents raised in the state house area of Naenae in the 1950s and 1960s, I was privileged. Beeby had reformed the education system, health services were adequate, and cheap housing loans and full employment were the norm for returned Pakeha servicemen’s families. My secondary schooling in a small state girls’ high school at Waiwhetu Girls High School had all the hallmarks of a private education that some parents now seek: small classes, independent minded educators, and modern well equipped facilities. My first tertiary education experience in the late 1960s and early 1970s had all the overcrowding and underfunding which is now endemic in the state tertiary education system.

My passion has always been observing relational power: in family dynamics, churches, political and therapeutic youth movements, educational workplaces, classrooms, political parties, Maori activism, music education and performance, early childhood provision, and academia. I have noticed a pattern in myself. I have engaged in these dynamics as a child, young person, teacher, union official, supporter, parent, or student. There is at first a period of euphoria, commitment and hope, followed by a growing awareness of the limitations and constraints, which eventually may lead to disillusionment and disengagement. Of late, I have renewed my trust and faith in family and friends as an ongoing source of creative energy in spite of what may occur. I have become better at asking for help, rather than giving it, and I am improving at being able to listen, rather than tell.

I have never doubted that women as a multiple category, performativity, deferred subjectivity, constituted subject, image, written or visual text, are infinitely capable of extraordinarily amazing things across the whole spectrum of human endeavour. My Pakeha mother and father showed me this in many ways through their constant encouragement and challenges. I have tried to acknowledge and raise awareness of gender equity in my teaching as a feminist, long before I had acquired poststructuralist analysis, or understood there was such an approach. I am also aware that gender equity is a discourse which has existed for a relatively short period of time in Aotearoa-New Zealand. Men as a category, performativity,
constituted subject and so on have acknowledged this phenomenon only relatively recently in historic terms through discourse: in the first feminist waves of the 1890s, and then the second waves from the 1970s onwards. But partnerships in marriage, business, churches, and communities were often possible to negotiate in colonial and post-colonial times, and women were not always subordinate in power relations in the domestic sphere, though marginalised in others. Leadership and partnership among Maori women in traditional and modern technologies, and Te Ao Maori have always existed.

So, while this opening may seem tainted with essentialism, it is also my historically constructed personal genealogy from last century into this one. With social positioning, dress and style that was frilly, or pretty or feminine and subordinate, discourses painted me indubitably female. But dissonantly, I resisted taking up these normative practices and challenged their effects. I joined in, challenged policies, negotiated changes, and then left many institutions in the 1980s and 1990s: political parties, secondary schools, government departments, a trade union, child care centres, and community and women’s groups, to name a few.

At the centre of my disengagement was often, but not always, the personal experience of having endured hostility. I became disillusioned with struggling with an ongoing imbalance of power in successive environments that did not fundamentally acknowledge inclusion on the basis of gender (or other parts of that mix, such as lower socio-economic status, socio-cultural identity, age, sexual preference and so on). I have seen some patterns of partial middle class gendered inclusion in business, medicine and law, for example, evolve.

But as socio-economic and political systems changed radically at the cusp of this century, I saw increasingly uneven gendered effects being taken up and engaged in through normative and regulative discourses and their effects in policies, practices and institutions. After some academic false starts, poststructuralist feminism has become my theoretical tool with which to explore neoliberal effects in education as a new researcher in academia.

The passion, then, has not subsided in me. Rather, I have taken on a more detached analytical gaze. I am now making sense of the gendered effects in the tertiary education environment in which I now teach ethics, information gathering and quality assurance; in the field of information and communications technology (ICT). While this may seem an unlikely position
for a former social studies and English-drama teacher, it is unsurprising. Once I left my position as a field officer in a teacher union in 2000, I retrained as an information designer in technical communication. I began teaching the skills of business written and spoken communication to business computing students and interpersonal skills as an untenured lecturer in a small school within a large city polytechnic institute of technology (ITP).

It became clear to me that few women were entering either the degree or diploma ICT qualifications. Indeed, numbers were declining. After working as a research assistant on some gender inclusion initiatives in 2003, I decided to retrain as a qualitative researcher to research women, gender and ICT. It took until 2006 to be accepted as research student. I have felt the same cycles of euphoria and disillusionment in my academic research work and dis/engagement with academia.

What sustains me is the way that other new researchers and experienced ICT practitioners and academics across various disciplines are still troubling away at this persistent problem of the dearth of women in ICT as professionals. Women students themselves are still puzzled why so few of them take up this challenging, creative, and ever changing field. While it is not the only gendered occupation (early childhood education, engineering, nursing, and trades such as electro-technology come to mind as stereotypically “people or technology” oriented occupations) it is the field where I have gained access and support from my employer to analyse.

I am finding my poststructuralist voice as well as finding my research place. I recognise this is just another beginning, but it is purposeful and engaging. I recognise too, that there is some distance to go, before I can independently and collaboratively engage. But that is another thesis, and another project. My research project, now written as a thesis, takes the following form.

The overarching research question, guiding this research project, is:

How do emerging women IT professionals in two ITPs in Te Wai Pounamu (South Island) of Aotearoa-New Zealand experience their education, training and initial workplaces?
The specific research questions for the Engendering ICT project included:

In these local institutional settings, what are the demographics of all of the students who have taken up training and education in ICT?

What are the dominant discourses underpinning women students’ attempts to make sense of their undergraduate setting of ICT training and education in a New Zealand polytechnic environment?

How does subjectification as a woman student/new professional in ICT constrain, empower, and/or modify her agency?

How can educational institutions do better to encourage a greater participation of women students in ICT?

So, in this thesis, I have begun by locating myself personally and politically. My second chapter describes the strands of the poststructuralist and technofeminist theoretical framework I have constructed as my analytical tool. My third chapter maps the education and research context in which this project is located. It traces the geneology of political discourses that operate in Aotearoa-New Zealand technical education generally, and the impact of recent reforms on that provision, including the current recession, on ICT training specifically. The fourth chapter reviews strategies from recent literature in the field of women, gender and ICT. I selected the Anglo-phone nation states of United States, United Kingdom, Australia as well as New Zealand, as a socio-cultural cluster with similar issues. The fifth chapter outlines my mixed method methodology, its rationale, ethical issues, and processes.

Then, in the main body of this thesis, I describe the Engendering ICT Project, with which I have worked as a part time post graduate Masters student since 2007. My research findings are reported in four chapters. The sixth chapter portrays the demographics of the mid-year intake of students who were training as emerging ICT professionals in two Te Wai Pounaumu Polytechnics, Institutes of Technology (ITPs). Then my overarching theory of interacting
discourses and counter discourses of Constraint, Resistance and Resilience and the lesser one of Empowerment and their discursive and material effects are described in the next two chapters.

The ninth chapter interprets how emerging women ICT professionals layer their multiple subjectivities within co-located femininities and masculinities. I conclude by reflecting on the ways in which ICT may continue to be more diversely engendered, and on the strengths and limitations of the project.
Chapter 2: Theoretical framework: blending poststructural Foucauldian, feminist and technofeminist theory

Introduction

This chapter describes my theoretical framework. I used conceptual tools as ways of thinking about women gender and ICT from blended sources. These include poststructuralist Foucauldian and feminist perspectives including technoFeminism, which converge into my analytical lens.

In doing so, I revisited Michel Foucault, Jean Carabine, Bronwyn Davies and Judith Butler, and drew upon the work of Clare O’Farrell and Moya Lloyd. A further troubling influence was TechnoFeminism, as theorized by Donna Haraway and Judy Wacman, a constructivist lens which I used as a starting point and almost abandoned due to its rhetorical rather than empirical nature. Drawing on Moya Lloyd I found the most effective tool I used is the poststructuralist feminist “subject-in-process” concept for examining subjectivity agency and power embedded in the co-construction of femininities and masculinities in the field of women, gender and ICT. This is reported in the findings.

In this chapter, I provide a general introduction to poststructuralism, the influence of some feminist poststructuralists and the place of TechnoFeminism, its strengths and limitations. The poststructuralist concepts which I selected to inform my analysis include; power, discourse, discursive practice, subject/identity, positioning, subjectification, agency, and reflexivity. I then outline the strengths and limitations of these concepts for this project. Finally, I reflect on the affordances and restrictions of this blended framework.

Poststructuralism

Poststructuralism emerged as a theoretical approach in the late 1960s and early 1970s. It originated in French intellectual thought, then spreading more widely in English speaking academia (Crotty, 1998). Simply expressed, it has its genesis in a critique of structuralism,
particularly claims of objectivity, comprehensiveness, and fixed binary oppositions. It emphasizes plurality, the deferral of meaning, and rejects authorial authority. I am using Foucauldian terms as the foundation for explaining this approach.

I have drawn on Clare O’Farrell’s\(^1\) translations and explanations of Foucault to simplify this section. I have also used direct quotes to illuminate this section. These concepts overlap and inform each other and are separated for ease of explanation. Foucault himself regarded his works as interwoven, overlapping experimental experiences that deliberately transformed his thought. His approach is not theoretical, in the sense of a deductive or a systematic analysis applied in a uniform way. It has been taken up by poststructuralist feminists since the 1990s, to better theorise subjectivity, agency and power, in the light of the diverse multiplicity and proliferation of gendered identities in the 21\(^{st}\) century. This is discussed further in the next section.

**Feminist Poststructuralist Influences**

In this section I summarise some of the influences of feminism on poststructuralism. It is hard to pin down as feminist theorists have different ways of categorising writers. Moya Lloyds (2007) suggests it is generally seen as a negative or critical philosophical position. Anti-essentialist, and anti-foundational, poststructuralist feminism is suspicious of grand narratives, opposed to history being conceived as linear and progressive, and distrustful of metaphysics.

Bronwyn Davies (2000) explains it as wary of a stable unified subject, and doubtful of the possibility of certainty of meaning. It is an interrogative mode of enquiry. It operates by challenging and contesting received norms and ideas, rather than attempting to resolve problems or prescribe solutions. Poststructuralist feminists tend to theorise by: rejecting ideas of general laws and universal systems, and emphasising instability and indeterminacy; never fixing meaning; regarding language is a temporal process where meaning is perpetually deferred (Lloyd, 2005). Further, the concept of the subject is not accepted as a unified and self contained subject. Moments come into being as interpolated and compared with the

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\(^1\) Brisbane based academic Claire O’Farrell met and interviewed Foucault as a student in Paris as part of her French honours studies research prior to his death. This impacted positively on her commitment to make his ideas accessible and useable in academia.
variable and historical ways that subjects/positions are produced by discourse and power (Lloyd, 2005).

Some feminists have argued against feminist poststructuralism, on the grounds that it is not possible to engage in empowerment of women in any sphere without a stable subject (Di Stephano, 1990; Bannerji, 1995; Jackson, 1999; Oakley, 1998; cited in McLaughlin, 2003). However, there has been extensive debate in second wave feminism about difference and socio-cultural diversity among a wide range of feminist theorists, who have contributed to the debate (Haraway, 1991; Flax, 1992, cited in Lloyd, 2005; Bhabha, 2000; Braidotti, 1994; Trinh, 1998, cited in McLaughlin, 2003; Irigaray, 1985, Cixious, 1976, and Kristeva, 1980, cited in Fraser & Bartky, 1992; Davies, 2000; and Butler, 2004). Finally, Lloyd argues that embracing the idea of “subject-in-process” breathes new political life into feminism. It opens up spaces for political contestation and allows for the flourishing of new forms of politics to sit alongside the more conventional ones. Feminism does not need the stable unitary subject to guarantee its politics. It needs a deeper understanding of the political nature of subjectivity and of the dynamism of politics. This will be explored further in my research findings.

**TechnoFeminism**

From the general to the particular, it is useful to have a specific lens through which to approach the field of women, gender and ICT. Critical work has already done by Wajcman (2004) and in Social Studies of Technology through feminist incorporations of Social Construction of Technology (SCOT) and Actor Network Theory (ANT) (Cockburn, 1983; Ely and Myerson, 2000; McLaughlin, 1999; cited in McLaughlin, 2003). Wajcman (2004) has constructed the concept of technoFeminism that fuses “the insights of (Haraway’s) cyborg feminism with those of a constructivist theory of technology,” p.103. In other words she has taken up the idealism of cyberfeminism and fused it with a social constructivist analytical lens that challenges us to explore how women’s agency is facilitated within our networked knowledge society. While we experience technology virtually, we are also

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2 SCOT is a sub-field of Sociology which uses a social constructivist approach that views the success or failure of an artefact as an end result of a social process. Meaning, identity and purpose of an artifact are the result of the activities of social groups, with no intrinsic property in the thing itself. ANT treats technology and society symmetrically, and sees both technology and human actors as forming a set of practices, shared languages, and common meanings which the technical components of the network help keep together. Women are often absent from these analyses, and feminists in this field endeavour to critique the patterns of exclusion.
influenced in our lived experience of the material world, as society, technology and gender are mutually shaping and interrelated (Wajcman, 2004).

Wajcman (2004) positions technology as inherently patriarchal and deterministic. Feminist traditions, liberal, radical and socialist, are plagued with a fundamental pessimism about the “transformative potential of technological change” (Wajcman, p.336). It is acknowledged that poststructuralist accounts of gender see interests formed through social interaction in particular contexts, of which women and technology provide a performative function, similar to ANT, but inclusive of gender.

Wajcman (2004) expresses concern about the impact of chronic under-representation. She also recognises that the impact is greater on poorer women in developing nation states. In this new era of technological change, she argues that women need to be in the jobs that “create and design the technical systems in the new economy,” p. 31, to influence their creation and use. For technology enables women to now have more opportunities to engage in a variety of forms of education, work, and social action.

Fusion with poststructuralist feminism places the focus on the ways that women multiply produce their subjectivities, and better manages the essentialist and binary underpinning of its derivation. I have integrated ICT examples within the conceptualisation of poststructuralism in the following section to demonstrate the usefulness of this approach as a matter of emphasis. This helps to overcome techno- feminism’s theoretical shortcomings which do not adequately conceptualise positioning, subjectivities, and the discourses that give rise to them in the specific field of women, gender and ICT.

**Poststructural concepts**

The first analytical tool I have selected is the overarching concept of *Power* which is applied within an historical context. As O’Farrell (2005) explains, Foucault argues that history is the best tool to examine and dismantle existing orders, as all events occur in certain time frames. As such, truth is an historical category, with scientific method as one of the methods that
exist, dominant in current times. For Foucault, knowledge is always shaped by political, social and historical factors of power.

For example, in the field of women, gender and ICT, becoming a woman ICT professional in a male domain is problematic yet normalized in discourse. Thus, Constraint is interwoven into the discourses so tightly that being a woman as a numerical minority is accepted as a regime of truth and taken for granted (O’Farrell, 2005). This constraint, then, is an ethical issue, one of social justice.

Applying Foucauldian poststructural analysis of power to women, gender and ICT takes two main forms. *Archaeology* refers to examining the discursive traces left by the past to make sense of the present. These discursive strands are also layered within the substrata of knowledge and culture out of which participants’ statements and text produce and are produced as similarities and differences (O’Farrell, 2005). For example, the second chapter of this thesis outlines the archaeology of technical education in Aotearoa-New Zealand. It relates technical education to the policies and practices of the education system as it evolved.

By contrast, *Genealogy* addresses the ways that truth and falsehood can be distinguished through the mechanisms of power that are operating. These discourses have evolved over time as historical variations. Post structuralist feminists have extended this as “ways of speaking, writing, and talking about, as well as the practices around, an issue” (Carabine, 2001, p. 274-275). Discourses signify the extent these are acceptable. They arise out of and shape the social context and relations from which power and knowledge are constituted (Carabine, 2001).

For example, one notion of ICT as being “gender free” applies as a discursive practice. Within this perspective, student learning needs do not have to be considered in relation to gender. ICT as a field can be seen as neither advantaging nor disadvantaging any learner as it is constructed as socially and culturally neutral. The effect of such assumptions advantages most male students and disadvantages most female ones, and maintains ICT as a traditionally male domain. Such positioning arises from power and how knowledge is constructed, and is a central premise in Foucauldian analysis.
Foucault, then, theorizes power as multidimensional. His classic view of power is repressive. Kinds of repression are located in the relations of power which are linked to the appearance of knowledge (Foucault, 1973, cited in Defert, Ewald, & Lagrange, 1985). He does not see power as owned by the state, but rather as but one configuration of power relations. Thus power is productive, “this reversal of values and truths…has been important to the extent that it does not stop with simple cheers…but it permits new strategies” (Foucault, 1977, p. 222, cited in O’Farrell, 2005, p.97). In other words, power and resistance co-exist and can be strategically mobilized for change, such as for the inclusion of gender diversity in ICT training and education.

Power, then, becomes, “a mode of action upon the actions of others” (Foucault, 1982, p. 341). Power is always there, but while we are never outside it, it does not mean we are “trapped and condemned and defeated no matter what” (Foucault, 1977, p.142, in (Gordon, 1980)). We can be agentic.

Thus, power co-exists with the social body, and power relations are interwoven with other relations in multiple forms. Foucault argues that power relations “serve,” because they are capable of being used in strategies which are resistant, “as (strategies) are formed right at the point where power relations are exercised” (Foucault, 1977, p.143, cited in Gordon, 1980). In other words, power is embedded in our relations with each other, and we are most effective in resisting its repression or prohibitions at the point it is being exercised. Thus, women students are at their most effective when resisting repressive power in classroom settings with their peers and lecturers.

Foucault urges us to use what is there, and not assume a binary of the “dominated” and the “dominators.” Rather, we have “a multiform of relations…partially susceptible of integration into all strategies… which critique a political practice (so) that it may give rise to reform” (Foucault, 1977, p.143, cited in Gordon, 1980). These are the tools for us to use, as we see fit, for our purposes of engendering equity, diversity, and social justice in the field of women, gender and ICT.

Another highly relevant concept is Discourse. Discourse is used variously, but is applied to the participants’ text as a “way of speaking” (Foucault, 1972; p. 107, cited in O’Farrell,
2005). The experience of the participants is an interrelationship between what is subjective, normal, and known within a time frame of a culture. Their “gaze” refers to their co-construction as the object and the knower, researcher and participants (O’Farrell, 2005).

Discourse may comprise “an individualised group of statements” (Foucault, 1972; cited in Carabine, 2001, p. 266) which produce different and often conflicting means of speaking about and constructing gender and information technology. Discourses produce power outcomes and effects. Post structuralist feminists have extended this by conceptualising discourse as more than traces. They draw on, and are mediated by and interact with other discourses, such as class, and ethnicity for example. Further, counter discourses, through contesting and challenging other discourses, produce new ways that gender and ICT is constituted, and material effects (Carabine, 2001, p.269).

Thus, discourses have evolved over time as historical variations that can be traced as “ways of speaking, writing, and talking about, as well as the practices around, an issue.”(Carabine, 2001, p.274-275). They expose the processes by which the discourses are produced, and establish the ways that they are practised, operationalised, and supported by our educational institutions, lecturers and administrators, educational legislation and policies, our society and economy. Discourse is further theorised within the following relevant sections.

Another relevant conceptual tool is Discursive Practice. Foucault applies it as a specific set of historical and cultural rules by which knowledge is organized and produced in different forms (O’Farrell, 2005). Each set deals with a thought, occasion or matter it is exercised upon. Thus, to Foucault, these phenomena are constructed from the set of occurrences in physical, social and cultural contexts. Discursive practices establish the normative grounds for concepts and theories to be explored and developed, within a subject of knowledge with a legitimate perspective. Davies (2000) extends this concept to convey the ways that we “actively produce (our) social and psychological realities” p.88. These can occur at different levels within the social body, and may compete or conflict with each other in incompatible ways. Knowing is through more than one discourse.

For example, ICT training is delivered within policies and practices within ITPs, and re/reproduced in classroom practices, course outlines, and assessments. The effect of these practices is to constitute emerging ICT professionals who may have conflicting ways of
understanding these realities as they are “progressively and dynamically achieved” as a “multifaceted public process” (Davies, 2000, p. 89). This is taken up further below.

Another key concept is Subject. While Foucault identified with the humanist concept of how we make sense of the world, we are not fixed or unchangeable as subjects. We are open to an infinite and endless multiplicity of subjectivity (O’Farrell, 2005). Thus, Foucault used subject in two ways. While others may control us, through our self-knowledge and awareness we form an attachment to our identity. Research participants interact with each other as subjects, as self aware entities who are able to make choices. They engage in reflection, as their statements are spoken into being. Foucault describes subjects as capable of engaging in reflective and voluntary practices based on the rules of conduct, discursive practice, as well as seeking to transform themselves. In other words, he sees existence of a subject as relying upon interacting with others, culture and history for self-formation, with change being facilitated through discourse.

As a contrast, Davies (2000) extends her conceptualization of subjects as discursive practices as being located within a repertoire of “subject positions.” Thus, a person has a worldview which takes up the real from that particular vantage point, and articulates it with relevant “images, storylines, metaphors and concepts” (Davies, 2000, p. 89) that arise out of those discursive practices. Choice is possible among the “many and contradictory” locations available, and which make us up through our social interactions. At the same time we have a continuous personal identity as well as discontinuous personal diversity; with selfhood contained within in that multiplicity of selves.

Davies (2000) posits this process as being developed through our own learning about which categories include and exclude; our taking part in discursive practices which allocate meaning and subject positions; positioning ourselves within these; and recognising how we located as a member of that category, with a developing sense of belonging and emotional commitment. Thus we are both unique yet historically constituted, within contradictory categories that make up how we are gendered.

Thus, another key concept is Subjectification. Davies (2000) writes that subjectification conceptualises the difficult and important dual aspect of being “seamlessly meshed in the social fabric” (p. 14) as well as knowing and signalling ourselves as specific beings. We are
constituted through discourse. Thus, working with ICT women students and graduates is an opportunity to enable them to see these discourses and their constitutive forces. It may interrupt the binary ways of being gendered within the positionings of male-female dualism in the male domain of ICT.

In contrast, Davies (2000) uses the concept of Positioning to explain the assigning of gender “discursively, interactively, and structurally” (p.70) by others and by we ourselves. This more fluid and multiple concept of identity indicates the complex often contradictory and difficult ways that participants are tied into discursively constituted positions. Examining the discursive patterns of power may show how some participants are rendered silent and invisible, and enable analysis of ways this can be re-envisioned. For the powerfulness of information technology itself does not necessarily also position women as powerful within that domain. My analysis focuses on this, recognising that some voices are absent, and others may convey their positioning as powerlessness.

Further, the ways these positions are taken up is seen as inseparable from our subjectivity, and are open to shifts within in the discourse itself. As Davies (2000) explains, this may occur within the ways that participants talk which invoke positioning based on their underlying assumptions and how the discourse is heard by others. Positions are cumulative rather than linear, and may include storylines that are shared, blocked, reworked, or subject to shifts of power. Interaction may take the form of having complementary, divergent, resistant, or compliant speech acts with different feelings underpinning them, such as humour, irony, or anger, dependant on the rationale of the speaker. Meaning remains open to negotiation.

Further, Lloyd (2005) developed the concept of the “subject-in-process” to capture the idea that subjectivity is constituted inessential and so it is perpetually open to transformation. Politics is radically reconfigured by this concept with far ranging implications for feminism. “Subject-in-process” problematises the feminist assumption that it requires a stable subject to justify and ground its politics. It challenges the naturalisation of the relation between the subject and politics, which is already political. For example, within the male domain of ICT, spaces are opening up, but often are reconstituted as ‘female spaces’ within the dominant regime, such as web development as opposed to software engineering (programing).
Thus, subjectivity is rearticulated as a subject-in-process in multiple ways. These include “the multiple subject; the subject of lack; the deferred subject; the constituted subject; and the performative subject” (Lloyd, 2005, p. 15). These formulations can be taken up in ways that overlap and inform each other. Women participants in this research have the potential to draw on their gender as being permanently a subject-in-process through which they may expose and be exposed to how their agency is facilitated according to gender. Thus, this opens up the way to understand their agency in terms of a political dynamic that is “messy, conflictual and dissonant” (Lloyd, 2005, p.15). This is preferable because it keeps subjectivity open and agency as being a constant that may be drawn upon.

Lloyd (2005) also considers the politics of identity. Essentialism, an issue which has polarised feminists, is reformulated by rejecting the opposition or logic that appears to underpin it. It is recast as an agonistic relation which is historically inflected (bell hooks, 1982, 1989, 1990, 1992, 1994, 1995; cited in Lloyd, 2005). Re-examining the debate around “strategic essentialism” (Spivak, 1988; cited in Lloyd, 2005) essentialism and anti-essentialism are shown to be co-implicated. In other words, those who see woman as an essential category see a danger politically in having gender shifted from centre stage by competing characteristics held by men. However, those who see gender as a construct draw on essentialist discourses as a way of deconstructing gender by readings these constructs against the grain.

Agency, in poststructuralism, is another important concept. In humanist discourse, ‘identity’ is rational, and ‘choices’ are coherent, based on internalised individualised social norms and values. In poststructural theory, however, we are subjectively constituted and positioned through discourse. As we are integrated into these discourses, the dilemma is how we can become agentic and provide for possibilities of reworking power and destabilising the ways power exists (Davies, 2000).

Poststructuralism, then, as a struggle for empowerment, continues to be immediately relevant to teaching and learning, within the field of women gender and ICT. As Butler (2004) notes, these analyses can provide preconditions for a politically engaged critique, and possible grounds for social and political movement.
Lloyd (2005) contends that Butler's reconfigured account of agency, (centered on notions such as catachresis, the use of extended and blurred hyperbolic metaphor) can satisfy feminist demands. The taking up of potentially multiple identities in their discourses may show how agency is facilitated by the participants within these frameworks of meaning making. Knowing when it is probably politically expedient or opportune to act requires a critique of the situation at hand. Lloyd considers critique as a mode of problematisation. Students may use critique as a means of resistance and empowerment in this study.

Lloyd (2005) concludes that politics is a matter of operating and acting within political contexts by taking up opportunities as they rise. The students in this study can anticipate issues that may be taken up as strategies for change to recruit and retain women as IT professionals, regardless of whether they have the agency to enact them.

Analyses require openness, making transformations visible and possible, by way of instability and uncertainty. By paying faithful attention to the discursive detail from which we are made, we can open up multiple movements with multidirectional forces for transformation of the teaching and learning environment. In turn, this can transform practices, policies and institutions that are discursively made about women, gender and ICT within academia, business and the community.

Finally, Davies (2000) suggests we use reflexivity to apply poststructural thinking to our lives, to see what ways of being are possible. We can analyse how we are positioned in nonagentic ways in these discourses, within women, gender and ICT, and develop new ways of speaking and writing that go beyond these constraints (Davies, 2000).

The strengths of this blended framework lie in the overlapping ways that the concepts inform and sustain each other. Power provides the historical context to trace the derivation of discourses and how they are taken up within the discursive practices that comprise and are comprised of ourselves as subjects, subjectivities, subject positions, subjects-in-process, and as multiplicities, within the essentialist discontinuities of gendering. The assumptions that underpin these concepts are that we are capable of being agentic, reflexive, and transform our lives through the way we are taken up and take up the discursive practices and resist our positioning through counter discourses. The diversity of cultural practice in the neoliberal era, outlined in the next chapter, lends itself to a poststructuralist analysis to attempt to capture the
diversity and yet subjectivity in the field of women, gender and ICT, and the constraints on agency.

The limitations are that these concepts merge and may seem indistinct. They are difficult to explain in clear and simple terms without reverting to humanist and essentialist notions from which they have sought to forge new meanings. Often terms are convoluted, and trace similar notions through different trajectories, but follow similar processes of explanation that are iterative. But as Butler (2004) suggests, while some women transcend and push the boundaries of gendered positions in a new domain, some of us may see advantages in remaining less than intelligible. A framework in itself may not enable the discerning of why some women, however they are positioned, may choose to exclude themselves. In conclusion, not everything is transparent, or able to be known.

Summary

This blended feminist poststructuralist framework brings this field into focus and revisualises new understandings of truth and power in women, gender and ICT: For when I say that I am studying the problematisation of madness or crime or sexuality, it is not a way of denying the reality of such phenomena… I have tried to show that it was precisely some real [ity] existent in the world…not an effect or consequences of one historical context or situation, but is an answer given by definite individuals… you can only understand why this kind of answer appears as a reply to some concrete and specific aspect of the world.

(Foucault, 1983, p. 171-3)

In other words, women, gender and ICT as a localised phenomenon is being problematised specifically in the ITP sector in the South Island of Aotearoa-New Zealand. This local study has relevance to this education sector in this time and place. It places the discourses of women, gender and ICT and their discursive effects in this setting as central to the production of this knowledge about emerging and new women ICT professionals, their subjectivities, agency and power. How social justice can be operationalised through workforce diversity in ICT is but one feminist strand within this project’s discourses. My approach takes the historical view of analysing discursive traces as knowledge is always shaped by political, social and historical factors of power. With power posited as productive, not only repressive
or coercive, within the relations of power lie the strategic means of change at the point of resistance.

Thus, other ways of being are possible. Poststructuralist analysis seeks to understand how reality is constructed through discourse and discursive practices which in turn produce and are produced by subjectivities, positioning, and enable women, gender and ICT to be taken up, including as subjects-in-process. Subjectivity is thus recast in multiple ways that may reflect trajectories of agency as dis/continuities with essentialism. Discourses as ways of speaking co-construct reality which may conflict, cohere, and produce effects and generate counter discourses and discursive practices around how knowledge is organized. Thus we are continually open to multiple subjectivities, to exercise choice reflexively in subject positions and as subjects in process. TechnoFeminism focuses on the ways this may be taken up through ICT.

In conclusion, my mixed method theoretical framework combines Poststructuralist Foucauldian, feminist, and TechnoFeminist concepts into a new and unique theoretical lens to analyze the literature and findings on women, gender and ICT. It is expected that this brings a fresh set of insights that focus on the ways that technical education has formed and shifted in the New Zealand education system; the impact of neoliberal philosophy on the positioning of ITPs and the ways that learning takes place, and finally, on the discourses that women students and graduates mobilize about their subjectivities, agency and power, with its effects on their recruitment and retention in ICT in ITPs in the South Island of Aotearoa-New Zealand.
Chapter 3: Discourses in Aotearoa-New Zealand Technical Education Policy

Introduction

Aotearoa/ New Zealand's Education System has evolved over the last 170 years from a rich, complex interweaving of indigenous, colonial, postcolonial, feminist and global sociocultural influences. These shape and constrain the system in terms of purpose through ethical standpoints embedded in educational policy and legislation. In Foucauldian vein, this chapter traces the ways that we, from various political persuasions, have used the education system to further our socio-cultural and economic policies. Using our education system as a predominant way to discursively constitute us as citizens of Aotearoa/New Zealand is deeply bound within our cultural identities (Apple, 1986; Torres, 1989; cited in Olssen, Codd, & O'Neill, 2004).

Over the last 25 years, Aotearoa/New Zealand significantly shifted in its economy and culture. The impact of neoliberal philosophy on the ways we think about and what we value in technical education, and ICT in particular, as learners, teachers, and citizens is subtle and all pervasive. Analysing ways that current education legislation and policy is materially constituted through discourse is important. It illuminates how polytechnics, institutes of technology (ITPs) shape and are shaped by our agency as teachers and learners within them. It exposes ways we are constrained and yet could be empowered (Olssen, Codd, & O'Neill, 2004)

Each dominant discourse that has shaped our education system is still present within. These are traces, fragments, and footprints of those who have gone before, and are still with us. Former discourses provide guidance and assurance that we may yet reassert and rediscover fairness and equity. The primacy of tino rangatiratanga and egalitarianism can be transformed from myth into communitarian social justice, a way of living which many of us within Aotearoa-New Zealand still hold dear.
The purpose of this chapter is to outline the indigenous, colonial, postcolonial, feminist and global sociocultural influences on technical education and their ethical standpoints and how women gender and ICT research is positioned in this milieu.

**Beginnings: Kai Tahu, Tangata Whenua of Te Wai Pounamu**

As a Pakeha feminist, I acknowledge the primacy of Kai Tahu. As tangata whenua, their occupational and hereditary rights permeate throughout Te Wai Pounamu. Connection with the whenua (land) is their source of well being, mana and prestige, and wairua (spirit) (Evison, 1993). In contrast for my own forebears, who were part of colonial settlement in the late 19th century, land was owned, and used for commercial activity through, for example, farming in Marlborough and Nelson, and, in common, as a place to raise families.

Educational practices in Kai Tahu culture focused on sustaining knowledge for use by future generations, to ensure the intellectual, spiritual, physical, and social wellbeing of Maori collectively and as individuals (Hemara, 2000). Informal technical learning was passed on in the doing of daily tasks. Significant cultural and historical knowledge, including the use of technologies, was traditionally transmitted through family interactions: “whanau and community engagements and events and specialised wananga where children were selected to attend and be trained in the relevant knowledge of that particular wananga” (O’Regan, personal communication, June 2007).

Thus knowledge was complementary and balanced within the respective roles to sustain the community (Evison, 1993; Hemara, 2000). Learning was assessed as an accomplishment by the community’s receptiveness and strength of its response. Technologies advanced the mana and prestige of the Kai Tahu in traditional life and were also taken up rapidly and successfully during initial commercial contact between Kai Tahu and Europeans at the end of the 18th Century (Hemara, 2000).
Colonialism and post colonial themes in Kai Tahu education

However, this initial positive phase was short-lived. The impact of colonialism on Kai Tahu significantly disrupted their iwi, and caused far greater consequential loss of land, mana, and language than for any other iwi (Evison, 1993; O'Regan, 2001). Instead of positive Maori-Pakeha culture contact, commerce and intermarriage, Kai Tahu faced invasion and land appropriation from Central tribes, aided by opportunist Pakeha settlement, epidemics and token recognition by the Crown as a party to the Treaty of Waitangi. A bitter, protracted, persistent struggle for recognition then ensued for the next 150 years, with substantial loss of land. My forebears benefited from other highly disputed land alienation outside of this domain.

Successive governments failed to uphold the terms of the Treaty of Waitangi and fully recognise and compensate land rights in Te Wai Pounamu (Evison, 2006). Yet, as the quasi-Foucauldian normative principles of liberty and justice suggest, “all power relations must be characterised by openness…requiring different things at different times and places” (Olssen, Codd & O’Neill, 2004, p 237). Deliberation requires both redistribution of economic resources and recognition of distinct identities and differences. Thus, the Kai Tahu Treaty claim was finally signed in 1998, with an apology from the Crown, and a settlement of $170 million, including land.

Kai Tahu Maori Corporation has carefully managed these resources to benefit those identified as their iwi, including in education (Consedine & Consedine, 2005). Education is a paramount goal for Kai Tahu, in the 21st Century, including use of ICT for the promotion of language, the arts and learning through telecommunications, multi media and a web presence for the iwi (O'Regan, personal communication, February 2009). Tertiary training in ICT is thereby an important means to continue the traditions of education to promote the intellectual, spiritual, physical, and social well being of Kai Tahu.

The principles of the Treaty of Waitangi, partnership, protection, and participation are now also enshrined in the Education Act 1989, (Section 181b). It is the duty of the councils of all state funded tertiary institutions, including ITPs, to acknowledge them in the performance of their functions and the exercise of their powers (Bishop & Graham, 1997, cited in Wilson,
These principles should guide any educational research initiative that is conducted in this region. They influenced my research design to attempt to include Maori women as research participants and potential learners and users of ICT. However, not all women who could claim Maori descent do identify, or seek access to these benefits. In other words, some Kai Tahu descendants do not have equity and do not directly benefit, and undertake education in Pakeha settings.

How best to approach training in ICT in ITPs for Maori women students is positioned beyond the scope of this research as not one female student participant claimed Kai Tahu cultural heritage or identification on the record. As such, bi-cultural disruption continues. Strands of identity are frayed, and some paths lie untaken. For some of these women, ICT education in ITPs is taken up in the Pakeha domain with little acknowledgement of post colonial effects. How to address this dilemma is problematic and may constitute a continuation of their historic disadvantage. It requires active consultation with Kai Tahu within the principles of the Tiriti o Waitangi.

**Gender Differentiated Technical Training**

Technical education in Aotearoa-New Zealand, which has developed in the Pakeha education domain over the last 170 years, is strongly influenced by the positioning of students by occupation, gender, and implicitly, their social class. In Day’s classic feminist overview of technical education, it is inherently conservative, because it reflects and perpetuates our workforce which is “strongly differentiated by gender” (Day, 1992, p. 68). Women have tended to participate in technical education to gain employment where “opportunities for women in the workforce lie” (Day, 1992, p.68).

Further, ITPs themselves perpetuate this by providing courses taken up by women in the areas typical of women's work as such courses have an assured market. For example, Day (1992) cites commercial courses to prepare typists and office assistants as prevalent from the turn of last century and which still exist for computer based office applications today. Little has been done at policy level to promote non-traditional courses to women or men.
Within the broad aims of the education system and the interrelationship between the free, compulsory, primary and secondary sectors, and the user pays tertiary education in ITPs, government policy fundamentally shapes training conservatively to prepare current and future employees for gendered engagement in the workforce. This feature evolved historically, and is traced in the rest of this chapter.

Egalitarian Foundations of New Zealand Education

The formal state education system was established under the 1877 Education Act as free, universal, compulsory, and secular (Olssen & Morris Matthews; 1997). The primary system was based on the principles of egalitarianism and liberalism, as positive rights associated with social democracy and freedom of the individual. The interests of children were privileged over the self-interest of parents. Children developed moral and personal autonomy, acquired literacy and numeracy skills, and values and knowledge to participate as citizens in a democratic society. Scientific and cultural progress enabled education to be seen as important for New Zealand's economic and social growth and a means of ensuring full employment regardless of location. Secondary and tertiary education remained the preserve of the wealthy and the able on scholarships (Day, 1992; Olssen & Morris Matthews, 1997). A gradual change took place as vocational education began to gain a foothold in existing institutions to train effective employees in workplaces.

Technical Education Meeting Workplace Needs as Gendered Domains

Technical education was first provided as evening classes at universities, grammar and high schools, through endowments and public aid, and well established by the turn-of-the-century. Students, already in the workforce, paid for their tuition in subjects which had a “vocational application,” that enabled students to “acquire special knowledge that will be of advantage to them in their daily work” (Day, 1992, p. 70). Most women were employed in a narrow range of occupations, with educated middle-class women as teachers, skilled women workers as typists in business and the civil service, and unskilled women workers as domestic servants for the wealthy.
The purpose of technical education was to improve economic efficiency, and create higher productivity, and increased competitiveness for Britain and New Zealand as one of its colonies. Reflecting social class and status, it had the lowest status of post primary education, and was seen as suitable for non-professional, skilled and semi-skilled workers, and women (Day, 1992).

The state education system had been expanded in 1914 to cover secondary education, for students who passed the proficiency exam. Separate technical secondary day schools were earlier established throughout the main centres and provincial towns. Most students participated as a result of their ability with a free place from passing proficiency. More than half took commercial instruction and many young women became typists. Gender justified this training, assuming employment was temporary prior to marriage, (Day, 1992). Young women continued to choose commercial subjects up until the late 1920s when the economic depression cut back opportunities for paid work, which affected technical school enrolments, and the education system in general.

In the first Labour government, Education Minister Peter Fraser appointed Clarence Beeby as Director-General of Education in 1940. His background in philosophy, psychology and educational research was fully utilised to put in place the educational policies, practices, and material manifestations of the socialist philosophy that underpinned the Government's political agenda. Their joint goal was stated, in the non-gender inclusive grammar of the day, thus:

> The government's objective, broadly expressed, is that every person, whatever his [sic] level of academic ability, whether he be rich or poor, whether he live in town or country, has the right as a citizen, to a free education of the kind for which he is best fitted, and to the fullest extent of his powers. So far this is from being a mere pious platitude that the full acceptance of the principle will involve the reorientation of the education system (Alcorn, 1999, p. 99).

Local industry stimulation provided work for women in offices and factories, and women were encouraged into work traditionally done by men to support the economy during the war years, 1939-1945. Technical schools taught women necessary skills, but Beeby's view was that they were overcrowded and in need of restructuring (Day, 1992). His attempt in the early 1950s to convince the universities that there was a need to have a national technical institute met with strong opposition (Alcorn, 1999).
Various measures, based on the principle of equal opportunity, were put in place in secondary education including introducing University Entrance in 1944 to break the stranglehold that universities had over the entry criteria. The 1944 Thomas Report reiterated that: “all post primary pupils, irrespective of the varying abilities and varying occupational ambitions, receive a generous and well-balanced education” (Olssen & Morris Matthews, 1997, p.10). In effect, the domination of senior exams perpetuated the systemic purpose of sorting students hierarchically for the labour market.

In spite of regulations being issued to ensure that the core curriculum included technical subjects in the first two years of high school, to discourage specialising too early in either vocational or academic streams, schools identified certain kinds of courses with particular social classes and gender. Commercial courses were taken mainly by girls, and technical courses by boys. Professional courses were taken prior to university study, with gendered subjects in the senior school, and few women proceeding into the sciences (Day, 1992). The predominant type of educational engagement by women during this era was as part-time students, in hobby classes particularly after the war. Vocational courses were predominantly taken by men, as daytime training for apprentices became compulsory in most trades in the late 40s. While pharmacy, engineering, drafting and planning, and science technicians were all being trained, few of these were women.

The 1962 Currie Commission Report raised concerns for various educational needs including of Maori children, physically and intellectually handicapped, rural children, and those in the new urban suburbs. The report also recommended “more attention be given to the technical training of women and girls as operatives and technicians in industry” (Day, 1992, p.76).

But the goals of uniformity of treatment, avoidance of privilege and equality of status and opportunity did not extend to women in terms of policies. The opening of technical institutes from some reorganised technical high schools in the 1960s did not lead to active participation by women in technical training in pharmacy, engineering, trades, or science, where they were either absent, or present in low numbers. For example, only 10% of drafting certificate graduates were women (Day, 1992).

This is accounted for by these areas being perceived by women as male domains and therefore unattractive to women. While a minority of women perceived some technical
courses as more suitable than academic study, and they could study part-time and work, their participation was not encouraged by the technical institutes, nor did employers make opportunities for women. There was no shortage of men, and so therefore, no incentive to recruit and retain women into the workforce (Day, 1992).

The predominant social pattern was that women married young, in their early 20s, and were then preoccupied with raising their children (Day, 1992). This pattern continued throughout the 1960s, in spite of the recommendations from the 1965 Commission of Inquiry into Vocational Training for encouraging women to acquire skills for economic and psychological reasons. Negative attitudes of employers towards employment of women also prevailed. Where innovative courses aimed at assisting women back into the workforce were set up, they were in the areas that were traditionally associated as a woman's domain, such as secretarial courses, and full-time secretarial courses for women school leavers courses in polytechnics and technical institutes was so popular that they were oversubscribed (Day, 1992).

**Gradual gains towards gender equity in training and employment**

The principle of equity emerged from the Kirk Labour government under Education Minister, Phil Amos through the 1974 Educational Development Conference Report. The redistribution of the Education budget was driven by the principle of fairness. It was acknowledged that students should be treated differently according to their needs (Olssen & Morris Matthews, 1997). Accepting that technical education could assist unemployed persons and Maori, the Department of Education did not however develop a similar policy to monitor or broaden the participation of women (Day, 1992).

The Lawrence committee, in the same year, reiterated the concerns of women being trained in a narrow range of vocations. Recommending flexibility and scope for the training of women, it recommended research on married women undertaking training in new occupations and courses for that training. Coinciding with International Women's Year, recommendations from a national conference on women and education were taken up with one pilot course in non-traditional work, and research into the vocational choices of girls (Day, 1992). Increased financial support and a pilot course in the male domain of engineering did not eventuate for
economic reasons. However, expanded polytechnics and the regional community colleges adopted the policy of flexible entry into courses, and flexibility of location, which is still part of the tertiary training policy. An equity fund provided some hardship grants to women (Day, 1992).

In 1984, the Department of Education initiated specific policies for the training and education of women. This policy change came within the context of the Equal Pay movement, the National Advisory Committee on the Employment of Women, and the advocacy of the Working Women’s Charter, within the conservatism of the union movement led by Sonja Davies and other women union activists (Davies, 1984). A woman advisory officer, designated continuing education, was appointed to look after the women's interests within the Department of Education, and a women's advisory committee undertook research on the range of issues for equalising educational opportunity for girls and women. The equity fund was used to establish child care centres at polytechnics, to encourage women's involvement in non-traditional work, and to support women's advisory committees in polytechnics. The Department of Labour undertook the Girls Can Do Anything campaign that encouraged girls and women to take up careers in non-traditional areas (Day, 1992).

Day (1992) concluded that technical education in polytechnics in the early 1990s was still predominantly undertaken on gendered lines. In nursing, and occupational therapy, 90% of the students were women. While equal numbers of men and women took business managerial and science courses, few took engineering or building technician courses, or non-traditional apprenticeships other than hairdressing. She suggested that women would continue to show a marked reluctance to training and undertaking work of a non-traditional kind. However, this was exacerbated by little sustained effort within the polytechnic system to target women and create innovative alternative courses available for them.

The equity principle was again taken up by a Labour government in the Curriculum Review of 1987 under Russell Marshall as Minister of Education (Olssen & Morris Matthews, 1997). But the growing influence of the Treasury in reshaping core institutions of the welfare state meant that these reforms did not take place. From a social justice standpoint, neoliberalism, as implemented under David Lange, as both Prime Minister and the Minister of Education, ushered in an era of radical reform that was to place Aotearoa/New Zealand back almost hundred years in terms of the principles that underpinned education policy (Olssen & Morris
Matthews, 1997). Education institutions were again exposed to material manifestations of inequity, including those based on gender (Olssen, Codd & O’Neill 2004).

**Education and Neo-liberalism**

The Labour government elected in 1984 had two distinct groups within Cabinet; those who were democratically committed to transparently implementing the Labour manifesto on which their landslide victory was based, and those who had already formed covert alliances with Treasury officials of neoliberal persuasion.

In retrospect, the agenda was to significantly and irrevocably alter the New Zealand economy, to promote the interests of the global economy and transnationals over the interests of Aotearoa/New Zealand as a nation state and its citizens (Barry, n.d.; Olssen & Morris Matthews, 1997; Olssen, Codd, & O’Neill, 2004). Thus the ground was set for the commodification of education, including technical education. How this was achieved is described in the next section.

**Technical Education as a Commodity**

In the reform of the education sector, under the Education Act 1989, the governing bodies of all tertiary institutions, including polytechnics, took up administrative and salary bulk funding with the goal of being sustainable, profit orientated enterprises. They were in competition with each other, in alliance with business interests, and removed from the accountability and constraints of the Department of Education, which was downsized to a Ministry that makes “policy” only (Olssen & Morris Matthews, 1997).

Thus, technical training, including training for ICT, in tertiary vocational institutions such as ITPs, was radically altered in its administration, funding, and delivery by the 1989 education reforms initiated by the Lange Labour government, as part of the wider neo-liberal reforms of the New Zealand economy. These reforms continued and were consolidated under National, in the 1990s and the Labour-led Clark Government from 1999 to the present day National-led Key Government (Abbott, 2006; Olssen & Morris Matthews, 1997).
Learning for Life policy reforms transformed tertiary technical education into a “quasi-publicly consumer good” (Abbott, 2006; p.371) where increased participation of students was seen as realisable through competition between the “providers.” The downsized Ministry of Education, through bulk funding of EFTS and deriving funding from non-government sources, including student fees and loans, repositioned ITPs to develop “autonomy” by being responsible for paying their own staff, providing their own buildings, and through their charters, “planning their own destiny” through contestably competing with universities, other ITPs, and private providers (PTEs), and developing campuses outside of their “home location.” This included providing a percentage return on the Ministry of Education’s funding. The New Zealand Qualifications Authority (NZQA) replaced the vocational training boards in the late 1990s, enabling ITPs to develop their own qualifications subject to accreditation and validation, including degrees, in competition with PTEs and each other, a discursive shift to knowledge as a purchased commodity (Codd, 1997; Peters, 1997). Industry Training Organisations [ITOs] managed apprentice training.

Successive governments expanded the total number of tertiary enrolments, from 3.8% of the domestic students in 1981, to 8.1% in 2004, but paid less per capita, with the financial burden being unevenly borne by institutions, students, and their families (Peters, 1997). Tertiary technical education became more market orientated, with expected efficiency in use of resources and the development of new courses (Olssen, Codd & O’Neill 2004).

User pays, in the form of tertiary student loans, which was introduced in 1991, and is a significant mechanism for shifting the cost of a trained and qualified workforce away from the State and the employer to the individual student and community. For those in many middle-class, lower to middle income, supportive families, students can have forced dependency on their parents up until they reach 25, even with interest free loans. The minimalist student allowances for low income students without children make it a struggle to complete qualifications, as they need to supplement income with low adult wages in most weekly and “holiday” work. This also applies to those with children on benefits rather than allowances, or supported by their spouse or partner (Peters, 1997; Olssen, Codd & O’Neill, 2004).
The shift of tertiary funding, policy and implementation to the new Tertiary Education Commission (TEC) in 2003, promised closer alignment of the tertiary sector to the needs of the knowledge economy and “greater system connectedness to New Zealand businesses, communities, iwi and enterprises” (T.E.C., n.d.). Current TEC restructuring under the Key National-led Government is based on deepening this same ethos through a “well-performing network of provision that produces quality outcomes for learners, and stakeholders and supports government's goals for: economic transformation, families, young and old, and national identity” (TEC, n.d.).

The impact has been uneven. The larger tertiary institutions in more affluent regions with strong business links have benefited, and have created financial surpluses, while controlling costs in collective employment agreements. Those servicing communities from smaller, and/or lower socio-economic, and marginalised sociocultural classes, and rural areas continue to struggle with student attendance, competition with private providers, and growing financial deficits arising from underfunding (Olssen, Codd & O’Neill, 2004). These external factors are mirrored within the ITP system, which has additional demands placed on it, which in turn impacts on gender, women and ICT research in those environments.

**Summary**

This field is embedded with a paradox. On the one hand, recruiting and retaining women professionals within the ICT industry and business can be taken up as an inclusive social justice goal in an era of critical global shortages. However, it is currently located within the recession cycle of the knowledge economy which in turn has its own discourses that reinforce exclusion ((Hendery, 2006).

Thus, these are the genealogical effects of the changes to Aotearoa-New Zealand’s socio-economic structures on technical education and training and education in ICT. Understanding the nature of these changes and how to work within these systems is essential for negotiating positive spaces with the stakeholders in ICT in particular, and within our transformed society as a whole. Positioning technical education in ITPs in its context illuminates sources of change. These shifts enable us to conceive how they could help shape new spaces, transforming our myths and beliefs into new ways of reworking the old.
In the next chapter, I survey some of the prevalent ways that gender, women and ICT has been taken up in some research approaches in USA, UK, Australia and Aotearoa New Zealand. I analyse how the phenomenon has been understood, the research strategies that have been adopted, and their effects. Within this, I summarise some of the main accounts for the persistence of the problematic nature of women, gender and ICT.
Chapter 4: Strategizing the recruitment and retention of women in ICT

Introduction

Much research has been undertaken in the United States, UK, and Australia on the difficulty of recruiting and retaining women, as the largest underrepresented group in ICT training and work. This chapter identifies the underlying problematic assumptions making up these research findings, the positioning of the women in the research strategies used, and the ways these research findings have been taken up and strategized. These limitations influence the approach taken in the Engendering ICT project in the findings chapters.

These strategies for the recruitment and retention of women in ICT have been located within the broad science, technology, engineering, and mathematics fields (STEM) in North America, science, engineering, construction and technology (SECT) in UK, and recently gender and information systems research, and as women, gender and IT research in Australia. Most research has been conducted in the four-year colleges, equivalent to Aotearoa/New Zealand universities. However, it is useful be aware of this research, as similar policy and practices in women gender and ICT apply to ITPs.

The discourse of lack: overcoming women’s deficiencies as an essentialist explanation and strategy

Bystydzieniski and Bird (2006) in a major review of the United States literature, describe the glacial rate of change for improving the rates of representation of women within these careers, in spite of several decades of research and interventions. Given that women are slightly overrepresented at high school and college (university) level as graduates, and dominate biological sciences, they reported discouraging outcomes over the last two decades to attempts to recruit and retain women within the STEM fields.

Focusing on this underrepresentation, Bystydzieniski and Bird (2006) locate their research approach within the discourse of barriers, which arises out of formal knowledge and practice
in these areas being socially constructed as gendered, based on essentialist ideas of “femininity and masculinity.” In other words, the studies sought to identify what women had to do to better fit into the existing organisation structures and practices. Studies emphasised “women's perceptions expectations and choices” and how best to fit women into existing ways that STEM courses were delivered and organised (in a masculinised domain). It was assumed that because early research had identified gendered differences in learning outcomes, (Benbow & Stanley, 1980; Berryman, 1983, cited in Bystyzienski & Bird, 2006) that underrepresentation arose from women lacking motivation and skills in mathematics and science, so they selected out of these domains on individual choice.

However, recent research indicated that boys and girls have the same aptitude for maths and science (Rosser, 2006). Research and interventions that take up the assumption that women and their deficiencies are the problem, which they have personally internalised, to the point where they blame themselves, lose confidence, and at worst, then drop out, are now seen as an inappropriate approach in ICT education and training in two year colleges similar to polytechnics.

A similar research assumption was applied to the supply side “pipeline theory” first put forward by Camp (1997). This approach assumes that if sufficient numbers of women were successfully encouraged to take up these fields, particularly girls in their middle school years, eventually the gap between the genders will disappear over time. The rate of flow into this career path was measured at specific transition points such as elementary school to high school, grade 8, (age 14), college, graduate study, and postgraduate study. At each point, potential students “leaked” from this career path, with fewer and fewer progressing to the next stage. While the theory was descriptive of the trends, it does not account for them, and was based on assumptions similar to the deficit model described above. It fails to analyse the context of this phenomenon, and to account for the ways in which the demand side has remained constant in terms of the resistance of organisations to change, and systemic barriers to women's entry and full participation in these professions (Etzkowitz, Kemelgor & Uzzi, 2000; Hammonds & Subramanian, 2003; cited in Bystyzienski & Bird, 2006). This approach also failed to account for the progression of girls and women into ICT education and training in two year colleges, taking up two year degree equivalence, similar to ITP diplomas, which is also explained as deficiencies in the women students themselves.
**The counter-discourses of constructing positive working and learning environments**

The most prevalent US research assumption is currently that the barriers are systemic, and that more women will engage in these fields if the fields themselves change in order to be more inclusive of women. This discourse, characterised as a “chilly climate” for women, as put forward by Fisher & Margolis (2002) has been taken up by the leaders of prestigious colleges, who articulated the need for significant changes in their institutional procedures, and within these fields themselves. It has been taken up by the National Science Foundation, which encouraged institutional changes which empower women, and at curriculum level in terms of changing the culture of science and maths education.

Informed by feminist theory, this approach sought to illuminate the ways in which sociocultural biases such as gender, sexual orientation and race, for example, were present within current practices. It acknowledged that these barriers that women encountered arose from historical and current science and technology practices. Further, it advocated that feminist critiques were as careful and rigorous in their research method as any other evidence based social research so that the conclusions drawn promoted better understandings of this field by including multiple viewpoints (Rosser, 1992, cited in Bystyzienski & Bird, 2006).

A major study, (Rosser, 2006, cited in Bystyzienski & Bird, 2006) surveyed highly successful women academic scientists and engineers who were scholarship recipients, between 1997-2000. It established a baseline of results, based on survey responses to open ended questions about their experiences of issues and climate within their field. Among these, women in CISE (computer and information science and engineering) articulated the five following issues is the most significant barriers to their career advancement: balancing work with family responsibilities for children and elderly relatives as the most significant issue; followed by low numbers of women, isolation, and lack of camaraderie/mentoring, and gaining credibility and respectability from peers and administrators; balancing their career with a spouse’s career; and affirmative action backlash and discrimination. Like others in the study, they were less likely to identify that these difficulties arose out of the policies and practices within the institution.
The study recommended that the highest priority should be given to developing policies and practices to firstly enable the balancing of career and family within the competitive environment of academia. Stopping the tenure clock, (allowing women to voluntarily suspend the time frame in which tenure is gained), modifying duties for a new parent, providing on-site day-care and enabling dual career hires of partners are some suggested ways to accomplish this.

In Rosser’s (2006) study, it was further suggested that the low numbers of women in computer science led to stereotypes, and difficulties also arise from women being so visible. Being unaware of the unwritten institutional rules and having a few ways to learn them also disadvantaged women. With few senior women to act as role models and mentors, other ways of enabling access to networks of the necessary professional information needed to be addressed. Women were more likely to have their time taken up with serving on committees, taking a greater teaching role, and advising more students than men which was less recognised and valued within the institution compared with research time which was more prestigious. Rosser also argued that gender discrimination and sexual harassment needed to be dealt with at the institutional level, with policies and procedures in place that were used and enforced, with appropriate outcomes for offenders. Workshops that emphasised appropriate professional behaviour including collaborating with women colleagues assisted in developing a supportive workplace climate. Competition for scarce funding resources, preferring to work collaboratively in a team, and being socialised to behave in traditionally gendered ways needed to be addressed through grant writing seminars, the encouragement of all to collaborate, and also actively supporting women as independent researchers. The ADVANCE projects were seen as a powerful mechanism to facilitate the removal of these barriers and to develop and to put in place the policies and practices to enable gender equity.

It is suggested that this approach of focusing on external barriers and obstacles created by prevailing practices had some potential to transform these fields for the benefit of both men and women and the greater good of society as a whole. These approaches could be helpful to apply to education and training in two year colleges and the field of ICT itself. However, it assumed that the institutions have the resources and willingness to foster such initiatives which is less likely in a recession.
**Poststructuralist Feminist research approaches**

Markwick (2006), using a feminist poststructuralist lens, identified IT as a global discourse of power, and identified the persistent issue in education of women being underrepresented in ICT as a political issue. Her feminist poststructuralist framework, as used by educational theorists, focused particularly on construction and understanding of subjectivity. Markwick suggested that we must “disrupt and dismantle the gender binary that is so insidiously embedded in the discursive repertoire of the dominant paradigm of educational research and reform” p. 257. In other words, the education system is reproducing the positioning of women as disadvantaged. She argued that until this is changed, we will not be able to transcend this duality and engage more effectively with individual women's lived experiences.

**Building a sense of identity**

Another research approach used a feminist lens to analyse the ways that women developed a sense of belonging and identify as being part their profession. It was suggested that sensing that women belong was an important part of the process of learning (Allexsaht-Snider & Hart, 2001; Ames, 1992; cited in Herzig, 2006). While Herzig (2006) analysed the ways women were recruited and retained in mathematics, a comparable field, through in depth interviewing, these insights may be usefully applied to training in ICT in ITPs.

Lave and Wenger (1991, cited in Herzig, 2006) argued that students emerge from peripheral positions within the community of practice they seek, and became part of it through participation, during which they gained increased knowledge and skill. This occurs through learning opportunities which are embedded within their social functioning and their engagement in these activities.

Thus, women students needed to feel important and active participants in the academic and social communities, including their relationships with teachers in and out of class, through education, advice and guidance, and informal interactions with them and each other. Rather than persistence, which implies coping with difficulties and enduring them, the focus of
research and best pedagogical practice needs to be on retention of students through assisting this ‘process of belonging’ through policies and practices that enabled participation and inclusiveness within their chosen field of IT (Tinto, 1993; Campbell, 1995, cited in Herzig, 2006).

Such research has identified that students belong to many communities of practice, including work family and home, and that retention within the academic programme may depend to some extent on how successfully they can manage these competing demands. Further, if education and training are structured as a series of obstacles, it is unlikely to maximize student potential. Recognition of this interference, and assistance with minimizing it, as well as designing flexible programs and services, may have a significant impact on recruitment and retention of women to IT in ITPs.

**Confronting stereotypes and assumptions**

Herzig (2006) also analysed assumptions made about mathematics, that it is a difficult field of study and that only a few have the special talent required for it. This has similarities with ICT. Such assumptions interfere with student motivation to learn, engaging with the content, and using effective learning strategies. Learning was achieved more easily when the pedagogical focus is not on an individual student’s ability but is on assisting all students to learn. Rather than focusing on correctness, the absence of errors, and success in terms of public norms, such as grades, ICT teachers should provide meaningful tasks, that are gender and socio-culturally inclusive, support and develop effective learning strategies, and assist students to gain responsibility and independence, so they become actively engaged, sustaining their efforts, while using effective learning strategies as ICT professionals in training. Students who are struggling should not be ignored on the basis of the assumption of their teachers that they lack the talent to succeed. Good pedagogy is not based on weeding out students who are felt to be wasting their teachers’ time (Douglas, cited in Herzig, 2006).

Like mathematics, ICT students are stereotypically seen as lacking in social skills (Campbell, 1995; Noddings, 1996; cited in Herzig, 2006). Women may therefore perceive they do not fit with this group. Isolation from being one or a few among predominantly male students can emphasise this effect (Herzig, 2006).
A more flexible, accepting, educational context that enabled a more diverse range of students to participate within the ICT field of training and education may well assist recruitment and retention of more diverse women in Polytechnic courses. It is suggested that some ways tertiary educators may encourage students into ICT as a career path include: giving all students early and frequent opportunities to participate in ICT activities within their programme; enabling flexible support to help students balance the competing demands of study, family, including being a parent, and other commitments such as work; keep an open mind about who can succeed and what success looks like, emphasising the facilitating of learning, rather than the encouragement of ‘talent’ which tends to indicate students who already have been socialised into the culture of the discipline; construct courses to help students explore connections between ideas and develop a deeper understanding; share enthusiasm, excitement, and vision with students who are actively and meaningfully mentored in positive and caring ways; facilitate sustained meaningful positive relationships with other students to encourage a diverse range of students to participate and belong in science, technology, engineering and mathematics (Herzig, 2006).

**Computer gaming as a vehicle to recruit women**

Another suggested approach was to consider how to design computer games to encourage women into ICT. The most prevalent form of engagement in computer play was daily home-based use of computer-based games by children, young people, and adults (Griffiths, 1997; Miller, Chaika and Groppe, 1996; Miapaul, 2002; cited in Martinson, 2006). Women gamers have attempted to highlight violence and sexist representations within the masculine gaming subculture (Banshee, 2000; Glaubke, et al, 2001; cited in Martinson, 2006) and pursue gender equity, so that games are designed more broadly than by white, middle-class, young adult males. But current popular games such as the massively multiplayer online role-playing game, World of Warcraft, continue to be constrained in their scope by essentialist and stereotypical avatars, content, goals, and outcomes, which do not necessarily appeal to women (Russo, 1997; GameDiva 2001; cited in Martinson, 2006). Research is needed into the leisure pursuits of adult women, including use of virtual worlds such as Second Life, and courses in game design need to consider how to give women students the opportunity to design computer games that were engaging to women (Mendels, 2000, McDonough, 1999,
cited in Martinson, 2006). This may account for young men who are active gamers being drawn into education and training in ICT, and may explain why fewer women are attracted from such a background.

**Gender equity as an approach to attract women**

Another approach is to study the problem within the context of the discipline of gender equity. A multi-disciplinary field, gender equity accounts for how equity problems arise. Using social-cognitive and organisational analysis, Valian (2006) applies the concepts of gender schemas at workplace level which interpret social events and assign psychological traits to men and women to address the problem of the academic underrepresentation of women in STEM. Fewer women reach the top because the skewing of perceptions and evaluations result in overrating of men and underrating of women in terms of their competence, sense of entitlement, ability and worth, even generally by women too, of others and themselves (Major, 1987; Butler and Geis, 1990; cited in Valian, 2006). The initial small disadvantages that women may experience in promotion, add up over time to being substantial (Martell, Lane, and Emrich, 1996; cited in Valian, 2006).

The advantages included: maximising the chance of hiring the best person by widening the number of applicants; showing women that they do have a good future in STEM; increasing the potential for innovative teaching and research; solving gender equity issues which can also solve unrelated problems that also become highlighted; ensuring the best work is done by maximising power and resourcing to women employees, which reduces the likelihood that some men gain an unjustified advantage; building a better institution with a reputation for fairness; and enabling students to accept and respect diversity in their workplaces, having experienced it in their training. Strategies include: ongoing analysis of the organisation’s academic personnel data based on gender equity principles; creating accountability policies that are enforced at each step of the organisational structure, including the monitoring of equity status at departmental level, guiding resourcing and employment, empowered by the leadership’s commitment to equity; and giving explicit guidance to employment panels, in recruitment, the planning and conduct of the interview, including what traps of gender discrimination they may inadvertently apply.
Gender and technology as an approach

Another approach arose from the field of science and technology studies (STS), (Johnson, 2006). It suggested that gender was coded into many technologies in complex ways. Gender and technology were profoundly intertwined in the deep structure of our cultural conceptions. Gender and technology co-created each other. As socially shaped, technology reproduced and reinforced gender patterns as it was constructed. Likewise, gender was shaped by and shaped technology. The field explored the ways in which gender and technology were connected, may or may not affect each other, and their interrelatedness. This field used a range of the interdisciplinary approaches, including analysis of gender and technology through the lens of different feminist theories (Rosser, 2006) the processes by which technology was developed, the products themselves, and access and adoption of the use of these technologies and the ways that technology and engineering are culturally correlated with masculinity (Wasburn & Miller, 2004) including the ways gender inequity can be reproduced in the workplace by ICTs (Wajcman, 2006).

Wasburn and Miller (2004) related a case study of Women in Technology, a student organisation at Purdue University. They pointed to research that identified the difficulty of getting young women to enrol in computer science arose from their lack of senior high school experience, because computers were used in ways attuned to the interests of boys. Young women entered programmes of study disadvantaged by the lack of prior computer experience, with career goals that were less well defined, lacking confidence in their ability, and encountering classes that are unfriendly to them with an absence of women faculty and mentors and few women peers. Overall, this added up to a ‘chilly climate,’ as related previously in this chapter, and women chose to transfer into other fields (National Council for Research on Women, 2001; Hanson, 1997; Molad, 2000; Vetter, 1996, cited in Wasburn and Miller, 2006). They further noted that projects aiming to improve the position of women in STEM may not have activities that reflect that theoretical perspective. While a program may define the problem as structural, it may adopt a strategy based on an individualised perception, due to resistance within the organisation, but later recognise the need to have coherence (Fox, 1998; cited in Wasburn and Miller, 2004).

One such intervention took place in Purdue's School of Technology which consisted of eight departments all of which were applied sciences, such as computer graphics. From 1997 to
2001, the number of women students remained static at 15%, or 10%, if the business orientated program was removed, with 12% of the total teaching staff being women, which was lower in any of the other ten schools.

As faculty advisors to Women in Technology, Wasburn and Miller (2004) identified several inconsistencies between the goals of the organisation and its activities. Having been initially set up by the faculty from the liberal and existential perspective, membership was dropping and courses such as assertiveness training had been cancelled. Women did not seem to know one another or agree as to the goals or how to implement them. They were looking to the faculty for leadership, in a top-down organisational structure.

Based on previous successful experience, Wasburn and Miller decided that it may be useful to initiate networking-mentoring and learning communities. However, to be effective change agents, they needed to understand the perceptions of the members, and engage them in helping the goals of the organisation to change. To this end, a survey was conducted, with three open ended questions concerning career choice satisfaction, gender specific difficulties encountered, and support needed to be successful, which received a 63% response rate. Five focus groups, comprising six women in each, were created so that the students could react to the survey findings and make suggestions as to how to address the problems that had been identified.

The findings indicated feelings of isolation, not being treated equally with men, discomfort of seeking assistance and uncertainty of feeling equal participants with men. However, most felt confident about their technological abilities and their choice of a career. It appeared that most of the issues arose out of the lack of a formal programme within the school to address the problems they were having. In particular, they felt intimidated and outnumbered in class, found group projects particularly challenging, felt demoralised by male students who they believed were more knowledgeable and expressed greater self-confidence, and lacked respect for the women students’ abilities. Some of the group saw their smaller numbers as an incentive to succeed. Many believed that male and female teachers needed to be educated about the issues arising out of being a minority of women in the mainly male classroom. They identified a critical need for women mentors and role models.
An analysis of the documentation identified a mismatch between the goals of the organisation to encourage networking mentoring and the community, and the programmes of assertiveness that were being offered and funded by federal grants. The individualised solution based on the deficit model did not address the structural problems that the students were encountering. The discipline itself was male dominated in terms of the curriculum content. Women entering the field asked new questions and challenged the assumptions on which the curriculum is based. Their small numbers made this difficult to achieve.

The members responded to the results of the survey and participated in the discussion of the support structures available in the Women and Engineering Program which were directed at dealing with the same kinds of problems that they were facing. The members were shocked by the low numbers of women students and faculty in technology, and spent some time sharing their various experiences which they had in common. This enabled them to connect on a personal level and to realise that strategies would require a collective effect. The facilitators then discussed research about student driven organisations and some of the theory concerning net working-mentoring and learning communities. In the focus groups, the members were then asked to identify strategies to address the concerns from the survey. The seven suggested solutions included: going to dinner with the woman professors; creating living learning centres, for studying living and taking classes; initiating a mentoring program, including women in the workplace; creating support groups to discuss common problems and solutions; creating outreach programs with high schools to encourage women into technology careers; having a retreat so that members could really get to know one another and keep networks open; and use Women in Technology meetings to discuss the survey findings and look for remedies. The members also suggested to the faculty advisors that they needed to educate the faculty about the issues that were affecting them as women students. This matter was taken up with male faculty members, who agreed that workshops for male and female faculty members entitled “Making Your Classroom Women-Friendly” will ensure an ongoing sense of purpose to address these issues. The facilitators decided to present the student recommendations to the whole membership, and monitor the effectiveness of the organisation by measuring the leadership that the members show in implementing activities that address the concerns, and which are actively supported by the members themselves.

The purpose of this monitoring is to continue to understand the student issues and address the needs, targeting areas that still need improvement. Further, it was decided that the student
voice was important to hear, and to give them encouragement to express confidence in their abilities and to solve the problems with support through student initiated and activated enduring programs. The retention of such students will enable gender equity as a philosophy and practice to be translated across into the ICT industry as a whole. This approach is based on the co-operation of the faculty and unless there is a high level of awareness of women, gender and ICT issues, it may not be able to mobilise it as a strategy.

**Positive strategic role models**

The importance of highlighting women in science and technology as role models has continuing significance as a strategy, including women computer scientists such as the late Anita Berg, and scrutinising fictional characters and the mass media, including advertising, and how they depict women, and young women in science and technology fields. Unless the issues are addressed by an ongoing use of the 21st-century tools of strategic marketing, and targeted political and industry advocacy, it is unlikely that change will be sustained within stronger infrastructures that can better bear the brunt of continued cycles of gains and backlashes, yet maintain forward momentum (Fox, 1998, 2000; cited in Kohlstedt, 2006). Looking wider and seeking international collaborative initiatives helps to explain the different ways, according to time and place, that women have participated globally in science and technology, which can also help to achieve change.

**Research as a tool for problematising women, gender and ICT**

Eileen Trauth (2006), in a major project to advance global understandings about the problematic nature of women, gender and ICT, worked with other leading researchers collaboratively to gather representative research within an encyclopaedia as a baseline for researchers in the field. Her rationale is that we do not yet have the conceptual tools to fully understand the lack of gender diversity. Nor do we yet have an understanding of how knowledge can be applied to encourage greater diversity in this field. Trauth urges theoretical innovation as well as interventions. Further, this broadening needs to influence public and corporate policy as well as the ICT curriculum. The purpose of this theoretical stance is to establish meaning behind current statistical underrepresentation by focusing on variations
within the gender group, as women gender and ICT roles expectations and stereotypes are mediated by “nationality, race, age, sexual orientation, marital status, socio-economic status, and educational level” (Trauth & Howcroft; 2006, p. xxix). It has taken an interpretive turn, moving from work-life narrative analysis to a critical orientation, which explores contradictions, and how women’s agency as IT professionals is shaped by power relations within a global context. Thus, women are positioned as the research focus, and research is framed as strategic and informing the development of policy and practices as emancipatory and transformative.

Liisa von Hellens & Judy Nielsen, (2006) have focused on an approach which emphasizes the importance of a strong ICT sector to the economy, and reports on various government funded initiatives, including action research, to raise women’s profile above a fifth of the workforce. At the same time, the drop in IT/IS enrolments has continued unabated. They cite statistical evidence for women, gender and IT being equally problematic in Australia. Many initiatives are conducted through organisations of women in IT in collaboration with business, government, and academia, with the goals of; positive nationwide interventions for young women, such as networking, role modelling, mentoring and demystifying the IT industry; providing leadership and support for women in the IT industry; and strengthening networks of organisations locally, regionally, and internationally through regular conferences. They argue that interventions are too new to draw useful conclusions from. They cite difficulties of defining the IT field as complicating efforts to understand declining participation by women, and describe the notion that women may contribute special qualities to the nature of IT as contentious. They note that it unclear how the masculinisation of IT makes it an unattractive industry regardless of gender. Their concern is that emphasizing negative aspects has the effect of perpetuating them, particularly in the popular media. Again, women are positioned as central to research effort, through monitoring interventions through action research which modifies practice and policy through networks of activists. Recent research (Craig, 2009, personal communication) is focusing on empowerment of young women in low socio-economic areas through ICT, using mixed method research that combines quantitative and qualitative approaches, including action research.

Alison Adam and her co-researchers, Griffiths, Keogh, Moore, and Richardson, (2006) outline the gender and information systems (IS) research being undertaken in the UK with European Social Fund support. This work is theorised as feminist theory applied to practical
empirical research which critiques the tacit liberal position, the prevalent theoretical assumption operating in this field. Adam has surveyed the amount of attention that the issue of gender and IT has attracted in IS/IT journals, and has concluded that it is an ethical issue of inclusion that has been overlooked for decades. Adam’s analysis of research outputs, funded in Europe, has identified that gender is rarely ranked as worthy of inclusion. Adam notes the inadequacy of gender based research in IS, as a relatively new field, framed within narrow functional rather than social and organisational terms. This is evidenced the lack of theorisation, statistical studies which leave gender as an unanalysed variable and in the ignoring of new ICTs potential for transformation. Adam attributes these as compounding factors in the lack of acceptability of gender based research in IS. Further, Adam has critiqued statistical studies that show gender as a dichotomous variable. Women are depicted as undertaking behaviours more or less than men, which reinforce stereotypes by polarising differences. Such analysis does not lead into examining underlying reasons for the absence of women. Adam’s suggested research agenda of current work in progress includes; pay discrimination, rapid rate of women leaving the IT workforce, with lower ranked positions being feminised and few managerial positions held; difficulties that women experience in a field that expects long hours, availability, and the organisational and socio-cultural contexts of women working in IT. In particular, Adam has identified that women emphasize the people side of IT work, rather than their technical knowledge; the struggle that women have with gender identities in the male domain; and the ways that they are excluded from the particular male spaces, activities and networks, and that schools and universities continue to reproduce gendered expectations about the ICT through the way students are trained and educated. Further research addresses ways that schools and higher education are reproducing gendered expectations about the use and capacity of IT as a male gendered domain and is developing the field of gender and computer ethics. This research is examining the underlying causes for these subjectivities and will lead to better policies and practices in academia and industry.

New Zealand research on women, gender and IT has reached similar conclusions. For example, a 1998 study, funded by the Ministry of Education, interviewed women students and staff at Waikato Polytechnic, Waikato University, and Hamilton Girls High School. (Selby, Ryba, & Young, 1998) found constraints of: lack of knowledge of ICT careers; negative images of the personnel and the industry itself; perceived lack of ability among women; few women lecturers; computing as a male domain; a conservative pedagogy; and a
need to recognise prior experience. Their recommendations were unfortunately not taken up or funded. Another study of Maori women, Ngatuere, Tupu and Young (2002) suggested that indigenous women of Aotearoa-New Zealand, who form support groups within IT training at ITPs, are able to gain culturally appropriate sustenance to complete their training in a system which did not recognise these needs. More research could be done on this aspect of IT to engage more Maori women in training in ITP settings.

Using a social constructivist framework, and interview data from 70 ICT women professionals in Auckland, Wellington, Christchurch and Dunedin, Crump, Logan and McIlroy (2007) noted regional differences in perceptions, organisational structures, job categories and salaries for women ICT professionals. The northern cities reflected higher salaries, work in larger organisations, and more assertive younger women who sought promotion, better salaries, and had the willingness to change jobs to achieve this. However, many of childbearing age expressed concern about how they could combine their highly responsible jobs with raising a family, suggesting that child rearing is still socially constructed as the responsibility of women. Overall, roles were gendered, with women tending to take up the “softer skills” such as business analyst, project manager, account manager, and seeing the more technical roles held by men as being important. They did not question the essentialism inherent in this response, and perpetuated stereotypes of a dominant male culture in ICT. This was despite living in a high equity nation state, ranked sixth globally (McGregor, 2005, cited in Crump, Logan and McIlroy, 2007). More research will assist in understanding this phenomenon.

The formation of a specific online journal in the field of women gender and technology, The International Journal of Gender, Science and Technology, http://genderandset.open.ac.uk, through the auspices of the Open University in the UK, has taken up the challenge of providing a vehicle for global dialogue, debate, and advocacy through research since 2009. The journal provides a space for women gender and technology researchers and practitioners, including in ICT, to have a coherent “one stop” output for their work to inform other research, technology businesses and general global policy making in these fields. This builds on the specialist encyclopedia work of Trauth, so that work is not scattered across different multiplicities of journals and conference proceedings, with a constant need to argue relevance before achieving publication.
Summary

The deep seated persistent problem of how to ensure that women cross successfully into the male domain of ICT to train, and take up successful careers, is mapped effectively in the research literature.

The approaches and assumptions underlying them include the following. Firstly, the discourse of lack where the problem is defined in essentialist terms as a gendered deficiency in women compared with men in taking up ICT. It positions women as responsible for their lack of uptake of ICT and as part of the problem. This is the deficit model, where strategies are suggested to overcome attributes that women lack such as knowledge, and assertiveness. Another approach is analysis of statistical patterns where it is assumed that women drop out progressively at each level of education. This “pipeline” approach confuses an effect with a cause, and generates strategies to try and curb the “leakage”. It assumes too, that if sufficient numbers can be recruited, that the critical mass will solve the problem. The third approach assumes that women, gender and ICT reflects systemic barriers, which, if removed would facilitate equity of uptake by gender. Strategies include research on the nature of these barriers and the ways that women experience difficulties, particularly achieving work-home balance, and encouraging workplaces to identify and eliminate barriers in terms of policies and practices. It positions women as non agentic when it comes to dealing with these issues, and relies on influencing workplace policy to effect change. Post structuralist research to date is meagre but focuses on the assumption that women, gender and ICT is affected by the discursive patterns that are restrictive in nature. It suggests that this is a difficult strategy to achieve. Locating women in non-traditional subject positions with a sense of belonging and a strong community of practice is also suggested as a strategy. This builds on positive relationships which is somewhat essentialist, yet is also good pedagogical and business practice.

Building computer games that may attract women is suggested as a strategy. It positions women as less involved in gaming, and suggests that ethical games may encourage women into ICT. The link between gaming and ICT recruitment is not established, as gaming continues to be popular while recruitment of either gender still fluctuates. Gender equity research attempts to isolate social events that discourage women and assign attributes to men and women on the basis of ICT uptake. This approach assumes that this will make a
difference in itself, and fails to take account of the various ways that men and women are constituted.

Research into the co-creation of technology and gender is another suggested strategy to overcome the underrepresentation of women in ICT. This approach assumes that technology is constituted culturally as a masculine field, which acts as a disincentive. However, as ICT evolves and the uptake by women of social networking is positive, the research approach is based on essentialist assumptions that do not fully account for the degree of women’s participation in ICT as professionals. Other research approaches emphasise positive strategic role models to encourage women, and to undertake global research that emphasised the individual differences between women. Finally, sharing research approaches and findings, and developing strategies to have these findings taken up in academia, industry and government is probably the most effective approach as it places women and their differences at the centre, and is seen as an ongoing effort which endeavours to illuminate the complexity of this persistent problem, and has no fixed view of what will constitute the solutions.

The challenge is to develop effective local, regional and global strategies to confront this existing positioning, and its effects on the subjectivities and agency of women ICT professionals, especially emergent ones. How women experience their ICT training, and the discourses which they mobilise are discussed in the four chapters of the findings.
Chapter 5: Research Methodology: Mixed Method Research in ITP settings

Introduction

In this chapter, I describe the main features of my mixed methods. I analyse the strengths and limitations of demographic analysis as my quantitative method, and of online and face-to-face focus groups and in-depth interviews as my qualitative research methods.

Then I discuss my analytical tool of discourse analysis. It is located within the poststructuralist technofeminist framework described in my theory chapter. I explain my use of NVIVO 7 as a repository to manage the coding of the huge quantity of potential qualitative data sets. I then describe and reflect on the ethical issues encountered when conducting research within the ITP context.

I conclude by discussing the strengths and limitations of this feminist research. I reflect on my rationale for selecting a mixed method research methodology and how teacher-as-researcher issues led to me to modify my research design. This process has helped me to illuminate some of the issues of access, power, and subjectivities of stakeholders, and to find my place as a researcher in the diverse world of women, gender and ICT.

Mixed Method Research Method

A broad general definition of mixed method or multi-method research techniques is the use of “multiple and diverse” data collection methods or data sources to increase the validity of the findings. The approach uses qualitative and quantitative sources or obtains perspectives from several different groups (ACER).

(Tashakkori & Creswell, 2008) enlarged this definition by envisaging mixed method research as part of a continuum of different dimensions and aspects, rather than a dichotomy of qualitative and quantitative methods which they acknowledge some researchers have questioned as a possible method. Others describe mixed method as a separate research paradigm (Denscombe, 2008; Johnson, Onwuegbuzie, & Turner, 2007). It does not appear to
be a very common approach in feminist research (Hodgkin, 2008), but it may be gaining
ground in women gender and ICT research (Craig, personal communication, October, 2009).

I agree with Gorard & Taylor (2004) that all educational research has an overarching purpose
of illumination of educational issues, so fruitful combinations of methods are possible. He
suggests that qualitative and quantitative methods have both affordances and limitations.
Mixed method approaches enable greater strength in research design where methods are
appropriately combined for the situation being researched and the research questions used.
Quantitative research is an indirect approach, comparatively passive and descriptive, with
qualitative research being relatively direct, active, and explanatory. But completely different
methods can have the same research aim, guided by appropriate research questions that
access different dimensions of the ways that knowledge is constructed and which “accept the
theory-ladenness of facts, the fallibility of knowledge, and the under-determination of theory
by data” (Gorard, 2004, p.3).

Thus, while knowledge is constructed through theorising in all academic fields, in different
ways, no theory or method can possess a presupposed capacity to underpin all phenomena
with appropriate empirical data. In short, in mixed method research, it is not just the data,
and the gathering method or theory, but also the different ways that I, as a researcher,
interpret and theorise that are germane. This blending of features is time consuming,
requiring a high degree of organisational skill and iterative analysis as to means and purpose,
to ensure that data is interpreted and presented in a coherent whole.

Pragmatism underpinned my mixed method research. I combined research method and
methodological–epistemological principles with research questions and methodology were
relevant, useful and capable of answering those questions. These are outlined below.

My mixed method rationale was as follows. Firstly, my research questions included
quantitative and qualitative inquiry. This enabled data to be gathered as widely yet as
inclusively as possible, and showed that I made an effort to involve students and recent
graduates across the range of courses, years of experience, and years of training, not just a
narrow band. For quantitative data, I set this particular local study against the compiled
demographic characteristics of the total ICT student population enrolled mid year at the two
ITPs as at July 2007. This enabled a general comparison as well as the analysis of the demographic intersectionalities from which women participants came. Thus, the diversities are made explicit. This is in keeping with previous studies reviewed in the previous chapter.

Next, the qualitative data collection methods were also mixed. Face to face and online focus student groups were comprised by their year of study, with an online group of graduates, with 1-3 years of experience in the IT industry. This enabled students with same years of experience in different programmes of study at the two ITPs to interact about those experiences online. In-depth interviews were selected as a method so that I could explore issues that had arisen in focus groups in more depth with participants who had shown leadership and commitment to the project. The interviewees were selected by active participation through group attendance, listening and facilitation skills, contribution to emergent issues, and ongoing communication after the groups about the Engendering ICT project as a whole.

Finally, my theoretical framework was also mixed, which Greene (2008) describes as the most controversial aspect of mixed method research. Adopting a feminist and poststructuralist framework was deliberately a hybrid approach. I was striving to develop an appropriate multi-faceted lens to analyse the ICT related discourses that emerged from the interaction of the participants. I was attempting to craft an approach that would be meaningful to a wide range of potential audiences, including students, colleagues, and other practitioners in Aotearoa New Zealand ITPs.

So, in conclusion, in order to bridge the range of discourses that can be taken up in the women, gender and ICT field, I combined quantitative and qualitative research methods, so that the entry points to accessing my research are wider ranging. Thus, my findings may be received by a wider audience, from different academic fields such as computer science information systems and engineering, and beyond academia, in the ICT industry. This diverse audience may contain persons who are perhaps unfamiliar with the conventions of poststructuralist research and yet are willing to take up those conventions to assist their further understanding of this important ethical issue of women, gender and ICT.
Quantitative Method: Student 2007 Mid-Year Demographics

The use of demographics is a common quantitative method in the social sciences and humanities, including education. Within the jurisdiction of the Privacy Act, 1994, government agencies such as the Ministry of Education (MOE) and subsequently the Tertiary Education Commission (TEC) have been monitoring ITPs, and providing longitudinal data of student characteristics and national educational achievement patterns, which has been published nationally and internationally. Education Counts [www.educationcounts.govt.nz](http://www.educationcounts.govt.nz) provides this data based on statistical returns required by the MOE from tertiary education providers. However, it is generalised and is not granulated to provide data from specific ITPs by subject fields and their specific programmes of study. So this analysis is helpful to see the nature of the student intakes. It is also efficient to make use of local data that already has been collected within the privacy principles.

Using the secondary data source, an in-common records system, the providing of data was negotiated with the privacy officers at the two ITPs in accordance with the Privacy Act. Quantitative data was gathered for all computing students enrolled in the programmes of; the Diploma of Information and Communication Technology (Dip ICT), the Bachelor of Information and Communication Technologies (BICT), and Graduate Diploma of Information and Communication Technologies (G Dip IT) at the internal ITP and in the Bachelor of Information Technology (BIT) at the external ITP as at mid-year, July 2007. Data sets were accessed after the completion of the mid-year intakes. This established baseline data about the student population as a whole. The selected attributes are reported in the findings.

The gender subset of data was also used as the population from which to recruit women participants. Thus, all students identifying as female were included, including transgendered persons. All women students were emailed an invitation to participate in the research as volunteers, and an explanatory meeting was held at each campus. Inferences were then able to be drawn about the nature of the participant group compared with the characteristics of all women students. This analysis enabled me to determine the extent to which focus group participants reflected the demographics of the women students enrolled, and to determine the characteristics of women students who were not represented in the focus group data. It enabled me to more actively encourage students to participate face to face where gaps
existed, such as in the Year 2 student group. Finally, the data sets were used to describe the particular demographics of the participants. These are described within a table at the conclusion of the demographics chapter.

There are some limitations placed on the accuracy of the data sets. For example, some students may have withdrawn, but their enrolments were still in the records system. Others may have completed their courses, but had not yet graduated, and were still in the system. Late enrolments, too, may not have been fully processed at the time of the data extraction. Some information is incomplete. However, regardless of this, the patterns within the data provide a general picture of the student demographics, which is still useful to shed light on the characteristics of the students enrolled.

**Qualitative Methods: Face-to-face and Online Focus Groups**

Focus groups are a common method of semi-structured interviewing in social science research including education (Janesick, 1998; Madriz, 2000). They take the form of a group interview moderated by a trained facilitator\(^3\) who explores issues within the context of the group. An interview guide of general questions focuses on the issues of the study (Burns, 2000). My questions are listed in the Appendices. Data output was in the form of written transcripts of the focus group discussions for later analysis.

The focus group participants were women ICT students enrolled as at the midpoint of 2007 academic year in the Dip ICT, BICT, and G Dip ICT programmes at the internal ITP, and in BIT programme at the external ITP. Participants included women graduates from those programmes who completed their programme requirements in 2005-2007. The courses were selected because they provided education and training that led to direct entry into the ICT industry and business sectors requiring ICT support. Students were recruited by email, and at a meeting at each ITP where I explained the process of research that would take place. Participants had the choice of face to face or online focus groups. Consent forms, containing an outline of the project and the participants’ rights, as approved in the ethical consent

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\(^3\) I have formal training in group facilitation through teacher training, conflict resolution training, and my experience in industrial mediation in the secondary teaching service as a teacher organization employee.
process, were distributed and signed off before the data gathering commenced. A copy appears in the Appendices.

From a maximum number of eight potential focus groups, six eventuated. The uptake was sufficient for an online and face-to-face student focus group at each year level, except Year 2, and the online graduate focus group. Some Year 2 students were recruited face to face to ensure that one online Year 2 group took place with students from both ITPs.

Each focus group met at weekly intervals up to three times. The full schedule, including subsequent interviews, is shown below. Face to face groups were timetabled into free classrooms over lunchtime breaks. For online groups, the e-learning advisor set up four Moodle sites, and enrolled participants with total anonymity by assigning them ciphers\(^4\). I then set up the sessions, in chat mode, with a screen that listed the questions to be covered in each session. The schedule enabled me to complete all the focus group and individual interviews in an eight week period, in the second half of the ITP year, before the students were engaged in their examinations.

Technical difficulties with Moodle postponed one graduate session, the final graduate session was postponed when no one attended, and the final Year 1 session was cancelled for the same reason. In hindsight, three sessions was a considerable participant commitment of time, but was worth attempting for the range of data that was gathered.

In both online and face to face groups, the decision to have three sessions that covered different topics of greater sensitivity and depth as the group interaction evolved appears to have been successful overall. This was most noticeable in online groups, where participation evolved to greeting each other, chatting before the session proper, and signing off on leaving. As moderator, I modeled this behaviour which was taken up by the participants.

<table>
<thead>
<tr>
<th>PARTICIPANTS</th>
<th>MODE</th>
<th>SESSIONS</th>
<th>ATTENDEES</th>
<th>TIMEFRAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1</td>
<td>Face to Face</td>
<td>3</td>
<td>5</td>
<td>6/9/07-20/9/07</td>
</tr>
<tr>
<td>Year 1</td>
<td>Online</td>
<td>2</td>
<td>5</td>
<td>6/9/07-13/9/07</td>
</tr>
</tbody>
</table>

\(^4\) Reasons for this are fully explained in the section of the Ethical Approval Process.
<p>| | | | | |</p>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Year 2</strong></td>
<td>Online</td>
<td>3</td>
<td>4</td>
<td>23/9/07-6/10/07</td>
</tr>
<tr>
<td><strong>Year 3</strong></td>
<td>Face to Face</td>
<td>3</td>
<td>4</td>
<td>16/8/07-30/8/07</td>
</tr>
<tr>
<td><strong>Year 3</strong></td>
<td>Online</td>
<td>3</td>
<td>6</td>
<td>22/8/07-12/9/07</td>
</tr>
<tr>
<td><strong>Graduates</strong></td>
<td>Online</td>
<td>3</td>
<td>7</td>
<td>9/9/07-23/9/07</td>
</tr>
<tr>
<td>Heather</td>
<td>Interview</td>
<td>1</td>
<td></td>
<td>29/10/07</td>
</tr>
<tr>
<td>Brigit</td>
<td>Interview</td>
<td>1</td>
<td></td>
<td>30/10/07</td>
</tr>
<tr>
<td>Emma</td>
<td>Tele-Interview</td>
<td>1</td>
<td></td>
<td>31/10/07</td>
</tr>
<tr>
<td>Maire</td>
<td>Interview</td>
<td>1</td>
<td></td>
<td>5/11/07</td>
</tr>
<tr>
<td>Namiko</td>
<td>Interview</td>
<td>1</td>
<td></td>
<td>6/11/07</td>
</tr>
<tr>
<td>Rowan</td>
<td>Tele-Interview</td>
<td>1</td>
<td></td>
<td>7/11/07</td>
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</tbody>
</table>

**Table 5.1 Schedule of Data Gathering**

Most of students and graduates chose to fully disclose their identities online. One group of Year 3 online students had a majority of participants preferring total anonymity. Policy and practice about disclosure is discussed in the ethics section. Group size varied from four to nine dependent on the response rate from potential participants, with graduates forming the largest group. Attendance fluctuated from two to seven, depending on other commitments. Most participants attended one or two sessions, with some attending all sessions. Three did not participate in any session.

I selected focus groups as a method in recognition of a power differential between me as a teacher-as-researcher and students as participants. This imbalance was heightened as I was in a dual role as a research practitioner in an educational setting, whether or not the students were being taught and assessed in my courses (Murray & Lawrence, 2000, cited in Madriz, 2000).

As a nonhierarchical method, it enabled the shifting of the balance of power away from me, the researcher, towards the research participants. The number of participants also diffused my influence, which in feminist terms, is an advantage because it also can shift power and control towards the participants (Taylor & Bogdan, 1984, cited in Burns, 1999).
Thus, the participants’ viewpoints were emphasized, their own language used, and they contributed to setting the research agenda. Participants asserted their own interpretations and agendas which helped me to better understand their meaning making in line with suggested principles of feminist research. Focus groups enabled me to directly observe the co-construction of meaning in a social context via their interactions, and to analyse and evaluate them, particularly in the area of femininities and masculinities in the male domain of ICT (Madriz, 2000; Taylor & Bogdan, 1984, cited in Burns, 1999).

Another strength of the method is that group interaction produces data that otherwise would not be as easily accessible. It combines elements from individual interviews and participant observation, yet is unique (Janesick, 1998; (Barbour & Kitzinger, 1999); Madriz, 2000). It enabled me to observe of high levels of engagement within the dominant discourse and counter discourses in a concentrated timeframe, captured on in chat, audio and field notes, as a running record. Participant interaction often led to a greater understanding of their points of view, in the moment, and after during extensive analysis.

Face-to-face focus groups were complemented with virtual ones, with different participants in each. An advantage of an online focus group is that they enabled me to have participants at different locations take part in the sessions, with the consequential saving on time and cost, as the transcript is created during the session. Some suggested disadvantages include lack of spontaneity, loss of body language, and a limited depth of response. It is suggested they are not appropriate for exploring complex concepts or projects with high degrees of confidentiality, as the online expression of a discourse may be more difficult to articulate.

However, most of the participants in this research project were already adept at computer mediated communication, as gamers, chat room participants, or txters, and use a variety of symbols such as emoticons 😊 and abbreviations, like lol, to convey affect. They did not appear to have difficulty articulating conversations about women gender and ICT online. They used their computer screens while multitasking, and follow different conversations simultaneously. So, online focus groups were ideal for some busy women ICT students who preferred to participate online to face-to-face, despite the constraints for some NESB students.
Another advantage of online focus groups is that it enabled the at-a-distance ITP students to participate with other students with the same level of experience rather than limit their interaction to their peers within their physical location. Online groups enabled recent graduates to interact, socialize and reflect on their student and workplace experiences from different cities, including Australia. One limitation was when second year students who preferred face to face participated online due to a lack of numbers in their year group. Another was when one third year student who missed the first face-to-face session, and switched to take part in all online sessions, which was not her preference. Finally, some students who were unknown to the researcher from the sister ITP elected full online anonymity. This created some issues of engagement and rapport within the online focus groups which already had lean communication.

I had to establish the online focus group as a safe environment, and manage the technical issues that may arise from time to time. I sent reminders of meetings through e-mail addresses, used appropriate interactive skills during sessions, and facilitated online. This was similar to my online courses, especially when I run online tutorials in my online courses. The situation was reversed in that I was asking the questions and the participants answering them. I coped with losing access when the server failed, fluctuating and nil attendance, and dealt with issues such as developing rapport, mutual respect, and well timed responses in an appropriate vocabulary in an environment that lacks verbal and non-verbal para-linguistic cues, such as facial expression, body language, voice intonation, and silence.

Moments of identification and empathy occurred between me as researcher and the participants in inconsistent and unpredictable ways in both face to face and online settings. These points of recognition were sometimes slightly painful for participants and me as researcher as well as warm or enlightening. For example, I found myself becoming cross with an online group when the response of older women students attempted to diminish the seriousness of the alleged sexual harassment of a younger student. But I could observe how they engaged in discourses, expressed and modified them through discussion and debate, much of it somewhat challenging and provocative to me. Discourses were negotiated and renegotiated by the taking of differing individual experiences and attempting to make collective sense out of them in which subjectivities are elaborated. This was rich data for later analysis (Madriz, 2000).
It has been suggested that focus groups conducted with minority groups involve an intercultural interaction that has equal power relationships (Chiu and Knight, 1999). In these commonly mixed groups, of Pakeha, international and residents, this was not particularly evident. While attempting to be conscious of the effect of my own Pakeha racial identity, some tensions were generated by racial and cultural differences during the interactions of the participants. The focus groups sometimes cast students from ethnic groups as “other.” This occurred less often in the lean Moodle chat mode where often women students could obscure their racial and cultural characteristics behind an alphanumeric cipher (Madriz, 2000). In other words, when students from non English speaking backgrounds communicated in an online focus group, their ethnic background was not necessarily visible, even in a chosen online name, but their confidence with literacy was exposed. However, the medium gave them time to frame and revise their responses, before posting them, or reposting them, for greater clarity of the thoughts and feelings behind them.

Discussion has also centred on the issue of the appropriateness of focus groups being used to gather the data on ‘sensitive’ topics. Some feminist researchers affirm focus groups as being settings where participants are more likely to self disclose, with the attendant risk of the thrill of discussing taboos subjects, including the potential for ‘over-disclosure’ (Fuller, 1993; Kitzinger; 1994, Morgan & Kruger, 1993; Hoppe 1994, cited in Barbour and Kitzinger, 1999).

A sensitive topic is a relative term which occurs in research projects where there is the potential to raise strong feelings and opinions which may pose a threat to the participants or researcher. For example, students may give ‘positive’ feedback about their lecturers and courses in course evaluation forms, but then complain about a course or its teacher informally as they are not prepared to submit to a formal complaints process. Participants had the opportunity to critique their experiences of teaching and learning. Debriefing in my research journal and with my supervisor assisted in working this through potential conflict of interest, and to maintain confidentiality.

The relative success of focus group research sometimes attributed to research being carried out by women with women (Barbour & Kitzinger, 1999) For example, the focus group gave participants a setting in which they could choose to vent their feelings. The face to face groups did not appear to feel unsafe or show reticence. Tension did arise within the focus
group between some participants, particularly when they had mixed feelings, some ‘over-disclosed’, and others remained silent. I tried to set a positive tone, by providing lunch where possible, and a welcome, especially online. I managed the flow of discussion as sensitively as possible, chatting informally before we started, mutually setting ground rules, starting with less sensitive topics then moving to more sensitive topics, and ending with an opportunity to ask questions or make comments. This was essential to developing a rapport in the research setting, especially online which is a colder computer mediated medium than face to face.

In both online and face to face groups, the decision to have three sessions that covered different topics of greater sensitivity and depth as the group interaction evolved appears to have been successful. This was most noticeable in online groups, where participation evolved to greeting each other, chatting before the session proper, and signing off on leaving. As moderator, I modeled this behaviour which was taken up by the participants. Most participants attended one or two sessions, with some attending all sessions.

Despite all these advantages, there are also some disadvantages. For example, a focus group takes place in an unnatural setting, compared with a classroom setting when conducting participant observation. It depends on me being a skilled moderator to be fully effective. My skills increased with each session. Sensitivities include bringing up the controversial issues, and the extent to which informed consent can cover the disclosure of highly personal information, and quickly recognising the need for timeout (Janesick, 1998).

Another limitation was when second year students who preferred face to face participated online due to a lack of numbers in their year group. Another was when one third year student who missed the first face-to-face session, and switched to take part in all online sessions, which was not her preference. Finally, some students who were unknown to the researcher from the sister ITP elected full online anonymity. This created some issues of engagement and rapport within the online focus groups which already had lean communication.

The method did enable me to obtain immediate feedback on the discourses and the ways the participants use them, and their apparent effects which may challenge, corroborate, or marginalize each other (Green and Hart, cited in Barbour and Kitzinger, 1999). However, I cannot know to what extent the participants adapted what they say according to their assumptions about what I wanted to hear, so the method is not unproblematic.
Madriz (2000) cautions that we still need to be conscious that focus group method alone does not guarantee our voice or authority is minimized. Using a classroom setting for face to face groups could work either way, as it is traditionally a place where a teacher exerts control.

As feminist researchers, we should not use the rationale that focus groups are a quick and easy way to conduct large-scale studies, nor use an inappropriate quantification of focus group data. I agree with Wilkinson (1999, cited in Barbour & Kitzinger, 1999) that feminist researchers rarely report or analyse the processes of the interactions between the participants which is a key attribute of focus group data sets. Focus group data is just as constructed as any other method, regardless of the analytical framework being applied. But an analytical approach that emphasises the construction and negotiation of persons and events, and the functions served by different discourses, especially the ways that subjectivities are produced and perpetuated through talk, is more likely to generate feminist research outcomes.

Thus, feminist researchers still advise caution with focus groups as a qualitative method. Delamont, (2002)argues that the popularity of focus groups and interviewing individuals as methods in qualitative research stems from the fact they produce data quickly compared with proper observation in the field. She regards this data is inferior and different from the more time-consuming ethnographic approach where the researcher is immersed in the lives of the participants in natural settings. Barbour and Kitzinger (1999) disagree, and suggest that quality of the data is related to the research design, and the conscious choices the researcher makes to structure the ways in which the focus group method may enable the eliciting of ‘naturalistic’ data.

Another potential limitation is that moderating online is more of a challenge than face to face. Online interaction sometimes developed spontaneously, with interweaving of themes, and different conversations developing simultaneously. It was challenging to facilitate, to keep track of the different conversation threads, and respond to different sequences which may become potentially confusing to participants and moderator alike, especially when lag delayed responses to posts.

However, online facilitation requires the same skills as face to face sessions; with the potential for sensitive moments, the need to ensure that interruptions and incomplete interactions are clarified, and any participants who is not interacting is able to have an
opportunity to respond. Absences of response were sometimes due to no longer being at the computer during a session, for example, answering a phone call, preparing a drink of coffee, going to the toilet, or having multiple screens open and multi-tasking as well as taking part in the research.

Finally, focus groups should not be used as the sole method of data gathering. Consideration needs to be given to which voices may be silenced in this particular setting, especially as ongoing relationships may be compromised by disclosure (Michell, 1999, cited in Barbour & Kitzinger, 1999). Because what is heard may be commented on and reported through the social networks, and beyond, this may impose considerable constraints on what some women students and graduates are willing to disclose. This may sharpen the distinction between the more public nature of focus group, compared with the privacy of an interview. This did apply in all of the interviews to some extent, as is reported in the findings.

But the advantages outweigh the disadvantages. Using computer mediated communication for qualitative research is comparable in quality to face-to-face methods in focus groups and in depth interviews. They suggest there are particular advantages which include extending access to participants in different geographical areas, saving on costs for travel, transcription, and venue hire, eliminating transcription bias, as the participants are “embodied in words.” An online environment is conducive to easy dialogue, and is a user-friendly place to test ideas in a safe environment when participants logged into the private research space, such as the Moodle site for Engendering ICT.

**In Depth Interviewing**

The other qualitative method used was semi-structured in-depth interviewing. This form of data gathering is characterised by a semi-structured yet free-flowing conversation taking place between the participant and the researcher. I conducted six interviews, after the focus groups had finished. Four were face to face. I did not conduct online interviews, but used telephone interviews twice for participants, using the same pattern of questioning and listening technique in each.

I selected my interviewees on the basis of three criteria. Firstly, the leadership and participation that they had shown within the focus group setting, and their commitment to the
project as a whole. Secondly, I considered the attributes of the intake, and ensured a spread of age, schooling and qualifications, NESB status and ethnicity, and characteristics that were not recorded in the statistics such as being a parent. All of my interviewees accepted my invitation to be interviewed. Interviews took place in the lunch hour in a meeting room in the library at one ITP, or by telephone at a mutually prearranged time.

Interviewing one-on-one has many of the same characteristics as focus group interviews, and the same issues to ensure quality interaction. For example, a participant can safely vent, assured of confidentiality, and can be asked follow up questions to moments in the focus groups, that may need further explanation, or about which the participant wishes to elaborate. As with focus groups, the one-on-one interview enables the access to events and activities, regardless of time and place, which cannot be directly observed (Burns, 2000). Thus, like focus groups, it is more economical of time than participant observation, and provides an opportunity to disclose subjectivities, agency, discourses and their effects that had not emerged in the focus group situation.

Sensitive issues, which may not have been raised in a focus group, can be explored. For example, one participant talked openly about being a transgendered person learning ICT which she did not do with strangers online. The development of trust needed to occur before the participant granted permission to have her responses recorded. Sometimes, at the beginning of an interview, relevant content was talked about informally, before being officially recorded, and did not form part of the transcript. Whether this was fully disclosed in the research depended on the rapport established and the importance to the participant that these sensitive matters were placed on the record. It was important not to unduly influence responses, as the participant may have tried to give me the responses that I appeared to be seeking (Burns, 2000).

To try to minimize this possibility, I spent time establishing a rapport with students at the beginning of the interview. I often used nondirective questioning techniques, such as mirroring, and minimal encouragers such as ‘Yes’ and ‘Hmmm.’ As time went on, I learned to listen more and talk less, a real challenge for a teacher-as-researcher. I asked clarifying questions when I was uncertain of what the participant meant (Burns, 2000).
A set of questions was used in each interview to focus the interaction to a common purpose. These are listed in the Appendices. However, these were a starting point only. Showing the participant the question list, and using descriptive questions, at the beginning of the interview, helped the participant become the focus of the flow of interaction. Structural questions focused content of the interview on issues relevant to the research questions. Probing questions followed up responses to elicit more detail. Active listening skills, building empathy and non-verbal communication are clearly essential for a good interview (Anderson, 2004).

In summary, there are many similarities nature of focus group and individual interviews, and similar advantages, disadvantages, and skills required to create an environment where relevant and research focused interaction can occur.

**Use of NVIVO7 as an analytical tool for discourse analysis**

NVIVO7 was selected as the CADQAS tool for this research project. Weitzman (2000) notes the functionality available through such programmes to facilitate data analysis. This includes; making field notes, memos, editing, coding, storage, search and retrieval, data linking, content analysis, data display, conclusion drawing and verification, theory building, graphic making, and report writing. Software development has made it possible for qualitative researchers to undertake these tasks more easily and powerfully.

Understanding the software's affordances and limitations is important, and how these may “support or constrain your thinking to produce unanticipated effects” (Weitzman 2000, p.806). Initial concern in the qualitative research community was that the software itself would perform the data analysis, with artificial intelligence used to interpret text. Fears were held about the software being used to build theory. Effective use enables supporting your own intellectual effort to think coherently about the meaning of your data.

Other advantages include providing consistency with coding processes when using large data sets, and enabling feedback from other researchers or participants. While it takes some time to prepare the data for analysis, and for a new user to learn to use the program, this is

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5 Computer Assisted Qualitative Data Analysis Software.
compensated for by how relatively quickly coding and referencing of sources can be done. Graphical relationships among the codes text segments or cases can help visualize ways of thinking about the data and theories generated. NIVO7 is a flexible and powerful repository for all documentation in qualitative research, and a powerful support to the analytical process.

On the other hand, the ease of some forms of coding such as auto coding could encourage the taking of shortcuts, being lazy, and making premature theoretical judgments and assumptions. For example, using key words, and research questions as nodes can obscure other ways that the discourse is being expressed by other participants. Using the software cannot become a substitute for learning properly about undertaking research. Coding clusters of discourses still involves reading, thinking, and interpreting where to code, and which nodes are appropriate.

NVIVO7, as with any complex software package, requires active learning to master its functionality. Its work space has a similar the look and feel of Microsoft 2003 Office products with three main views. It enables importing into a new project of all the electronic documents that had been generated during the research process as sources within the customised folders, or linked as externals. The coding generates referencing by paragraph numbers which is very useful for in text referencing of data.

It enables coding sources by discourse which is stored within a ‘node.’ I used free nodes which are stand-alone. While I experimented with and learned other functions, I primarily used the software to manage the datasets, code the discourses and discursive and material effects, and to identify any overlying and overlapping discourses in my analysis. I also used it to reference the data used in the findings, which provided numbered paragraphs, names of participants, and the context for accuracy and trustworthiness.

Working with the data required reading and reflecting on the focus group and interview transcripts, in common with any form of discourse analysis. I began by coding face-to-face year one students, then the online group. I worked progressively through the year groups to the graduate group. The transcripts were coded as free nodes according to the discourses that emerged from the text and interactions within it. Multiple codings to more than one free
node category reflected the way that the rich descriptive data had multiple readings that could be made. I then identified the three overarching discourses, and recoded to them. Finally I coded interview data as free nodes, which deepened the possible interpretations that could be read into them. I was then able to map out the findings chapters, and group evidence from the analysis to assist with the development of my interpretations.

In summary, keeping the analysis simple in terms of software functionality and yet complex in terms of poststructuralist feminist research practice became a balancing act that was important to maintain. It is suggested that the use of such software forms part of advanced undergraduate courses, so that the emphasis at postgraduate level can be on the use of the software as an analytical tool, rather than learning both at once. However, while the software needs to be learned, it proved its worth as both an analytical tool from a poststructuralist perspective, and as an assistive technology enabling an emerging researcher to engage productively with a large data set of 17 focus group sessions, and six individual interviews, involving a total of 31 active participants.

**Ethical Approval Process**

The ethical approval process was complex and lengthy. It involved approvals from my academic institution as a postgraduate student, from the ITP where I worked as an internal researcher, and from a sister ITP for whom I worked voluntarily as an external researcher. I also consulted the University of Otago Maori Research Consultative Committee, as some participants may have identified as Maori.

Each of the three tertiary institutions had different processes policies and requirements. Approval was negotiated over a 5 month period from April 2007 to August 2007. Ethical approval of the research proposal was first granted conditionally by the University of Otago Human Ethics Committee in May. The modified research project then gained ethical approval in August from the two ITPs, which was approved by the university ethics committee in its final form. While this ethical approval was sought in a linear manner, any future approvals
Ethical approval for the research proposal was required by the University of Otago as it involved human participants. Conditional approval was granted subject to an assurance that the educational institution in which I worked was aware of the research and that their students were involved. The requirements for personal information about graduate students were also clarified. The scope of the project was then widened to include students from a sister ITP in Te Wai Pounamu at the request of their Head of School of Computing. These matters were clarified by memorandum to the convenor of the committee. Access to the student records for research purposes was granted by the Privacy Officer in my ITP.

Internal research approval firstly involved endorsement from the research committee in the school in which I was teaching, and in the School of Computing, whose students were potential participants, as well as being signed off by the Dean of the Faculty. The research proposal was then sent to the Academic Research Committee for approval. Internal policy was that where proposed research was part of a qualification, staff submitted their research proposal with an attachment showing it had been approved by the institution in which they were enrolled, including ethical clearance. In most cases, such approval foreshadowed endorsement.

However, the Academic Research Committee referred the proposal to the internal ethical approval process because of the research policy where a staff member with students was also involved as a researcher. Staff members were not able to undertake research with students whom they were currently teaching and assessing, unless it was a form of action research. Because six of my students were potential participants, much debate evolved around anonymity, and how I could, if at all, facilitate the focus group and any possible in-depth interviews with them. Debate included whether I could invite them to participate. Resolving these issues involved direct negotiation between me and representatives of the ITP Ethics Committee. This included the former chair whom I knew professionally, who supported my research proposal, gave advice about its modification and was the independent support person and facilitator with my students as participants.
My research project plan was approved to include first year students whom I was teaching as potential participants, to enable as wide a cross-section as possible. Managing potential conflicts of interest as a teacher and researcher, issues of guaranteed confidentiality and anonymity for students and countering possible bias, internal ethical approval was granted subject to three conditions. Firstly, I was unable to assess of any participants in the research project. Secondly, full anonymity was offered in an online mode of data collection for any participant. Finally, full anonymity in an online focus group was recommended as the course of action for my students, at a meeting facilitated by an independent person. Accordingly, online focus groups were set up by a third person, the e-learning advisor, with complete anonymity as the default setting. Disclosure had to be deliberately chosen by the participants through changes they made to their site login. It was also agreed that the names of the ITPs remained anonymous, and were only identified as being located in two cities in Te Wai Pounaumu, the South Island of New Zealand.

As I was an external researcher to the sister ITP, the ethical approval process and access to student records with the Privacy Officer was managed by the Head of School, as the sponsor of the research. A simple process of ethical permission was signed from the sister ITP, and both agreements endorsed by the university ethics committee. Confirmation that these processes had been satisfactorily concluded was required by both the University of Otago and my ITP before the research project could commence. This was done, and full approval from my academic institution was gained. Approved information and consent forms are listed in the Appendices.

As it transpired, students I taught elected full disclosure in face to face and online modes. But some students who were unknown to the researcher from the sister ITP elected full online anonymity. This created some research validity issues about how the participant sample compared to the women student sub-set demographics. It also created some issues of engagement and rapport within the online focus groups which already had lean communication. For example, some students confused each other’s alphanumeric ciphers, made statements, rather than interacting, and had difficulty following the discussion threads. In retrospect, I consider this is better used as an appropriate data collection method if the students are familiar with the conventions of online communication, may already know each other as part of a learning or ICT community, and are able to interact and understand that form of online communication.
In hindsight, I recognise the value of developing the research proposal concurrently with all stakeholder institutions so that the differences and tensions that arise within the project can be better managed before ethical approval is sought officially. My expectation, as an emerging researcher, was that the research proposal would be approved sequentially, and that being approved by the institution where my qualification lay, would guarantee acceptance in my workplace. However, as shown above, insider research carries with it greater sensitivities which need careful management from the inception of the research proposal. Consequently, the original research method was modified to accommodate the internal research policies so that the project could commence.

Had I been aware of these policy constraints initially however, it is unlikely that this research would have been undertaken in this form. My persistence, and support from my academic supervisor, university, and sister ITP, and internal allies enabled the political issues to be resolved to the satisfaction of all parties and enhance my credibility as an emerging researcher. Since then, there has been an ethical process policy review with advice from a university within our region so that a wider range of research modes can potentially be undertaken by staff.

**Trustworthiness**

Further, I have considered the concept of trustworthiness built on reciprocity (Harrison, MacGibbon & Morton 2001), and the broad criteria of both trustworthiness and authenticity (Schwandt, 2007; Lincoln & Guba, 2007). I am mindful that I am working and researching as a feminist at more of a distance from participants, in a technocratic position within a conservative educational environment with a business focus (Howe, 2009). I am located in this “web of beliefs, practices, and standpoints” (Schwandt, 2007, p.11). My interpretations are made within this subjective context, and infused with political and ethical implications arising out of issues of power and authority.

As a professional educator, I am conscious that my professional code of conduct as a registered teacher precludes friendships with my students, unlike those which may be formed by researchers in not-for-profit women’s organisations. My credibility as a teacher-as-
researcher requires me to negotiate research projects in settings where I teach and in a sister ITP. I need to understand the organisations’ relational networks and the parameters of the research policies of my employer and the collaborating ITP. The care and tact that I exercise arises out of my duty of care to any students and graduates, and those research relationships (Noddings, 2003).

**Reflexivity**

I acknowledge this section is incomplete in its theorising, and that I am yet to fully absorb Pillow’s (2003) suggested reflexivity. However, I have redrafted so that this section takes account of “whether we can be accountable to other people’s struggles for self-representation and self determination including ourselves.” (p. 177). In other words, can I use an ongoing critique in this work to claim neither success nor failure. Rather I admit that this is probably an impossible task, but it needs to be done anyway.

As a teacher, I am used to reading eclectically across the science, social science and the humanities fields to inform my professional practice. To me, it felt obvious to choose mixed methods for my own research. Reflecting back on the choices I made, what strikes me is the level of complexity that this introduced into my research. This richness contrasts vividly with my personal circumstances when I started this work. I was in a very marginal position in the ITP. I had lost most of my teaching hours in a restructuring. I taught one ethics course in the School of Business for computing students. I deliberately decided to turn this to my advantage. I had time to devote to developing my research skills.

Tensions keep on arising around how to best position myself as a researcher in this field. As a feminist, what guided me strongly at first was to seek a method that engaged as wide a range of participant voices as possible and contextualize them demographically. But, being a feminist is at odds with some of the initiatives to attract women into ICT. And, while my data gathering method is broad, my theoretical paradigm of poststructuralism is a specific form of feminist theorising that sets me apart from some of my Systers. Then, as I immersed myself in the literature, I became increasingly conscious of a need to bridge these diversities with the most inclusive approach as possible. I felt the same while networking online and at national

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6 Systers is an online forum within the Anita Borg Institute through which feminists within ICT communicate issues.
and international conferences with other researchers. In this field of women gender and ICT, a multi-disciplinary field, we use similar words, such as matrix, paradigm, support and research in different ways from different ontological and epistemological landscapes. We make meaning in multiple and as yet not fully comprehensible ways to each other. As such, communication is imperfect and tentative, but our relationships can be strong.

But some things are deeply recognisable. I am a new researcher in a contested field that is only just gaining recognition as being “about” computing or ICT after a decade of struggle. There is a fragility and vulnerability underlying what we are trying to accomplish. While I am trained in communication, information design and usability testing, I do not teach these computing specialties. While I am an experienced educationalist, I do not hold higher academic qualifications in a computing field. Most of my colleagues and Systers are technically adept but many of them do not have formal teacher qualifications at all. These contradictions nudge me to find an authentic voice to write as a researcher in this field. I am intrigued and often frustrated by these paradoxes. How do I fit, if at all, and am I communicating fittingly?

At best, I have tried to facilitate and interpret how women students make meaning out of their emergence as ICT professionals. At worst, I recognise I may have misunderstood, and that their voices may still be ignored by my colleagues. I am on uncertain ground in terms of our research practices. But what stays with me is that this study is only a small beginning. The women in the study may desire more, but also they may not, beyond their participation to date. Thus, my rationale and method have been troubled. I have developed it through an iterative process of challenging it, reworking, deepening and confirming it and abandoning parts of it. Maire keeps asking when I will be finished. I have also worried and rationalised about finding a way of researching in this field that is the most appropriate. It is flawed by not having responses from the participants, and I am aware that my interpretations are partial and subjective. Even so, I intend to continue as feminist researcher working as reflexively, haltingly, and meaningfully as I am able. We can use the words of this neoliberal time, and still make ethically sound contributions, by adding our poststructuralist voices to the cacophony and sometimes harmony of women, gender and ICT research.
Chapter 6: On the ground: Southern New Zealand Polytechnic IT students

Introduction

The purpose of this chapter is to contextualise the participant discourses within the main features of the two student bodies studying ICT courses in the two Te Wai Pounamu - South Island ITPs. The data was extracted from the in-common record system. All students were described in terms of gender, ethnicity, international student status, age, schooling, highest tertiary qualification held, and highest school qualification gained. Each characteristic formed an indirect indicator of learning ability and needs as discussed further in each specific section.

Using existing data as part of mixed method research is pragmatic, as it has already been compiled. Under the Education Act 1986, ITPs are required to gather and report educational data from their record systems to the Ministry of Education, which is collated by a unit within the Tertiary Education Commission. This quantitative data is currently reported by the category of education institutions within the tertiary sector. At present, no data is collated and reported by individual educational institution. However, it is available for research purposes, at the level of each institution by accessing the student data from the record system. This analysis is based on those records and data categories within the limitations discussed in the method section and this chapter. It does not include graduates as their data is no longer in the active record system.

In this simple demographic data, that compares the students across the four programmes, I am attempting to capture the student body as a fluid, multiplicity of student experience and expectations, from their different socio-cultural contexts. However, these demographics substantiate that student needs are more diverse which may affect their motivation and work ethic, as is discussed in the findings.

The other purpose of this analysis is to locate the project participants within the contours of the intake as a whole, to see who participated, where gaps exist and what kinds of voices are silent or under/over represented in the discourses that later emerge.
Gender

In common with the patterns of student enrolment reported in the literature from the United States, UK, and Australia, male students greatly outnumber female students across the four IT courses. Male students comprise 79% of the 491 student cohort as at 30 July 2007, from intakes in February and July. As the table of student numbers shows, the female gender ranges from 38% in the one year post graduate diploma, 20% in the first degree programme, 20% in the two year diploma programme, to 15% in the second degree programme.

![Distribution of Gender by Programmes of Study (as at 30/07/2007)](image)

**Figure 6.1 Distribution of Gender by Programmes of Study (as at 30/07/2007)**

So, in keeping with western trends, these female ITP students are learning ICT skills in a predominantly male environment. As reported in the findings, the gender presence also varies according to the ICT domain. The effect is that they may be one or two women in a networking class, but up to a third in a multimedia class. This trend could be further analysed in another study.

Ethnicity

The most prevalent student ethnicity as self-identified is New Zealand European/Pakeha (60%). The range within that New Zealand ethnicity, 9 categories in all, reflects a growing number of New Zealand students with mixed ethnic heritage, and a greater awareness and
Identification with that heritage. Ethnicity patterns also reflect the number of students who come to New Zealand from Asia, especially China (37%) and India (5%) and other smaller countries as well as the South Pacific and some parts of Eastern Europe. It also shows a significant number of students are learning ICT in English from a non-English speaking background (NESB).

![Figure 6.2 Ethnicity by Programmes of Study](image)

The long tail of small numbers in ethnic categories reflects the contours of cultural diversity within ICT classes. But assumptions cannot be made about the significance to students of that identity, or the effect on the students if they are only one or two from a specific culture. Further, their language acuity cannot be inferred. They may be residents, rather than international students, but residents are not differentiated in the current data. Cross matching is subject to error and assumption if based on a family name. This needs further detailed analysis, beyond the scope of this overview.
Figure 6.3 International Students by Programme of Study

Historical constraints outlined for Kai Tahu as tangata whenua may account for the low number of students, 2%, claiming Maori heritage. This percentage includes waka Maori who have migrated south from other iwi areas. The exact identity of students who are Maori is difficult for the institutions to discern as the indicators are subtle and disclosure is voluntary. Relatively few Maori are training in ICT, in Te Wai Pounamu-South Island ITPs, which could be explored in Kaupapa Maori research.

Age and previous work status

Figure 6.4 Age by Programme of Study
Diversity is also apparent from the range of ages of the students. School leavers are well represented in the two year under graduate diploma and the two degree programmes. But the largest group is students in their 20s, especially in the degree and post graduate diploma programmes. An effect is that many classes will be a mixture of young students and mature adults in their early 20s to early 30s who are changing careers after having worked in the paid workforce. This leads to probable ranges of expectations and levels of motivation among the student intake. The older the student, the more likely the person may have a partner or family as dependants or breadwinners while they study. Age is also a factor when linked to the time that has elapsed since the student participated in formal education. If that experience was at secondary level, and was not positive, then it may be quite a challenge to overcome that previous experience, and literacy issues with academic study may need to be addressed. New modes of delivery, such as online courses, may have not been experienced. This too, could be further researched.

**Education experience and achievement**

The cohort covers a range of schooling experiences from large urban co-educational high schools, to smaller provincial high schools in rural towns. Single sex boys schools are well represented, and single sex girls schools under represented numerically by comparison.

![Secondary Schools attended by Programme of Study](image)

*Figure 6.5 Secondary Schools attended by Programme of Study*
Only some students have previously engaged successfully in tertiary education, with a minority gaining higher and under graduate degrees, and some with trades certificates and diplomas. But the majority have not previously participated, or may not have participated successfully, as there is mostly no recorded outcome of a tertiary qualification. This data is limited as it excludes one degree programme. However, personal communication with a programme leader suggests that the records do not accurately reflect some student tertiary qualifications. Whether this is an issue within the record system, or students do not fully disclose previous tertiary experience, or the students are confused by the categories leading to underreporting is beyond the scope of this study. However, the finding does link to the concept of second chance education, with a majority of students studying to gain a qualification for vocational reasons to improve their standing in the workforce by choosing ICT.

![Figure 6.6 Highest Tertiary Qualification by Programme of Study](image)

Student secondary educational achievement is more homogeneous, as befits entry to a technical field, with 49% holding NCEA\(^7\) Level 3, or its older or overseas equivalent, 23% holding Level 2, or its equivalent, and 11% holding Level 1, with the remainder with no recorded qualification. The lack of formal school qualifications for some students is anomalous. It may reflect their entry from the workforce, and their participation in their

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\(^7\) National Certificate of Educational Achievement (NCEA) is the New Zealand national qualification for secondary students. Level 1 is undertaken at Year 11, Level 2 at Year 12, and Level 3 at Year 13, the final year of high school.
training as second or perhaps third chance education. For younger students, who are required to meet the current entry criteria, it may reflect the results not being available or recorded at the time of pre-enrolment, or a waiving of the formal criteria by the programme leaders on the grounds of ICT qualifications gained which are not categorised within the record system. This limitation means that the information needs to be treated with caution. Again, it excludes one degree programme.

However, a general trend of many students having underachieved at tertiary level, learning alongside younger students who have recently met the entry criteria, means that diversity of learning needs and possibly overcoming negative secondary schooling experiences for some will need to be managed in the delivery of the curriculum. This is further discussed in the other findings chapters.

![Figure 6.7 Highest School Qualification by Programme of Study](image)

**Disability**

A minority of students, 6%, report disabilities across the programmes. The type of disability is not reported, so no conclusions can be drawn. However, it may impact on the delivery of the curriculum to these students.

**Part time and full time enrolment status**
The records also show how many EFTS are taken up by each student. Some students enrol in a less than full time workload, and others have an additional semester to complete their full qualification. However, this indicator needs to be treated cautiously (personal communication with a Head of School) as the record system in one ITP treats full time students who enrol mid year as having less than a full time load. So this data may not be useful to interpret because of these limitations, and as such is not reported in the body of the thesis.

**Engendering ICT Study student participants**

In order to show how the participants relate to the demographics of the July 2007 cohort, the table below lists each student by their pseudonym, their year of study, type of participation, and their characteristics. As is shown, the participants are overrepresented in the Dip ICT programme, and underrepresented in the G Dip ICT programme. The graduates are all from degree programmes, with some starting in the Dip ICT programme. While the participation pattern may reflect the familiarity with the researcher as a lecturer, and the active support of the Head of School in recruiting participants from other ITP, the lack of uptake by the G Dip ICT is not accounted for, and would need to be pursued in future research.

The demographics of the 23 student participants\(^8\) are recorded as follows. The participants are grouped by their programme of study in their ITP, and contain a mixture of year levels. Some data is not available from one ITP. This table gives a background picture of the characteristics of the participants, which particularises them, and can be read across the general patterns in the July 2007 cohort as a whole. Where exact details could lead to the identification of individuals, the information has been generalised further. For example, ethnic backgrounds have been blended with other categories.

\[\text{\textsuperscript{8}}\text{This data excludes the graduates whose data was no longer in the active record data base. ** indicates a recruited student who did not take part in the research project sessions.}\]
<table>
<thead>
<tr>
<th>Pseudonym</th>
<th>Programme</th>
<th>Ethnicity</th>
<th>Age</th>
<th>Secondary Education</th>
<th>Last year at school</th>
<th>Highest school qualification</th>
<th>Highest tertiary qualification</th>
<th>Occupation</th>
<th>Workload</th>
<th>International Student</th>
<th>Disability</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICTY3E Y3</td>
<td>Bachelor of Information Technology</td>
<td>Indian</td>
<td>42</td>
<td>OVERSEAS SECONDARY SCHOOL</td>
<td>1983</td>
<td>&quot;OLD&quot; Higher School Certificate OR 30+ NCEA Level 3 Credits</td>
<td>N/A</td>
<td>Overseas (irrespective of occupation)</td>
<td>PT*</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>ICTY3B Y3</td>
<td>Bachelor of Information Technology</td>
<td>Chinese</td>
<td>54</td>
<td>OVERSEAS SECONDARY SCHOOL</td>
<td>1974</td>
<td>&quot;OLD&quot; Sixth Form Certificate (one or more subjects) OR 30+ NCEA Level 2 Credits</td>
<td>N/A</td>
<td>Non-employed or Beneficiary (excluding retired)</td>
<td>PT*</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>ICTY3D** Y3</td>
<td>Bachelor of Information Technology</td>
<td>Other Pacific Peoples</td>
<td>22</td>
<td>North Island City Co-ed</td>
<td>2002</td>
<td>&quot;OLD&quot; School Certificate (one or more subjects) OR 14+ NCEA Level 1 Credits</td>
<td>N/A</td>
<td>Polytechnic Student</td>
<td>PT*</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Emma Y1</td>
<td>Bachelor of Information Technology</td>
<td>NZ European / Pakeha</td>
<td>19</td>
<td>OVERSEAS SECONDARY SCHOOL</td>
<td>2005</td>
<td>NCEA Level 2 or 6th Form Certificate</td>
<td>N/A</td>
<td>Wage or Salary Worker</td>
<td>FT</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Red Y1</td>
<td>Bachelor of Information Technology</td>
<td>NZ European / Pakeha</td>
<td>25</td>
<td>South Island City Co-ed</td>
<td>2000</td>
<td>&quot;OLD&quot; Higher School Certificate OR 30+ NCEA Level 3 Credits</td>
<td>N/A</td>
<td>Non-employed or Beneficiary (excluding retired)</td>
<td>FT</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Kara Y1</td>
<td>Bachelor of Information Technology</td>
<td>NZ Maori</td>
<td>19</td>
<td>South Island City Single Sex</td>
<td>2006</td>
<td>No formal secondary qualification</td>
<td>N/A</td>
<td>Secondary School Student</td>
<td>FT</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Serena Y2</td>
<td>Bachelor of Information Technology</td>
<td>NZ European / Pakeha</td>
<td>23</td>
<td>South Island City Co-ed</td>
<td>2002</td>
<td>&quot;OLD&quot; University Entrance OR NCEA Level 2 (ie 80+ credits)</td>
<td>N/A</td>
<td>Polytechnic Student</td>
<td>FT</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Latika Y3</td>
<td>Bachelor of Information and Communication Technologies (BICT) L7</td>
<td>Pakistani</td>
<td>22</td>
<td>North Island City Single Sex</td>
<td>2001</td>
<td>Higher School Certificate of 12 to 39 credits at level 3 or higher</td>
<td>Trade Certificate Secondary School Student</td>
<td>PT</td>
<td>No</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Brigit Y3</td>
<td>Bachelor of Information and Communication</td>
<td>New Zealand European</td>
<td>33</td>
<td>South Island City Single Sex</td>
<td>1991</td>
<td>A or B Bursary or National Certificate at level</td>
<td>No Tertiary Qualification</td>
<td>Wage or Salary Worker</td>
<td>FT</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Name</td>
<td>Year</td>
<td>Qualification</td>
<td>School Type</td>
<td>Tertiary Qualification</td>
<td>National Diploma/NZ Diploma</td>
<td>Private training Establishment Student</td>
<td>FT/PT</td>
<td>Wage or Salary Worker</td>
<td>FT/PT</td>
<td>Tertiary Qualification</td>
<td>FT/PT</td>
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<td>Rihannon</td>
<td>Y3 Face to face</td>
<td>Bachelor of Information and Communication Technologies (BICT) L7</td>
<td>New Zealand European / Pakeha</td>
<td>22</td>
<td>South Island Co-ed</td>
<td>2001</td>
<td>University Entrance or a National Certificate at level 2</td>
<td>No Tertiary Qualification</td>
<td>Wage or Salary Worker</td>
<td>FT</td>
<td>No</td>
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<tr>
<td>B'arch</td>
<td>Y3 Online</td>
<td>Bachelor of Information and Communication Technologies (BICT) L7</td>
<td>New Zealand European / Pakeha</td>
<td>33</td>
<td>South Island City Co-ed</td>
<td>1989</td>
<td>Sixth Form Certificate in one or more subjects or 12 or more credits at level 2</td>
<td>No Tertiary Qualification</td>
<td>Other</td>
<td>PT</td>
<td>No</td>
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<tr>
<td>Heather</td>
<td>Y3 Face to face</td>
<td>Bachelor of Information and Communication Technologies (BICT) L7</td>
<td>New Zealand European / Pakeha</td>
<td>25</td>
<td>South Island City Co-ed</td>
<td>1998</td>
<td>Higher School Certificate of 12 to 39 credits at level 3 or higher</td>
<td>National Diploma/NZ Diploma</td>
<td>Private training Establishment Student</td>
<td>FT</td>
<td>No</td>
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<td>ICTY3A</td>
<td>Y3 Online</td>
<td>Bachelor of Information and Communication Technologies (BICT) L7</td>
<td>New Zealand European / Pakeha</td>
<td>42</td>
<td>Attended NZ School Not on List</td>
<td>1981</td>
<td>School Certificate in one or more subjects or 12 or more credits at level 1</td>
<td>New Zealand Certificate</td>
<td>Houseperson or Retired</td>
<td>FT</td>
<td>No</td>
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<tr>
<td>Lucy</td>
<td>Y2 Online</td>
<td>Diploma in Information and Communication's Technology L6</td>
<td>New Zealand European / Pakeha</td>
<td>46</td>
<td>South Island City Single Sex</td>
<td>1976</td>
<td>University Entrance or a National Certificate at level 2</td>
<td>No Tertiary Qualification</td>
<td>Wage or Salary Worker</td>
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<td>Namiko</td>
<td>Y2 Online</td>
<td>Diploma in Information and Communication's Technology L6</td>
<td>*SE Asia</td>
<td>34</td>
<td>Overseas Secondary School</td>
<td>1991</td>
<td>Overseas qualification (includes International Baccalaureate)</td>
<td>Masters Degree</td>
<td>Overseas</td>
<td>FT</td>
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<tr>
<td>Tyla</td>
<td>Y1 Face to face</td>
<td>Diploma in Information and Communication's Technology L6</td>
<td>New Zealand European / Pakeha</td>
<td>19</td>
<td>City Integrated Area School</td>
<td>2006</td>
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<td>Year</td>
<td>Mode</td>
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<td>Region</td>
<td>Age</td>
<td>Entrance or National Certificate at level</td>
<td>Wage or Salary Worker</td>
<td>Hours</td>
<td>Status</td>
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<td>Karen</td>
<td>Year 1</td>
<td>Face to face</td>
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<td>New Zealand European / Pakeha</td>
<td>30</td>
<td>South Island Integrated Co-ed</td>
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<td>New Zealand European / Pakeha</td>
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<td>South Island City Co-ed</td>
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<td>Wage or Salary Worker</td>
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<td>Anya</td>
<td>Year 1</td>
<td>Face to face</td>
<td>Diploma in Information and Communication Technology L6</td>
<td>Eastern Europe</td>
<td>32</td>
<td>Overseas Secondary School</td>
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<td>Wage or Salary Worker</td>
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<td>No</td>
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<td>Rae</td>
<td>Year 2</td>
<td>Online</td>
<td>Diploma in Information and Communication Technology L6</td>
<td>New Zealand European / Pakeha</td>
<td>29</td>
<td>South Island Co-ed</td>
<td>A or B Bursary or National Certificate at level 3</td>
<td>Other</td>
<td>Private training Establishment Student</td>
<td>PT</td>
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<td>Jan</td>
<td>Year 3</td>
<td>Face to face</td>
<td>Diploma in Information and Communication Technology L6</td>
<td>New Zealand European / Pakeha</td>
<td>60</td>
<td>North Island Co-ed</td>
<td>Entrance qualification from Bursary exam or 40 or more credits at level 3 or higher</td>
<td>Bachelors Degree</td>
<td>Wage or Salary Worker</td>
<td>PT</td>
<td>No</td>
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<tr>
<td>Ann</td>
<td>Year 1</td>
<td>Face to face</td>
<td>Diploma in Information and Communication Technology L6</td>
<td>New Zealand European / Pakeha</td>
<td>52</td>
<td>North Island Co-ed</td>
<td>Sixth Form Certificate in one or more subjects or 12 or more credits at level 2</td>
<td>Other</td>
<td>Houseperson or Retired</td>
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<tr>
<td>Patti</td>
<td>Year 2</td>
<td>Online</td>
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<td>New Zealand European / Pakeha</td>
<td>29</td>
<td>South Island City Single Sex</td>
<td>University Entrance or a National Certificate at level 2</td>
<td>No Tertiary Qualification</td>
<td>Polytechnic Student</td>
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Table 6.1 Demographics of participants
As this data is also extracted from the records, the same limitations and omissions apply. This data is as accurate as can be achieved as supplied by a second party, rather than extracted at source by the researcher. However, the overall patterns can illuminate the characteristics of the participants against the 2007 cohort of students as a whole.

Of the 23 students volunteering for the study, seven were enrolled in the BIT, six in the BICT, and 10 in the Dip ICT. No participants took part from the G. Dip ICT. Of the four students who elected full online anonymity, all were degree students, were older, and were in their third year or more of study. One did not take part in any session, and her cipher remains unchanged. Eleven of the participants were enrolled part time\(^9\), and 14 were fulltime students. Some were completing their final courses for their qualification, and others were working full time as well as studying.

The participant group identified ethnically as predominantly New Zealand /Pakeha, with one New Zealand Maori woman, one from Eastern Europe, and four from Asia. Only one identified as an international student, so it is presumed the other ethnically diverse women had New Zealand residency.

There is a considerable age range within the group: three were under 20, four in their early twenties, four in their late twenties, six in their early thirties, three in their forties, two in their early fifties, and one in her early sixties. They are generally older than the students in the 2007 cohort.

Most had attended a co-educational high school, with five attending a single sex school. Most had not attended a formal course of learning since their secondary schooling. Consistent with their ages, the general trend was the older the student, the greater gap in her formal education. One had attended in the 1960s, three in the 1970s, two in the 1980s, eight in the 1990s, and nine in the 2000s.

They had a greater range of academic achievement compared to the student group as a whole. Two had completed degrees, including one at post graduate level. One had a Trade Certificate, one, a New Zealand Certificate, and one a two year diploma. While most had met the school academic entry criteria for the courses, they did at the lower end of the scale, compared to the cohort as a whole. There were seven who had been given entry on other grounds than school academic ones.

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\(^9\) PT* indicates probable full time status owing to an anomaly in how a record system attributed status.
They also had a range of backgrounds. Immediately prior to entry to their programmes of study, two had been in receipt of a benefit, two were house persons, three were secondary students, two were resident overseas, five had been polytechnic or private provider students in another tertiary programme, and eight were in the workforce, and one was unspecified.

In summary, the participants were women who appear to be under-qualified at tertiary level, based on their ability as shown in their school achievements, or have under-achieved. They were also taking up training in ICT to improve their employment status, as most were already employed. This finding is consistent with the ITP tradition of “second chance” education and training leading to a more skilled workforce (Day 1992; Olssen & Matthews, 1995). To undertake such training at a more mature age as women is consistent with Ministry of Education policy and the policy of interest free student loans to assist with the payment of fees. However, it also indicates possible disrupted pathways in career training for these women, as they are taking it up at an older age, which will be taken up in the findings chapters.

There is no demographic data for the graduates, as only current enrolments are kept in the records system. The focus for graduates is their experience of their participation in the ICT workforce, and to what extent they consider their education and training prepared them for this work.

The next three chapters analyse how students and graduates experienced their training and their emergence as IT professionals. This analysis is of the discourses that arose out of the focus groups and individual interviews in which they participated.
Chapter 7: Gender, women and ICT: the dominant discourse of Constraint

Introduction

Two overarching discourses and their discursive effects have emerged from my analysis: those of Constraint, and Resistance and Resilience. These are not pure, but overlap and inform each other as they are played out within material and discursive practices within ITPs and ICT training. On some levels it is artificial to separate them out, but in order to discuss them in any detail it was necessary to do so. My analysis of Constraint in this chapter identifies some epistemological and methodological concerns. That is, issues about the nature of knowledge and the methods to use to access it. My poststructuralist technofeminist framework guides my theorising about the ways that subjectivities are being spoken into being about gender, women and ICT in general, and taken up about becoming an ICT professional in particular. This process of forming subjectivity is analysed initially within the dominant discourse of Constraint. It is further analysed in the counter discursive and material effects of Resistance and Resilience in the next chapter.

In this chapter, I begin by delineating the nature of the dominant discourse and its key material and discursive effects. The Constraint discourse illuminates what subjectivities are being taken up by women as emergent and new ICT professionals. It shows the negative discursive and material effects of acquiring these skills in a traditionally male domain, in a context of minimal recognition of countering these effects on ITP practices. This analysis relates the ways that these discursive effects impact on the agency of lecturers and students alike, as regulating norms, located within the discourse of Constraint. The chapter concludes with an extract, Rihannon, as a bridge to the next chapter on the counter-discourse. It shows how these two discourses are interwoven to overlap and inform each other. The malleable, sometimes fragile yet cohesive nature of their interrelatedness is made explicit.
**Constraint**

Constraint was the most prevalent discourse coded in this research. It generated 112 instances from 23 source focus group sessions and interviews. Constraint is taken up by ICT women students and graduates to articulate some of the ways their agency, as knowledge and power, is limited, disrupted and contained during their training and education. The counter-discourse is accessed to a lesser extent, as coded and quantified in the next chapter.

The term Constraint was used to describe this discourse, rather than the more common term “Barriers.” The current literature tends to privilege external factors and patterns of effects (Camp, 1997; Fisher & Margolis, 2002). Theorising has tended to problematise the lack of participation by women in ICT by identifying the limitations which students and graduates can be helped to overcome, such as the institutional, socio-cultural and policy issues for example. In contrast, my analysis focuses on the subjectivities, agency and disempowering effects of the Constraint discourse. I suggest that this focus is critical as it enables the analysis of the material and discursive effects of this discourse. It illuminates how these effects are produced and perpetuated in a small scale Anglo-phone nation state, where there is no active encouragement of women to train in the global, yet traditionally male domain of ICT. Focusing on constraint rather than barriers provides an opportunity to illuminate instances of Resistance and Resilience.

These effects are derived from positioning, agency and power relations that arise out of the institutional policies and practices and are detailed in the following sections. Students relate their pedagogical and financial struggles arising from disrupted vocational pathways into ICT training, the ICT industry and their perceived prospects of future employment. They describe the ways that acquiring ICT skills in a male gendered domain has negative effects on re/engaging in their learning, curriculum content and delivery, classroom interaction, and relations with peers and lecturers in the context of an ITP environment.
Effects of Constraint

Disrupted pathways into IT training in spite of having a high interest in computers

When making sense of their schooling, students often spoke of experiencing an acute restraint on their agency as a sense of personal failure from finding nothing much of interest at high school. They discovered an interest in IT through other pathways, such as at home with a parent’s or brother’s computer (Heather, Brigit, Maire and Emma), or skills training through alternative young parent or adult distance education (Tyla and Maire).

For example, Maire left school in Year 13 with no qualifications, but gained a Level 3 National Certificate in Computing as an adult distance student, then worked in a variety of IT related jobs as an assembly worker and data entry operator. Maire is an example of a person who demonstrated a high interest in computing from her childhood, but was positioned within her compulsory schooling in multiple discourses of Constraint, not accessing relevant education and training until a parent with school age children:

Maire
I discovered at a young age I could make Basic mini programs on an old Amstrad 64 computer and make little men run around the screen. I thought that was very cool.

Researcher
How old were you when you did that?

Maire
Oh, eight, nine. Young. Yeah (pause). But I sucked at high school, and, like really badly. Didn’t bother going, sort of thing. So I bumbled around for a while, left high school, got pregnant… I needed to get some sort of computer qualifications through typing, office work, sort of thing. And I did …an online correspondence type course. They set you up with a computer. How cool is that! I just really enjoyed it. And I went out and got a job, and I decided I don’t want to be a data entry operator all of my life. But I want to do something with computers. So here I am. Without a job. No money. But, hey, I’m getting qualified…

This effect of Constraint arises out of the participants’ schooling. Unlike other Anglo-English education systems, the New Zealand school system did not evolve a formal separate ICT or computer science curriculum, even though it was originally located in senior mathematics, and

10 The extracts are referenced to the transcripts in the following style and order (as applied to the above exemplar). The focus group session number from 1-3 [eg. S1=Session1] or individual interview [I]. The year level of the participant/s, from 1-3+ years [Y1=First year students]. The mode of data gathering [F2F= face to face, or OL= online chat] and date [23 August 2007]. The transcript paragraph number/s from NVIVO7 [paragraphs 55-60]. The text has been lightly edited for ease of reading.
advocated as a separate domain (Nightingale, 1991). It was subsumed into the Technology curriculum which replaced the old home economics, woodwork and metalwork, and typing curricula in the late 1980s, with many schools teaching applications through Text and Information Management as ‘computing’, substantially narrowing the field (Carrell, Gough-Jones, & Fahy, 2008).

In the neoliberal devolved administration mode, the Ministry of Education neither funds computer suites nor is responsible for curriculum delivery or quality. Responsibility lies with parent run school level Boards of Trustees to fund computing technology out of the operations grant and fund raising. NZQA\textsuperscript{11} monitors and certifies qualifications and providers, and ERO monitors schools (Olssen et al., 2004). Despite numerous supportive attempts from ITPs to integrate ICT education into the high school curriculum, ICT curriculum delivery remains voluntary, and depends on the enthusiasm and individual skills of high school teachers, as there is “no actual curriculum or funding for ICT at high school” (Roberton, 2008/2009, Dec/Jan)\textsuperscript{¶ 24.}

Even the current NCEA initiative is some years away from being fully implemented and is not part of the core curriculum.

Such effects were common in this project. They arise out of the current ethical framework for education policy that privileges the “maximizing the greater good” of utilitarianism over social justice as fairness which addresses gaps and limitations (Olssen et al., 2004, p.217). As a consequence, an educational digital divide is reproduced as the material effects (Crump, Logan, & McIlroy, 2006, p.130). Well-resourced secondary schools in high decile urban areas, including private schools, are more capable of delivering core IT education, and senior school specialities. But poor schools, with students who may have no access to computers at home, are usually positioned within limited agency, to deliver office technology packages, with computers being used primarily as typing and office practice tools, replacing typewriters. As the demographics have already shown, the participants in this research tend to come from poorer socio-economic secondary schools, or rural schools. It is not surprising that they have experienced this lack of equity in their schooling.

**Teaching and learning IT in a male gendered domain**

\textsuperscript{11} NZQA, the New Zealand Qualifications Authority, and ERO, the Education Review Office, were set up under the Picot Report and Tomorrow’s Schools reforms to the Education Act 1989. NZQA replaced the Curriculum Development Unit, which trialled new curricula, provided in-service training and developed teaching resources, under the guidance of specialist Curriculum Development Officers. Inspectors of Schools in the District Inspectorates were replaced by ERO for quality assurance.
Students and lecturers interact and negotiate ICT teaching and learning within a constraining discourse which traditionally privileges male assumptions and values. As a small but visible minority to the male students and tutors, women students can respond by taking up the discourse of being less knowledgeable and experienced in IT matters than their male peers, which can be more intensely experienced as returning adult students interacting with younger teenaged males. First year students articulated this in their third session:

Karen
There is an assumption, there is a bit of that stereotype that the guys already had that knowledge

Tyla
or that we should have that knowledge already

Karen
Yeah, right.

Maire
Whether that’s us as females I don’t know. I mean all the males on our course do seem to know this stuff already.

These students sensed from the nature of the initial course’s curriculum content, that they were being positioned and often were positioning themselves as ‘less knowledgeable’ because of their gender. Knowledge of computer hardware was assumed as having been acquired by male students and so was not included. Acquiring IT skills did not begin from a neutral position where all students were assumed to have no prior knowledge.

Further, this phenomenon leads women students to tend to underestimate their levels of gained IT knowledge, and overestimate their levels of difficulty compared with their male peers, who conversely may overestimate their knowledge and skills. Lecturers may also engage in this constraining discourse. For example, a lecturer expressed surprise that two girls, including Tyla, went on to complete his highly technical networking second year final exam first, ahead of ‘knowledgeable’ male students. His explanation was that “the girls worked harder.” In other words, it was not their ability that contributed to their better results. It was their lack of ability, and having to work harder to overcome their skills deficit compared to male students who underachieved in the exam as they were already skilled and didn’t need to prove this to him:

Tyla

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12 The average percentage of female students to males in 2007 in these two ITPs was 20%. By 2009, it had fallen to 10%, with an overall rise of male students numerically in both institutions, possibly due to the effects of the global recession.

13 The programme leader reported this to the researcher after the project and Tyla confirmed its inclusion in the thesis.
Boys know everything.

Karen
We’re doing a paper on user support and that paper is teaching us how to help people but we don’t even know how to help them yet, do you know what I mean. It’s giving us those skills which I do think is important, but we still don’t know the basics actually how to help them you know.

... 

Maire
A lot of us haven’t really seen the inside of a computer.

Tyla
Yeah.

Maire
The technical side. We’ve heard quite a lot about them and, you know, what the theory is, we’ve seen PowerPoint, but we’ve never pulled a computer apart… I think in the first year that should be covered. I mean I’ve done it but…

Tyla
I’m just hoping next year that we do.

... 

Karen
...problem solving with your own computer how to fix it and that’s something that would probably give me more a lot more confidence, learning it, give me that extra knowledge.

While Maire had previously disassembled and built computers, she recognises the negative positioning for other women who had not. Assumptions cause gaps in their knowledge and make coursework difficult. Tyla’s learning and Karen’s confidence are constrained by not having this knowledge which most male students have from experience. This finding was immediately reported to the programme leader, but has still not been remedied at the time of writing, which shows how powerfully the curriculum is based on male prior knowledge, and the constraints on his agency to implement curriculum change.

The effect of the discourse of Constraint for women students is that the supposedly “gender neutral” field of IT is experienced as a male gendered domain (Wajcman, 2004; Tiainen, 2006). Thus, the dominant discursive positioning of males as “normal” IT students and females as not, has consequences for pedagogy. Course design, entry criteria, options and pathways within the degree and diploma qualifications are based on assumptions that prior experience and knowledge are shaped by male everyday practices with computers, including building, using, maintaining and programing. As an applied science, IT is structured, concrete and creative, quite capable of appeal across genders if taught inclusively (Trauth & Howcroft, 2006). But while pedagogy reinforces male “backend” prior technical knowledge, it is unlikely that women will be encouraged as primarily users of social networking to discover how information and communication technologies work, and what potential they hold across a range of fields in society. Women as users of technological tools, rather than as maintainers and creators of them,
is part of the wider discursive positioning inherent in the global neo-liberal knowledge economy. Without counter discourses and practices, these effects are likely to be maintained within the ITP curriculum delivery. What needs to happen is an acknowledgement of this effect. Countering it with courses which integrate the building of technical knowledge, through hands on workshops with computers and their parts, would be a practical response for women IT students, rather than continue to assume the “deficit” is unnecessary to confront.

**Engaging in quality teaching and learning**

Engaging in quality teaching and learning was constrained in some ways in this study. One effect was a lack of clear information about recognising some of IT skills already gained as certificates at school, in the workplace, or informally. Interestingly, learning software packages such as Word, Excel, and Powerpoint were part of a compulsory core for all IT students. Yet women, whose pathways into IT training had often involved knowledge of these Microsoft products as expert users, were required to cover skills which they had previously acquired. As Maire noted:

> It would have been nice to know about RPL...it's never mentioned properly…

Maire was positioned as a beginner in ICT, even though she had considerable industry experience with office applications and as an expert end user of databases. This effect was a policy and practice of requiring her to learn unnecessary course content which she had mastered. Her prior learning was not recognised. Maire found herself constrained in multiple discourses where formal learning was privileged over on the job training and ITP funding mechanisms were reliant on her enrolling in a course that generated EFTS funding. Maire gained entry to the Dip ICT from her industry experience, but was still required to prove her expertise by being assessed in a course, rather than having a clear option of being granted recognition for her skills. This practice is clearly linked to the discursive positioning of males as normal and building course requirements around their prior knowledge, but positioning women as “other” and not building course requirements around women’s prior knowledge.

Another constraint was that business skills courses such as Interpersonal Skills lacked an IT context, or relevance, especially if delivered online. International and resident students may also be positioned in multiple cultural or literacy constraints with online learning. They were required to learn by reading and writing which may not be their strength as NESB students.

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14 RPL is recognition of prior learning for course credits where students can demonstrate they have gained course related skills in their employment or being self taught. Such credits do not count towards distinction or merit in the diploma qualification, and so are not encouraged.
Maire

I’ve got some serious issues with that class (IP Online). Some of us haven’t done assignment 1, and some of us can’t because we haven’t even received feedback from the tutor on our drafts. And it was due yesterday.

Ann

Well, I would have thought that I have done it, because I’ve been in industry for 16 years.

...

Anya

To tell the truth, I am not finding it very easy or absolutely relevant to real life even.

S1_Y1_F2F_6_09_07¶273-275_&_305

If the curriculum lacks an IT industry context or focus when delivered within the lean communication of e-learning, this deficiency is exacerbated by a lack of an online teacher presence. Students are positioned poorly as they not only doubt the relevance of the content, but they also do not know how to be successfully assessed within a virtual context. Tutors may assume that computing students are automatically able to learn in a computer mediated environment. This positioning is pedagogically unsound. All teachers and students need to be taught how to teach and learn online, regardless of their prior expertise in ICT, field, or learning ability face to face (Anderson, 2004; Garrison, Anderson & Archer, 2000).

Recalling their attempts at learning programming skills triggered the Constraint discourse for many of the women students, regardless of age, or work experience. Novices felt they were positioned as lacking the ability to acquire programming skills which was then ignored. Some third year degree students were frustrated with learning in mixed ability classes with post graduate international and resident students (who had generally no prior or lesser IT skills and NESB backgrounds). They were positioned as having to compete for attention from the lecturers to extend their knowledge against novices and students with language difficulties who took up a lecturer’s time to grasp the programming basics. This effect arose from learning in a class with a great range of abilities. Potentially, this placed all students as having their learning needs inadequately met.

This constraint was expressed by third year students in ways that blamed the international and resident students. They did not raise issues around institutional and teacher responsiveness to their needs as a whole class of students. As no post graduate international students were successfully recruited into the project, their voices remain silent, creating a gap that needs further research, including how to access discourses from this group.
Heather

Tutors are spending too much time on the basic stuff. I'm also going to bitch about the Grad. Dip compared to the degree. Often we are taught all in one class. We are all taking XML, but the graduates doing the one-year course don't have three years of programming like we do. We've done level 1 or level 2, or the advanced one in the degree.

Latika

I quite agree. In the level 3 class, they don't have a clue. They (one year graduates) need to have lower level skills taught them, they don't have them. It's frustrating, working with them in groups. I've learned English, why can't the other students do that... Much of that is not speaking English well. They are very frustrating and take the tutor's time.

S2_Y3_F2F_23_08_07_¶353_ - 355

Heather (who had a teacher as a parent) and Latika (who had an NESB background) were unanimous that they were constrained by the lack of fluency and prior knowledge of ICT among the one year postgraduate students. Other readings of this constraint could be pastoral care issues such as homesickness, socio-cultural differences in student expectations towards the lecturer as an expert with knowledge, or the need to tune one’s ear to diverse accents when speaking English. However, diverse learning needs should be taken into account when planning curriculum delivery (A.P.A., 1997). If not, this also positions students poorly for engaging in quality learning. This issue was taken up by students in each year group, over the diploma and two degree courses.

Another pedagogical effect was the ways tutors positioned women students, and how women positioned themselves as novices in programming:

Jan

... And I had one lecturer that said to me," Well, look, if I have to show you how to do it, you're not going to learn." Which was true. It was programming. But if one of the students, he was a guy, hadn't helped me, I wouldn't have got through. That was one of my first papers so the first paper was quite hard.... Sometimes it's a time issue like people will spend ages explaining the first parts of the course and tell you where the loo is and that and when you get to the really hard stuff they don't stop when you need to stop and just absorb it.

... Rhiannon

I'm not much of a coder... Using tools like Flash and that, that's fine, I can do that, but... when it actually comes to coding it, my brain sort of switches off and finds it hard... But it's really hard to deal with them (lecturers) when they just don't want to even take interest in you.

... Heather

My first programming paper there were four people turning up and it was great and I'm sure that if I'd been in a class of 20 it would have been harder for me like to pick up how to do programming.
Latika
That’s very true, cause I think my bigger class, I find it easier to understand my smaller classes was my first class. Then when I got into Java I found it so hard to understand cause the class was so much more bigger.

Rhiannon
Yeah makes it harder to ask questions. More one-on-one help I think.

These third year students position themselves and their tutors within the multiple discourses of Constraint. While their agency could be enabled in smaller sized classes, access to the tutor is still constrained when a tutor positions women students as unworthy of attention because they are having difficulty learning programming skills. Jan is a capable mature woman, with a career as a librarian, who also works in an academic environment. Jan’s agency is further restrained by being positioned by the tutor and by herself as having to learn for herself, rather than having her learning facilitated by him. However, she is repositioned positively by a male peer student who teaches her instead.

Lack of consistency in pace and level of delivery is also an effect of the discourse of Constraint. Rhiannon was not repositioned by peer assistance, her agency is impeded and she “switches off.” Heather and Latika’s agency around engaging in learning is enhanced by having a small class with ease of access to their tutor, but then Latika is further impeded by inconsistencies in class size at a higher level of instruction and she moves back into Constraint. These matters are taken up in the final concluding chapter in terms of what ways tutors could reposition women students positively as programming students to better facilitate their learning.

Constraint arising out of combining parenting with being a tertiary student

While it is relatively common for some women IT students to have domestic responsibilities for their families, some male students are also parents, with custody, or as the primary caregiver, due to the health or paid work of their partner. Some students are raising children as the sole parent, or are sharing custody. Where this is articulated as a discourse of Constraint, strain can cause illness, and getting behind in course work creates further difficulty, as Ann, a first year diploma student, who dropped out of the degree programme, relates below:

Ann
Look, like I got so behind on that. I didn't have the software. And I had the flu for a week, which threw me back, so I had two weeks work to catch up on and I’d lost all motivation then. It gets a bit bad, at the cost of assignments.
Ann loses energy and momentum trying to cope with her student workload and the domestic duties for her household and two sons. She recognises that it affects her academic achievements. She appears unable to negotiate extensions with the lecturers from her multiple positionings of constraint. A further constraint could be a lack of consistency among lecturers in recognising of the ways that parents may be constrained as students. It appears that students such as Ann feel constrained to ask for this to be taken into account which could help to minimize this effect. Further examples are included in the workload section. Research into what discourses are accessed by male students with domestic responsibilities could deepen this body of work.

**Financial Burden of User Pays**

A discourse of Constraint arises around the fees and living costs of tertiary study, in common with all students who are funding study through student loans and part time work. Like other students, some IT students do not have parental support, or fall outside parental income or policy guidelines and face the financial burden of study alone. For international students, levels of debt are constraining, even with parental help. This discourse is often articulated as a struggle or self-blame and includes a fear of not getting a job, and not being able to work off debt:

*Karen*

But I’m so struggling, I’m going to come out with this massive loan and credit loan, and credit card and all these, you know, financial obstacles and I have quite a low time when I reflect on my financial situation, it’s just it’s so hard to drag yourself out of that and it’s so easy to just go stuff it, let’s just go out there and I’ll get an administration role.

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*...*

*Latika*

Not only that though, I reckon NZ is suffering in IT because they’re not letting their youth try and get out there and get their professional experience. They’re not letting them do that. As soon as you go there and say I look sorry I don’t have any experience but I’m willing to work and I’m a hard worker, you can show them your grades and everything and they’ll say.

*Heather*

We want two year’s experience.

*Latika*

Yes.

*Rhiannon*

...there’s no possible way to pay off student loans. Like mine’s getting close to $100,000 because I made some bad choices early when I left high school and ended up taking a year off.

S3_Y3_F2F_30_08_07¶116-118_&_158

Students felt constrained by a lack of consistent national policies to attract new employees and to retain a more diverse workforce in the ICT sector, including among the ICT sector companies
themselves. This discourse has elements of the *Resistance and Resilience* discourse embedded in it, as they discuss what could be done:

*Jan*
Yes we need some apprentice type positions because the thing is they (employers) get worried about taking someone on because you’re stuck with them forever and you can’t just tell if they’re going to be any good and might be totally unsuited. But with apprenticeship type jobs…

*Heather*
I do think that the starting rate for a graduate is also why people leave… in Australia… a graduate would be getting $45000 a year straight out of Uni. Go work for (local IT company), you start off at 28(,000) so, well, if you’re lucky. 25(,000)!

*Latika*
28 if you’re lucky!

*Rhiannon*
I think the best thing the government could do is to introduce something like if you teach for three years we wipe your student loan… They would never ever ever have a problem with teachers again… They’re talking about doing that with doctors. If the doctors went in you know and spent five years in a rural area they’d wipe their student loans because there was a shortage of rural doctors.

*Latika*
They’re getting paid so much like my brother’s just going into dentistry next year and will be in Aussie working in a rural place $160000 a year and he’s just starting earning.

The students are constrained by entry criteria within the ICT industry. They report that two years’ experience is a minimum entry standard, so that employers do not have to induct new IT professionals into their career. This disrupts a smooth entry into the profession. Apprenticeships in Australia and internships in North America are common, but are not a usual feature of the ICT industry in New Zealand. Despite repayments of interest free student loans being relatively low while working in New Zealand, local salaries are also relatively low compared to Australia, especially for beginning IT professionals. Other areas of the economy where personnel shortages existed, such as medicine, were lobbying at the time of the research to write off student loans in exchange for rural service. These possibilities are attractive to these students, but they are positioned within multiple discourses of Constraint by debt, perceived harsh attitudes by local IT employers to recruiting them, and lower relative wages to pay off that debt. While ITPs may offer internships to IT students which may lead to permanent employment in the IT division within these tertiary institutions, not all students can access this pathway.

**Student Workload**
At the time of the research project, a full time study load required Dip ICT students to cover nine 7 credit papers each 18 week semester. Students needed to score 80% as a minimum pass mark, to demonstrate their mastery learning of a broad range of IT knowledge and skills. The BICT degree programme required eight 15 credit courses per year, with five per 16 week semester, and a minimum pass mark of 50%. The BIT degree programme had a similar workload.

In ICT, as an applied science in a rapidly changing field, labs, practical work as well as theory, assessments tests and examinations create work pressures on students and their lecturers alike, which may compound restraint on student agency. Some older students feel constrained by the amount of content they need to learn, especially in mastery learning. They already feel constrained by being parents with children, as Ann notes below. However, the demanding cognitive challenge can also be stimulating and open new vistas as Maire explains:

**Ann**

Just getting back into school. My brain just doesn’t- I just don’t comprehend. Coming to do binary, hex, and all that. I found the degree papers were easier than the diploma, cause it’s only a 50% pass as opposed to 80% in the diploma. The workload in the diploma is actually more, it’s so much harder… I think it’s time management, with young children, being on my own with them.

Oh, programming. I hate programming… Sorry about that. I, I’m getting there. I did it in the degree programme as well. Taking a long time to sink in. apart, put it back together again, not a problem. It’s things like that. And because I’m older, as a mature student…

**Maire**

The first week was fine. It was a breeze, and we were getting all these course descriptors, and I’m thinking yes! This is easy, marking out all the tests … The week after, the work set in. Oh, well. That’s nothing, headaches and tiredness. Never felt so full on, and my brain being torn apart in different directions…

The individual differences here arise out of their subjectivities: Ann positioning herself as lack, what she cannot do, with Maire being stimulated and cognitively challenged and rising to that challenge.

**Constraint in the literature**

This overarching discourse of Constraint has evolved over the last 20 years in the Anglo-English literature as researchers have grappled with this persistent problem of recruiting and retaining women in ICT. It has been variously described; first and famously as “the incredible shrinking
pipeline,” (Camp, 1997) “barriers that need removing” (Bystydzienksi & Bird, 2006), “a chilly climate” (Fisher & Margolis, 2002) “gender gap” (Trauth, Nielsen, & von Hellens, 2003), socio cultural factors restricting recruitment and retention by gender, (Lang & McKay, 2006), “digital divide” (van Gorp, 2006) and “gender diversity” (Trauth, 2006). The most recent theorising is ‘Individual Differences Theory’, a critical analysis of IT womens’ reflections on contradictions and how external forces shape their decisions and behaviours(Trauth, Quesenberry, & Yeo, 2008). Ways of describing Constraint have been taken up globally, in these various forms, for example, Huang, 2006, Pande, 2006, and Olatokun, 2006.

These linked discourses of Constraint and Resistance and Resilence, as identified in the data, connect with theorising about women, gender and ICT in the wider literature, and mark a difference in my own theorising, re-envisioning the field as discourses from a poststructuralist technofeminist perspective. The literature tends to link student agency to external factors or patterns of effects (Camp, 1997; Fisher & Margolis, 2002). Research has focused on how students and graduates can be helped to overcome them, and what institutional and policy responses are needed.

As a point of difference, my analysis focuses on the subjectivities, agency and power effects of the Constraint discourse. In particular, the students identified the effects of having a high interest in computers at an early age, but no ICT curriculum or a well-resourced school to foster this interest. This was compounded by the impact of the education reforms which have sharpened the lack of resourcing in the poor and rural schools they had attended. Next, male attitudes and assumptions in ICT learning environments were privileged, including their prior ICT knowledge. However, prior knowledge as an expert user of applications was largely ignored. This had an effect on the nature of the curriculum and how it was delivered. This was especially prevalent in the pedagogy of programming where the impact of mixed classes and/or positioning women students as novices constrained effective assistance from lecturers. A lack of relevance of course content for IT business communication skills, especially in online learning, created student disengagement. Student workload, arising from the amount of course content and assessment being set at a high level, exacerbated these effects. Financial constraints from tertiary education as a commodity created a burden of debt that was set against a background uncertainty of employment in ICT and the relatively low initial salaries.

These effects can be re-envisioned, which enables students to take up the counter-discourse. The risk is always that they may slip into Constraint at any time. That is the nature and power of this discourse of Constraint and its effects. But there is a potent reworking of this discourse at work.
For how Constraint is utilized, interacts with and is mediated by the counter discourse as transformative change lies with the students themselves.

A Bridge: From Constraint to Resistance and Resilience

So, while Constraint is the most prevalent discourse used by the student participants, embedded within it are Deleuzian possibilities of “lines of flight into new lives” (Davies, 2004) which, as they explore their experience-limits, enable them to emerge as IT professionals. For example, Rihannon, a final year degree student, discursively reflects on the effect that class size has had on her agency; that is, being able to seek help from the programing lecturers:

Rihannon
Yeah makes it harder to ask questions. [Constraint]. More one-on-one help I think. [Resistance and Resilience]. Also I found that learning XML has helped [Resistance and Resilience] because XML is a programming language that you can tailor to yourself [Resistance and Resilience and Empowerment]. It's not necessarily this goes here, this goes here, this goes here, [Constraint and Resistance and Resilience] well it is, [Constraint and Resistance and Resilience] but you define where here and here is [Empowerment and Resistance and Resilience] and so it's easier to get your head around the concepts because you're not working to what someone's concepts are. [Resistance and Resilience] You're working to your own concepts [Empowerment] and that I found that has helped my understanding [Empowerment]. They should probably have XML as a first or second year paper, not a third year [Constraint, Resistance and Resilience and Empowerment].

In this extract, Rihannon, who found programming languages difficult, but enjoyed being a web developer, reflects on that which gives rise to her difficulties. She is already located in a discourse of Constraint, it is hard for her to ask questions of the lecturer, the class size makes it even more difficult to ask for and gain one-on-one help. She resists withdrawal by reflecting that web pages are constructed in code which she has control over. While the syntax must be learned, she experiences gaining control over the coding resiliently because she can work to her own concepts and use her creativity, a glimmer of empowerment. Rihannon reflects on how she may have been better served by engaging in XML earlier. Thus she moves between her multiple positions within the discourse of Constraint, and reflexively accesses the counter-discourses as a possible way of facilitating her agency, both of which are present in her final statement.

The counter-discourse of Resistance and Resilience map refusals to accept restraints on agency and the adopting of positive strategies to overcome them, which may be also spoken into the real.
At the same time, these words are carrying different weights of embedded meanings from glimmers through to clear instances of Empowerment. These indicate different material effects within the same passages of text. The potential of transformative justice being spoken into the real is there, with its attendant material and discursive effects. This is further explored in the next chapter.
Chapter 8: Women, Gender and ICT: the counter-discourse of Resistance and Resilience

Introduction

The discourse of Constraint was considered in the previous chapter, and, to a lesser extent, some of the interrelationships with the other overarching discourse of Resistance and Resilience. My analysis now focuses on some of the distinctive ways that this alternative discourse facilitates agency, drawing on the Foucauldian concept of genealogy. As seen in the previous chapter, Constraint may limit and restrain agency, with different degrees of severity.

In this chapter, I begin by describing the features of the coupling of the counter discourses of Resistance and Resilience and describing their material and discursive effects. These include: creating pathways into ICT training; countering the effects of the male domain in education and workplace settings; engaging in learning; rising to the challenge of being a parent and a student; managing the financial demands and student workload and the effect of empowerment. The chapter concludes with a summary of the effects of these counter-discourses, and how the women students and graduates position themselves within them.

The counter discourse of Resistance and Resilience offers alternative ways of taking up subjectivities as women in ICT without taking on the negativities of the male domain. The ways in which women are agentic depends on how they position themselves. This positioning may conflict with, compete and/or impinge upon, and/or ameliorate the discourse of Constraint. As women participants take up this 'counter-discourse', (Carabine, 2001) they expose and are being exposed to how their agency is facilitated. Thus discourse, knowledge and power form a shifting and dynamic matrix (Carabine, 2001) that energizes this discourse. The counter-discourse, in turn, effects networks of interrelated discursive policies and practices which cohere, at particular moments, to produce meanings and effects in the lived worlds of the participants.

My analysis of the Resistance and Resilence discourse in this chapter identifies further epistemological and methodological concerns from a poststructuralist technofeminist framework. Again, key patterns and interrelationships within the counter discourses are linked to the literature, including contrasts and contradictions.
The Counter-discourse of Resistance and Resilience

My analysis of the data generated by the participants has identified Resistance and Resilience, as a counter-discourse to the discourse of constraint. It is taken up by women students to successfully complete their ICT training and education. It is also taken up by ICT graduates to enter and remain in the ICT workforce. Resistance is a refusal to be affected by educational and workplace practices which are experienced as restricting and/or disabling. Resilience is the ability to counter the negative effects of educational and workplaces practices and continue to engage with meaningful activity in that space. However, if resistance is not coupled with resilience, which enables recovery from perceived negative events, resistance may have the effect of disengagement from learning or employment. Thus, this counter-discourse is not binary, resistance or resilience, but is a coupling of both, consciously and/or to some extent, unconsciously.

The discourse of Resistance and Resilience is characterised as agonistic rather than antagonistic. Emerging and new women ICT professionals as subjects-in-process counter Constraint as a ‘regulative narrative’ (Spivak, 1992, cited in Lloyd, 2005, p.40). Originally referring to sexuality and race, Spivak’s analysis can also be applied in women, gender and ICT research. For these discourses do not precede reality, they are constituted. The identities of emerging and new ICT professionals are politically constructed, which normalises and processes “what it is and what it is not permissible for women to do … (as their) identities are…always saturated with power relations” (Lloyd, 2005, p. 40). By challenging the political constructions that present the combination of women, gender and ICT as ‘naturally problematic’, these emerging and new ICT professionals are able to produce subject positions, generate exclusions, and make oppositional political demands in their educational and workplace settings. They can take up subversive and potentially therapeutic ways to produce themselves as resistant and resilient subjects in these discourses, accessing opportunities for engagement as women training and working in ICT.

While not as prevalent in this research as the dominant discourse of Constraint, the counter – discourse of Resistance and Resilience was coded in 87 instances from 19 NVIVO7 sources of focus groups and interviews. It accesses meaning making that (de)constructs how women are making a successful transition into a new vocational field that is traditionally a male domain.

In summary, the Resistance and Resilence counter-discourse articulates some ways that participants respond to, and resist accepting restraints on their agency. They invoke this discourse to resist negative positioning of Constraint, and to reposition themselves or be positioned more positively in that educational and workplace space. Thus, for the sake of consistency, the differences in practices that apply to the same thematic structure are examined.
These practices involve taking up subject positions, generating exclusions, and making oppositional political demands in the contexts of pathways into IT, curriculum content and delivery, teaching and learning, classroom interaction, relational issues with peers and lecturers, being a parent and student, the financial struggle as students, the workload struggle of learning, in the context of the ITP environment and their employment.

The remainder of this chapter delineates these practices. It shows how they are taken up within these educational settings and their impact on the agency of women students.

**Effects of Resistance and Resilience**

**Pathways into IT training arising out of a high interest in computers**

Participants did not always first encounter computers at home as children, or at high school, depending on their socio-economic background and age. However, engaging as a woman in ICT sometimes arose from taking up computing through alternative young parent education (Tyla) or discovering computing as a ubiquitous part of modern employment (Karen).

These pathways are distinct from Maire’s disrupted pathway. Tyla’s pathway into ICT was not disrupted by failure of the mainstream school system to provide learning opportunities with computing. Rather, Tyla was a disengaged student positioned negatively as initially resisting the whole school curriculum and dropping out early. She was then repositioned positively in an alternative school setting, taking up the discourse of Resistance and Resilience and engaging in computer training and education as an alternative subject of high personal interest:

*Tyla*

I did all my high school qualifications. And I didn’t like anything really. But I did notice I could do some of the computing stuff. So, we did it through (tertiary distance provider) to start with. I did a few courses like that. And I thought, yeah, I could do this, it’s the only thing I ever even thought I could do. So I decided to come here.

S1_Y1_F2F_6_09_07_¶51

Despite being located in multiple discourses of Constraint from dropping out of her schooling and having a child at a young age, Tyla attended a young parent’s college and gained Level 3 National Certificate of Computing qualifications. Tyla’s resistance to ordinary school subjects and her resilience in taking up tertiary computing training locates her in the Resistance and
Resilience discourse, which enables her to access education in the alternative education policy discourse as a duty of care for a small minority of disadvantaged students.

Similarly, Karen’s pathway arises out of an employee resisting being positioned at work in a subordinate way in computing, and then repositioning herself positively to retrain as an IT professional:

Karen

I came to do the (Dip ICT) course because several years ago I worked online within a computing department and that’s where I discovered how important technology was. I quite enjoyed it. I went travelling for a few years and then came back to NZ. I was in a job that I felt unfulfilled and dissatisfied and discovered that there were courses available that could get me into a job that I considered would be a great job to be in and so here I am.

Karen shows how engaging in the Resistance and Resilience discourse enables her to resist her negative positioning in the workplace unlike Maire who had to postpone her high interest in computing from her childhood until she had entered the adult workforce as a parent.

Consequently, Maire took up the discourse of Resistance and Resilience to resist being positioned in low status computing work, like Karen, and also repositioned herself positively as an IT professional through retraining.
Teaching learning and working in ICT as a male gendered domain

The counter discourse of Resistance and Resilience is taken up when negotiating learning in the supposedly ‘gender neutral’ field of ICT. Some participants negotiated their teaching and learning environment within this discourse to disrupt the traditionally privileged male assumptions and values. While small in number in class, women students described themselves as being increasingly knowledgeable and experienced in IT matters compared with their male peers, as their engagement in their learning was more intense. They saw their own engagement contrasted favourably with the generally less mature male behaviour. Male students were seen as often positioning themselves as superior by dint of their gender, and yet many resisted formal learning and the hard work that went with it. They tended to overestimate their IT knowledge and engaged instead in debates about ‘commercial applications versus open source’ which the women students considered irrelevant. First year students take up the discourse of Resistance and Resilience by positioning themselves agonistically with the male students:

**Tyla**

Females think about more, doing more, and are more focused more easily, and at a younger age.

**Maire**

They’re also more distracted more easily. That tunnel vision they’ve got. We’ve got a whole heap of talent. …

**Karen**

I don’t know if it’s their age, or what.

**Maire**

Yeah, well some of it could be that.

**Tyla**

Cause some of them are older.

**Maire**

They’re just bad. Yeah. (laughing) They’re like little monkeys sitting in the back of the class. (makes monkey type noises), chatter chatter chatter. Where’s that boy, come here!

While this discourse is constituted as essentialist, it is also productive. It is based on what they say they have observed. Women privilege their own practices and qualities, and undermine the taken-for-granted position of the male students as being superior. This shifts the base of power towards them and away from the male students. The women students position themselves as
harder working, more thoughtful and focused, and also more mature at a younger age than the males. They position males as having tunnel vision, being more easily distracted, behaving less maturely, and as a source of irritation from their constant chatter during lectures, which is characterized as “naughty little monkeys,” a term parents may give to children:

**Karen**

They've got some weird language and ideas.

**Maire**

Some of them actually have really weird values like I mean (name)'s a prime example. He’s seems like such a laid back guy and then you'll say something and he's on the attack, he's going, 'No no no, no, that's really wrong' and stuff and to me that's like, where did that come from in such a young fella?

Maire and Karen position themselves as normal and mature and the male students as weird and immature, reinforcing the negative image of the ‘anti-social male geek’. Binary discourses of ICT femininities and masculinities are also embedded in this discourse, which are more fully analysed in the next chapter.

In a male domain, sexual harassment and gender discrimination can occur at work, arising out of the discourse of Constraint. Holly, a graduate, is interviewed by telephone in Australia at work as a web development project manager. She encountered both in her first ICT position. It “turned her off” that workplace, but not the ICT industry as a whole ¶295. Holly now selects her employer and workplace cautiously, taking up the discourse of Resistance and Resilience:

…My interview was with one of the directors here. I looked at body language, I looked at where he was looking. I was very keen to hear his questions and noted that they were very technical. He wanted to hear about what I could do and was actually listening to what I was saying.

Then I got to meet the other project manager here as well which was really good. I looked around and tried to ascertain for myself. I thought because I had had harassment in a small workplace, I thought next time I’m going to go to a big work place just to have the opposite.

Because this place is another small business I was very careful, wanting to meet as many people as I could and get a feeling of the atmosphere and how other people found working here. I sort of try and read as much as I could into the communication and the interaction I had with the one director that I was interviewed by.

Holly monitors whether the interviewer is distracted and where he looks during the interview. If he conducts the interview professionally, positioning her as an ICT specialist by seeking information about her skills and abilities, this is positive. If he scans her clothing and looks at
her chest during the interview, positioning her sexually, this is constraining and negative. Holly also analyses the workplace atmosphere, the attitudes to women, and whether her skills and abilities are likely to be recognised and valued by meeting potential colleagues.

But pigeonholing could occur, even in quite open company environments. Colleagues had laughed when Holly mentioned her online focus group involvement in the research project. A developer at Holly’s work had commented: “Girls do project management, guys code. What’s more to discuss?” S3_G_Ol_20_9_07¶298. Holly found this enigmatic, and was unable to account for the comment later in her individual interview. The effect of the male domain was underpinning that discourse. The gatekeeping about how work was done in that small company included gendered boundaries, based on essentialist roles: men worked with the computing machinery, doing the “backend” technical work of programming, and women worked with clients, keeping the project to its timetable, and ensuring quality outputs were delivered in a timely fashion. While Holly had found a place that was supportive of her ICT skills, she was still potentially constrained by their view of what ICT women were best suited for within the industry, which could become a source of dissatisfaction later. This shows the fragile nature of her empowerment, and the ways that the power saturated male domain needs constant negotiation and mediation.

The online graduate group take up the discourse of hyper femininity of feminine clothing attracting attention, which is further analysed in the next chapter. How women’s agency and power are positioned in ICT employment can be taken up in the very least as a discourse of Resistance and Resilience. This continues to be increasingly relevant as more women train and take up positions in a male dominated industry.

**Engaging in quality teaching and learning**

First year women students draw upon the discourse of Resistance and Resilience when making sense of their training after 7 months in the programme. Maire, Tyla and Karen’s agency as students arises out of their growing confidence, ability and skills in ICT. They appreciate the degree of effort they need to put in for mastery. Their ability to make sense of the core courses, arises from their resistance to being positioned negatively, as they strive to become increasingly familiar with the technical content, with the effect of Empowerment\(^\text{15}\) emerging:

**Tyla**

I'm passing everything reasonably well. I passed four courses in the last semester with merit.  

\(^{15}\) Empowerment is discussed as a section within the Resistance and Resilience chapter.
I passed three, but I came from nothing. I sit in the class with all those nerdy guys. (laughs) Well, they are. And they are going on about their stuff and the ram in their computers I didn’t have a clue. It went over my head. And then I thought, s***, I actually know that.

**Maire**
But it’s just the way they even talk about it.

**Tyla**
I feel like replying to them, just shut up! Apart from all those nerdy people. But if you go into programming, I’m just scratching my head, and I’m thinking whooah!

S1_Y1_F2F_6_9_07 ¶346 & 350-354

Tyla reflects on her progress, showing that the discourse of Constraint is still present in programing. The potential for her to be repositioned into that discourse is ever present, but she counters this by resiliently seeking support from the lecturers.

Karen, who has been a student at university before working in a variety of workplaces, including mining in Australia, takes up this counter-discourse when articulating her response to learning programming. Karen says she was overwhelmed, yet had expected that she would enjoy it the most. She seeks assistance from organised student peer support, and feels less isolated. Karen is now able to give peer support in programming to Ann ¶25. Karen contrasts this with her discourse of Constraint when learning science at university “this is your due date, this is your assignment” compared to personal involvement with lecturers in smaller classes (S2_Y1_F2F_13_9_07 ¶ 25& 55).

Different ways that students are agentic are also evident in the ways they respond to difficulties, and whether they help each other, for example, with installing course software. Tyla and Maire position themselves within the discourse of Resistance and Resilience. While Maire complains about the demands of the software package, “what a nightmare to install it” she and Tyla appear to support Ann by explaining how to better navigate its features. They conclude that it is a matter of “trying” and “experimenting.” Ann responds by positioning herself within the discourse of Resistance, as blame, and gives excuses. “Look, I got so behind on that,” Ann says linking the problems with the software to her illness, getting behind and losing motivation (S1_Y1_F2F_6_09_07 ¶ 161-237).

Another reading is that Maire and Tyla are challenging the contradiction of Ann’s negative positioning of herself, particularly as she claims to be an experienced technician and perhaps should be able to resolve the issues. Tyla is also a single parent with a dependant child, and Maire
has teenaged children, yet they are more able to cope. They also explain after the fact, which shows their knowledge is superior to hers, in spite of her experience. They show Resistance and Resilience by taking on the male behaviour of competing about knowledge rather than sharing knowledge, of which they have been critical and say they dislike. Yet another reading is that they are also challenging the researcher whose husband is the tutor who created the difficulties for them. All these readings indicate that subversion is part of this positioning. Tyla and Maire’s identification as emergent ICT professionals who work hard to master their skills exposes Ann’s inadequacies and excuses, as well as challenging the irony of researcher gathering negative information about her own partner’s pedagogy. Within these discourses, they do not acknowledge Ann’s multiple constraints from her positioning as a divorced woman. They practice exclusion rather than inclusion.

However, feminist principles of an inclusive duty of care (Noddings, 2004; Zingaro, 2009) do form part of some students’ uptake of the Resistance and Resilience discourse. For example, it arises as discursive practice in relation to online courses in Brigit’s interview. Acknowledging that her preference was for face-to-face classes, Brigit recognises that the online mode of learning may provide “a safety barrier in front of you on the screen” ¶ 406. Students can shelter behind their monitor to overcome inhibitions to talk about concepts with each other and their tutor. Online interaction can enable engagement for students who have difficulty relating in face-to-face classes or who are overshadowed by more vocal ones.

Safety, as a discourse of resilience and resistance, is also taken up by Cate, in the second year online group. Recalling a Kate Bush song, where isolated people are turning inwardly to their computers, Cate counters with the discourse of Resistance and Resilience where virtual spaces are increasingly used for networking and building online communities. “(Let’s) congratulate the virtual world for letting people who are normally judged and shunned to have an anonymous voice to communicate and make friends.” (S1_Y2_OL_23_08_07_¶324). Cate advocates that a virtual presence enables people who have difficulty with face to face human interaction to find another way of communicating. They can also learn in a space where they will not be judged on their appearance and status but be accepted on their interaction and understanding. Thus, online learning depends on the lecturer’s ability to enable an inclusive cognitive, social, and teacher presence in the virtual learning community by applying appropriate pedagogy to the ICT courses offered (S1_Y2_OL_23_08_07_¶324. Thus by positioning herself within a discourse of safety, Cate is able to be supportive of other people and use technology for global social networking in a non-judgemental way. In these ways, the dominant discursive practices of privileging male dominance in the ICT field are countered by alternative discursive practices which acknowledge
inclusion and engagement of women and others with diverse needs as emerging ICT practitioners.

**Rising to the challenges of combining parenting with being a tertiary student**

As discussed in the previous chapter, many students are positioned in a discourse of Constraint as they combine their domestic and parenting role with being a full time student and working part time. Students as parents can take up the counter-discourse of Resistance and Resilience as they manage the conflicting demands on their time. These discursive practices may include dealing with the needs of their children, fulfilling domestic chores, meeting deadlines, and resolving their own learning needs. A crisis can be worked through by positioning oneself as able to rise to the occasion and still meet academic requirements, with the assistance and support of the staff. Tyla recalls a recent example of this as she positions herself within this counter-discourse:

*Tyler*

Three year old... He’s roaring across things (son Finn takes part in ECE16). He fell, a kid hit him with a rock and his hand swelled up. We took him to the doctor’s on Tuesday, and they put him in a sling, to help the swelling to go down. And it got worse over night, so I took him back. I went to see X. cause I needed to get some pictures for my assignment, also I wanted to do it at home. X was really good. He helped a lot, and he gave him a little ball and let him run around the room while we did work. It made it a lot easier. Then I had to go back on Wednesday, I had a test on Wednesday, and they made it a lot easier for me as well … it was sat with a theory and a practical. So she offered that I just did the theory test and if I had enough time, do the practical. Or if I got half way through something, just to stop and I could come back and do it, and it wouldn’t be a resit or anything. So we went back up to x-rays…

S1_Y1_F2F_6_9_07_¶_123_127_135_151

Tyla positions herself within the counter-discourse of *Resistance and Resilience* and responds to her child’s accident as an event that needs managing, rather than a crisis that disrupts or halts her learning and assessments. She seeks assistance. The lecturers respond positively. One gives Tyla advice and support for her learning while her child plays in the office. The other makes concessions about how the two tests can be carried out. This enables Tyla to combine her parental responsibilities with her studies even in a crisis. She gets appropriate and flexible support for completing her assessments without penalty. It is a stressful time, managing her own learning and assessments, and at the same time, organising x-rays, medical care and nursing her injured son. Tyla takes up the counter-discourse of Resistance and Resilience, rather than that of

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16 ECE is early childhood education that is offered through a variety of providers in New Zealand, from infants through to age five.
Constraint which would impede her agency. Tyla rises to the occasion, rather than using the accident as a reason for an extension or blaming her son’s accident for getting behind in her studies or failing to turn up for her assessments. Thus, Tyla’s resistance to the negative effects of the discourse of gender is assisted by support within the institution. Whether this continues in the workforce is a matter for further research, and will depend on family friendly policies which may not exist in the traditionally male domain of the ICT industry and the ICT business sectors.

Another example of taking up the counter-discourse and its impact on their agency arises in their first session from the different ways students manage their domestic responsibilities. Ann’s need to provide “decent food,” not just baked beans, like a short order cook, is taking up the Constraint discourse. However, this countered by Maire who takes up the counter-discourse of Resistance and Resilience. Maire manages to “minimize bad food” by “switching when it is” and getting her children to take turns to cook, which Ann doesn’t do with hers. As for housework her advice to fellow students is, “DON’T DO IT!” (S1_Y1_F2F_6_9_07 ¶ 253-262).

Time management also triggers different responses. Having mocked theory in their interpersonal skills course, Maire takes up the counter-discourse agonistically to Ann. “I don’t know how I manage it…I’m running a week ahead of myself. I’m not going to fall down in a heap and cry about it. I don’t have time to be upset…or sick” ¶ 266. Again, Maire positions herself as resilient, and positions Ann, who has been sick, as constrained. Ann finally responds to this by repositioning herself as being resistant to some extent. “But, I am passing so, I am probably being a bit hard on myself, you know, I don’t get merits, but I don’t aspire to have merits, because I think, as long as I pass” (S1_Y1_F2F_6_9_07 ¶ 266-436).

Ann completes the diploma course after one year at Level 5, and accomplishes her goals of being employed, financially independent, and getting her sons into an integrated school17 with some fees to pay. Ultimately it is the counter-discourse of Resistance and Resilience that she takes up, having initially been multiply positioned in discourses of constraint. Her agency ultimately is not constrained and she does emerge as an ICT professional, teaching software applications full time for a private provider.

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17 Integrated schools are ones which have 100% state funding for staffing and operations grants, as per state schools, but retain their special character under the Education Act 1989. Some schools of a religious character have done this but others remain as private schools with some state assistance.
Managing the Financial Burden of User Pays

While none of the students in this research dropped out from their studies due to financial hardship, they do mobilise the counter-discourse of *Resistance and Resilience* to make sense of the positioning of some male students:

**Karen**

Yeah, I’ve been noticing though that some of them, I’m starting to notice that they are taking interest in things not just computer games ...It’s still a passion but they are recognising the importance of their learning and education because like some of them talk about finances, investment groups and things like that and I’m like, ohh!

Male discourses over ICT knowledge and obsession over computer gaming is being extended into other areas such as money and investment \(^{18}\), and weekly board with parents. The first year students take up this discourse of disparagement compared to their own financial burden:

**Tyla**

One of them complains that he has to pay $50 a fortnight. Fifty dollars a fortnight! I’d kill for $50 a fortnight...For living.

**Karen**

Because some are still living with their parents.

... **Tyla**

I spend like $300, $400 a week.

**Maire**

Yeah, that oh that would be so nice. I worked out my bills the other day and I need $700 a week to survive ok because I’ve got a family to provide for. $50 a fortnight that’s pathetic.

**Tyla**

I know. (mimicking) ‘Mum wants me to pay $50 a week.’ I’m spending $430 on bills and things.

**Maire**

If they lived with me it would be 100 bucks a week.

**Tyla**

Yeah! So, one of them (a male student listening) said, ‘You’ve got it easy then’.

Karen challenges their ability to discuss investment. Maire and Tyla mock and critique the males students as “being hard done by” through their own taking up of Resistance and Resilience. They see some males being buffered by their dependency on parents and living at home. They see young male students generally as not yet fully appreciating the actual cost of user pays in tertiary education. This may also reflect different socio-economic backgrounds. The women students

\(^{18}\) This research predates the 2009 global recession.
position themselves as financially responsible and independent from a relatively young age. But some of the younger male students in their late teens have yet to earn a living and are still supported financially by their parents. Tyla acknowledges that some male students also struggle financially in her final remark.

Managing Student Workload

Managing student workload is another part of Resistance and Resilience. This discursive practice was most commonly articulated in the first year focus groups. Once past the first year, it appears most students have found ways to manage their workload as a matter of survival, and see overload as “normal” or have decided to terminate their studies, by withdrawing or unofficially not returning.

Some first year diploma women students articulate the process of tertiary education in ICT as challenging and demanding. Again, the practice of rising to the occasion emerges, in a re-reading of Ann’s extract. It is worth repeating this quote to capture how the students feel both restrained and yet develop Resistance and Resilience in their quest to emerge as ICT professionals:

Maire
The first week was fine. It was a breeze, and we were getting all these course descriptors, and I'm thinking yes! This is easy, marking out all the tests … The week after, the work set in. Oh, well. That's nothing, headaches and tiredness. Never felt so full on, and my brain being torn apart in different directions…

Ann
Just getting back into school. My brain just doesn't- I just don't comprehend. Coming to do binary, hex, and all that. I found the degree papers were easier than the diploma, cause it's only a 50% pass as opposed to 80% in the diploma. The workload in the diploma is actually more, it's so much harder…. Oh, programming. I hate programming. F***. Sorry about that. I, I'm getting there. I did it in the degree programme as well. Taking a long time to sink in… because I'm older, as a mature student…

Maire is taking up the discourse of Resistance and Resilence in the process of learning to become an ICT professional and recognises the tiring cognitive process that places high demands on her. Ann, who has switched across to the one year diploma course, after not coping in the degree programme, still resists the cognitive effort required, especially for taking up programming skills. However, Ann does persevere in this core subject that she must master to complete her ICT qualification. She switches from the Constraint discourse of work overload into Resistance and Resilence by ‘swearing’ and expressing strong negative feelings. Karen is helping Ann build her
resilience. Karen tutors Ann as her peer support student tutor in learning programing. But Ann switches back to Constraint again, blaming her age and being a mature student. Maire and Tyla counter this negative positioning with the quips “we’re all mature darling”¶ 418 and “some are more mature”¶ 420. This repositions them away from Ann’s taking up of Constraint and positioning herself within a generalisation that older women and those with families have more difficulty studying. This is similar to their response to Ann in the previous chapter concerning her expertise as a software user.

The Effect of Empowerment

As an effect created by the counter-discourse of Resistance and Resilience, empowerment equates to ways that the students and graduates take up knowledge, strategies, and develop awareness of how ICT operates in different ways and on different levels in a business environment. From a poststructuralist technofeminist perspective, it implies that professionalism is concurrently taken up as a way of functioning effectively and ethically in the discursive practices of ICT training and then ICT workplaces. Empowering then, is located in agency, knowledge, and embracing the power that comes through that knowledge of ICT processes and practices. Empowerment is not “done to them” or “arranged for them” but rather is a growing awareness of power that women take up for themselves, to resist the labelling and discursive sense making.

Gore (1992) reminds us in her classic analysis that empowerment is used differently in conservative/neoliberal, liberal, and critical and feminist discourses. The first tends to be expressed rhetorically, the second, in relations within classrooms, with teachers “empowering” students, and thirdly, in societal relations, stemming from emancipatory ideals. Gore warns us that we operate within feminist educational discourses which have normalising tendencies, and we tend to overlook the ways that empowerment can be used as an instrument of domination in spite of our intentions. Gore, by example, encourages us to use the Foucauldian tool of “regime of truth” to reflect on the shortcomings and weaknesses of our assumptions about empowerment. We need to be mindful that goals of empowerment may endanger how power relations construct knowledge in educational settings; as oppressive rather than enabling, as overwhelming rather than encouraging, and disempowering rather than empowering. At best we can use it as a problematising concept.

In summary, empowerment, then, is not a static state that can be achieved fully and finally. It is ongoing, it ebbs and flows. Revisiting Lloyd, it is suggested that empowerment is located through
inessential coalitions between students, and work colleagues and IT friendships comprising a plethora of micro-resistances at each local level (Phelan, 1994, cited in Lloyd, 2005). Analysis and political agendas may be taken up by participants through their “self knowledge, the humble and incomplete knowledge of the fractured in process postmodern self” (p. 160). In other words, participants may reflexively and collectively piece together meaning from their participation in discursive practices. This meaning making may give them insights and suggest strategies that they may consider could further their confidence, skill, and positioning. Lloyd (2005) sees these multiple resistances are generated by the particular and multiple dynamics involved in their formation. Fostering such politically situated movements are consistent with the subject-in-process. These movements cannot be predetermined for they may be woven out of “sharp and divisive” contradictions which energize and yet threaten the demise of emerging and new IT professionals and their deactivation along the journey to equity. They may be marked with factionalism, pain, rupture and conflict. Against such possibilities, in this section, the participants consider and reflect on how gender and ICT empowers them at a personal level, and to what extent, if at all, they are taking up women gender and ICT equity as part of their identity politics as emerging and new ICT professionals. Specific examples of how this sense making occurs among emerging women IT professionals is discussed in the following sections.

**Empowerment through acquiring ICT skills and becoming energised as an emerging professional**

One common source of personal empowerment cited by the participants was the effect of learning ICT skills. This contrasted positively with their constraining school experience, and was a source of self-affirmation. For example, Heather had initially enrolled in a one year undergraduate diploma, then extended her enrolment to a two year diploma, finally into the degree programme. “I wanted to be able to say, after one year or two years, right I’m out of here. I’ve still got a piece of paper to prove that I’ve done some study” (I_Y3_F2F_29_10_07¶273).

Her initial positioning in learning was guarded and temporary. Heather wanted to have something to show for her time spent studying, but did not want to commit herself in case she was unsuccessful or did not enjoy her study. Her learning became more than gaining a qualification. Its effect was empowering and affirming as it gave her a potential career opportunity, based in ICT skills, which overcomes her previous constraining high school experience.

Like other student participants, (S2_Y3_F2F_0_0_0¶225) Heather found herself taking up the enthusiasm of good teachers who enjoyed their field, imparting skills enthusiastically which was
infectious and using relevant industry based assignments to extend and stimulate students to improve on their outputs\((I_Y3_F2F_29_10_07_¶261)\).

Maire recalled being empowered through her initial ICT training as an adult with a young family on a free PC. She continues to be energized by the creativity of ICT, “combining programming and web design” and laughing out loud at the special effects when using graphics packages to manipulate images of her daughters. “I love it. It's exciting. So much new stuff I love”\(I_Y1_F2F_5_11_07_¶367, 492, 520)\.

Some participants were optimistic about technology being more inclusive of diversity and could see changes evolving. Cate wrote online: “The culture of technology being a separatist thing is changing. People are being more affectionate to it, and as usability increases, more people are embracing it.” S1_Y2_OL_23_10_07_¶285. Cate enjoys seeing herself as the extension of her machine. We’re “natural born cyborgs” (S2_Y2_OL_30_10_07_¶291).

Namiko’s determination to retrain in ICT had her leave her homeland, “so busy and crowded” to travel the world seeking a suitable training environment to learn English and ICT skills. Choosing the South Island of New Zealand, she embraced a landscape that is “beautiful, silent and peaceful” and training in an ITP that was practical, moving from draft board to computer screen and virtual worlds (I_Y2_F2F_6_11_07_¶96,100). A programmer, Namiko delights in coding: “programming makes me excited… I can write a very logical and beautiful program” \(I_Y2_F2F_6_11_07_¶192\). Acquiring English rapidly in a six month period, and programing and multimedia skills in two years, Namiko is empowered as an emerging ICT professional. “Computing is just fun! It’s fun, and my hobby and my way of making a living. So it’s ideal!” I_Y2_F2F_6_11_07_¶192, 707. Holly agrees. Her work as a project manager for a busy Sydney IT company is empowering. “It’s stimulating, busy, ever changing, working with great people… I just love my job” I_G_T_6_11_07_¶501 ¶387. Both women share an affinity for technology, even though they are aware that certain domains are more masculinised, such as networking and programming. However, they show optimism that they will make spaces in the industry to accommodate their skills and abilities.

Frankie, an expert web designer, has the last word: “You can still dress hot and reach for the latest toy!” S2_G_OL_13_9_07_¶247 Frankie is empowered through ICT as a focused identity of fun, pleasure and fulfilment. Frankie sees no stigma attached to being a woman who dresses to
show her enjoyment of expressing her femininity, and showing off her sexual attractiveness. She does not see this as conflicting with her technical ability. Her expression of “girl geekiness” as a woman who likes gadgets and the latest technological artefacts does not conflict with her femininity. Frankie’s subjectivity demonstrates that women can be taken up into the ICT industry as an energizing and creative space. This optimism, while in her first position, has remained with Frankie who in two years, has arranged a reunion in a Pacific Island with her women classmates, and has been rapidly promoted as a web designer in Australia and now Europe.

**Conclusion**

The ways that women students and new ICT employees take up the counter discourse of Resistance and Resilience in this chapter indicate that they are able reposition themselves to counter the discourse of Constraint. Their repositioning is determined by how agentic they are. By considering how they are positioned, and how they reposition themselves, their agency works through the strata of politically saturated power relations in classroom, institutional, and workplace settings. They are actively creating ‘women gender and ICT’ spaces to perform these technical skills alongside, between and among the male practitioners. Some discursive practices are therapeutic, some are subversive; some are inclusive, and some are exclusive. As Maire concludes, the glue that holds them together is not necessarily feminist ideals, or concepts of social justice, but rather how to survive and succeed in the male domain of ICT. This includes challenging each other and oneself to compete with the conflicting demands on their emerging subjectivities and their effects.

For women who respond to the energising discourses surrounding ICT to engage in technical skills training in ICT, their agency and power is shaped by the regulating norms of the traditional male domain in which they learn and work. Intrinsically drawn into this discourse by their desire, women are shaped by the technology as they shape it, through programming, network administration, and multimedia. Becoming part of the machine, they reach into it to create, dream, and energise themselves. Their laughter, joy and engagement is creating spaces for women to occupy and transform this male domain, and challenge the discursive and material practices, and make their own spaces within it. Some women may need more support to overcome the constraints, where they have been multiply constrained, so they can reposition themselves to counter the effects that continue to shape the taken for granted worlds of masculinised training and work in ICT. These discursive reworkings could enable more women,
in their infinite reiterations, to enter and re-enter this field, more equitably, productively, and taking more responsibility as ICT professionals for the uses to which information and communication technologies are put. Some of these transforming and empowering strategies could also be taken in other gendered training and work domains: by men in nursing and early childhood education; by women in non-biological sciences, and engineering; to interrupt the essentialist ways that femininities and masculinities are shaped and constrained in the global economy. Subjectivities that are being taken up by women as emerging and new ICT professionals comprise diverse femininities as subjects in process. These femininities and constituted diversities of observed masculinities are explored in the final findings chapter. The femininities and masculinities that co-exist in this environment are examined in the next chapter, in order to more fully explore their subjectivities as emerging and new ICT professionals.

Clearly, a limitation of this Master’s project is not having the scope to research masculinities with male students, and video actual classroom interactions with lecturers, male and female students. However, this is for another subsequent research project. This limitation is managed as best as possible in the next chapter that looks at the ways these new and emerging women IT professionals position their subjectivities within the gender discourse in relation to male students and lecturers.
Chapter 9: Geek Girls, Geek Guys: Femininities and Masculinities in New Zealand ICT Education and Training

Introduction

In this chapter, I apply Lloyd’s trajectories of subjectivity, based on feminist theory to various discourses taken up by some of the participants in this project. I begin by defining the concept, “subject in process”. I then map Lloyd’s different accounts of subjects in process as: mobile, lack, deferred, constituted and performative. In doing so, I interpret how this multiple neoliberal subjectivity is taken up in women, gender and ICT and give some accounts of how femininities and masculinities are co-created in ICT. I conclude by summarising the main features.

Femininities as subjects-in-process

This discourse, women as subjects-in-process, positions subjectivity as having no essential nature, but being comprised in ways that are incomplete and various. So, while for many feminists, “the concept of woman is a problem” (Alcott, 1988, cited in Lloyd, p. 14) it is further argued that “politics in all its guises, works… as a messy unstable, infinitely reversible, yet generative dynamic." (Lloyd, 2005, p.2). Lloyd’s approach is consistent with both subjectivity and power being conceptualized in multiple and messy ways. I use this theoretical gaze to examine ways that students and graduates position themselves and are positioned within the discourses of femininities and masculinities in ICT. I also analyse how this positioning impinges on their agency and power as emerging and new women IT professionals.

Five accounts of subjectivity: derivation and application to problematising issues of women, gender and ICT

Lloyd (2005) maps different accounts of the subject- in-process, by plotting some influential theoretical trajectories within feminist debates about the subject. She examines five accounts of subjectivity: mobile, lack, deferred, constituted, and performative. Her purpose is to sketch accounts discernible within feminist work in relation to the subject and politics. The idea of subjects as processual has motivated many feminists to turn to poststructuralism to examine questions of difference and specificity, which is essential in this project.
In the Neoliberal Gendered Subject in Process model, (after Lloyd, 2006) layers of subjectivity are underpinned by discourses of femininity and masculinity. Ways that these discourses are taken up can be analyzed to trace positioning/being positioned within these subjectivities. Positionings/being positioned also may foreshadow ways that enabling women, gender and ICT strategies may emerge, as well as ways that women, gender and ICT may be undone. These positionings are not binary of themselves, sometimes agonistic, in tension with each other, sometimes fluid.

Further, the discourses that underpin taken up subjectivity may often be multiple, with different students making sense of their subjectivity in different ways at different times, and/or in the same session. Again, the distinctions drawn in my analysis as to subjectivity and discourse are to some extent artificial within this Foucauldian theoretical lens, as they are co-constructed and have effects. But this device is necessary for theorising. Drawing on Lloyd (2005), five accounts of subjectivity as subject-in-process are summarised in the figure below.

The ways that each of the women position themselves and are positioned as new and emerging ICT professionals within the subjectivity of subject-in-process are unique. These ways or layers reflect different dimensions of their subjectivity, agency and power. I have used the model to map how some of the participants are positioned and position themselves through their mobilisation of these accounts. It reflects the multiplicity, fluidity, and messiness of their positioning, and how they were located and located themselves temporally and spatially as participants in the Engendering ICT project. It is highly unlikely that they have remained static and frozen in position, but rather that they have continued to evolve as subjects in process, as is assumed within this theorising.

Embedded within this discursive model are many of the elements of neoliberalism as framed within the context of the global knowledge economy. These include: virtual and physical mobility, under the surveillance, tracking and tracing of Internet data mining, and the technologies of nation state border controls; lack, where wealth has been systemically captured by the few, with education and health as commodities in which spending must be constrained unless you can afford private education and healthcare; deferred, as we pursue the promise/illusion that we are free to be anything or do anything we desire, but for most of us, that it lies just outside of our reach; constituted, in that we are co-constructed by technology through media images, our relationships through email, texts, blogs, videos, and social networking sites within the constraints of gendered subjectivities and positioning; and finally performative, as we iterate ourselves as neoliberal subjects everyday. In other words, the model is a tool which enables us to trace the discursive effects of the neoliberal economy through which and by which
ICT is intricately entwined, and out of which our subjectivities may arise, resist, and yet be enabled by them.

Figure 9.1 Neoliberal Gender Subject in Process Model (after Lloyd, 2005)

In this context then, the gendered ICT discursive subject position is a dynamic multilayered subjectivity which females take up as they emerge as ICT professionals. Femininities and masculinities are co-constructed as relations. This co-construction is multiple, and works on several levels. Firstly, women make meaning of the ways they are positioned as women students by men students. Further, they make meaning of the ways that men position themselves as men students. This co-construction is also regulated and taken up by their teachers in multiple ways. Finally, women make meaning of how they, as women, position themselves. So, subjectivity and discourse are co-constructed in nature.

Thus, the politics of how female and male student subjectivities in ICT are co-constructed, contested and resisted is very much a part of my analysis. It includes to what extent male
dis/empowerment leads or does not lead to female dis/empowerment and/or to marginalize female and/or some males. Thus these ‘intergendered’ and ‘intragendered’ interplays map some of the ways that these discourses are taken up, modified and contested in these male settings. Some emerging women ICT professionals take up more than one discourse to make meaning as they resist their taken-for-granted positioning. This is further explored in the next section.

**Subject in process as a source of resistance and identification as an ICT professional: Mobile subjectivity discourse**

Mobile or multiple subjectivities can be taken as a discourse as women students emerge as ICT professionals. The students may take up their subjectivity as being in a “constant state of flux” Lloyd, 2005, p.15. This approach may reflect multiple or mobile complex subjectivities. The subject is seen as “coalitional” where the axes within a matrix of identity, such as gender, race, age, are always interconnected and vying for dominance (Lloyd, 2005). Thus subjects are constantly produced and positioned. But peeling away layers reveals no essential self, such as the figuration of a cyborg, “a hybrid of machine and organism” (Haraway, 1991, cited in Lloyd, 2005, p. 16). While imaginative, Lloyd considers this concept does not explore how it may be rearticulated in terms of agency and power.

The adoption of avatars and gaming is part of Rihannon’s positioning within this layer. She variously describes herself as a ‘WOW chick,’¹⁹ ‘chicklet’ ‘a kind of goddess’ and ‘a pot of gold at the end of a rainbow.’ She positions herself as a privileged female in a recreational pursuit where she considers only 20% are women gamers, and 90% of those are already in a relationship with a male gamer (¶55, 59, 79, and 107). She sees males who use female avatars as getting “some sort of pleasure out of playing a female character” ¶89 “a hot chick,” ¶83 which they presume she must also feel. But Rihannon enjoys the playfulness of deception, a form of subversion “I sit there and laugh” ¶89. She realises that her ex-boyfriend may have been actively looking at males in attractive female avatars that he teased her about ¶79. Rihannon agrees that this way of behaving in gaming has been set by men, and women have somehow joined in on men’s terms “at the moment” ¶127. But stripping away the avatars that replicate variations of performing gender, Rihannon is left with no essential self. It contests Rihannon’s security and underlines her vulnerability of positioning herself as successful in this virtual world. In other words, Rihannon is still being positioned and positioning herself in an essentialist world where

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¹⁹ WOW is the abbreviation for the Massively Multiple Player Online Game ‘World of Warcraft.’ Online identities (avatars) are created by the players who form guilds and participate in Quests. Chick is a girl player and chicklet is a girl player using a male avatar.
everyday practices posit her as “other” or as an object, and are not inclusive nor enable her to have a sense of belonging on her own terms.

Heather also occupies this layer of mobile identity but positions herself differently. She says that she has 15 WOW personas, some male. She says women play with effort and involvement compared to men. Heather says that women players are more caring and careful in how they play, and wait for a player to resurrect if killed in a game, showing group engagement and empathy. This contrasts with her view that most men players log off as soon as they die and take losing personally . Thus, the space is one where gendered sense making still confers essentialist gendered effects.

Heather and Rihannon agree it is common for IT professionals to also be proficient gamers, and have a variety of gendered avatars . Gaming itself, as a profession, as well as a recreational pursuit, is also said to be attractive to them . This fluidity of gendered identity is taken up by male and female players in the virtual world, and shows a mobile subjectivity among some IT professionals. This effect could be carried over as gender flexibility in workplace and classroom practice, as it creates a space for change. It shows that women are capable of transforming spaces for their goals and values, rather just fitting in. Resistant spaces can be created in terms of performing gender differently.

However, in her interview, Heather draws a distinction between herself being a gamer and being an IT professional. She does not see them as co-joint. She relates her agency as a gamer as being something she fell into, rather than deliberately sought out, as a result of a vacation course run by a programming lecturer who inspired her. She says that she happened to keep her game licence current after the course . This positioning is dissonant with her previous positioning of herself as a person who wrote scenarios for MUDs , and being positioned as someone who watched her brother play computer games as a child, but was not allowed to join in . Thus her neoliberal performativity as a powerful ICT professional is constituted as distinct from the virtual world of gaming which she positions as lesser and lacking as it is mainly a male world of playing games. This privileging of her female gender being able to occupy a male space is distinct from Rihannon’s preference for gaming over becoming an ICT professional. Rihannon has more influence and power as a WOW chick than as a struggling programmer.

Heather’s training in ICT is described, in contrast, as deliberately taken up, and she values herself as independent, only wanting support if she asks for it, and being a person who helps others, both

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20 MUDs are Multi-user dungeons or fantasy worlds where players interact with each other online entirely in text.
men and women students, §§1178-1243. In the male shaped environment of the classroom, Heather positions herself in the powerful male dimension of the programing expert, who assists others, has the courage to speak out and challenge inconsistencies in policies and practices. She positions herself as dominant to her twin sister’s ICT skills as “lack” even though both have had the same opportunities, but excuses her mother’s “lack” as generational.

Yet Heather also describes herself as having much to learn and a person who values her privacy§§1688. Her outward appearance as tall, full figured and feminine, with long naturally blonde hair has attracted unwelcome attention from some male students. Heather articulates the discursive dilemma of being attractive, yet not in the stereotypical terms of thin and cute. She asks on the record, how she can gain a male partner who respects her intelligence, rather than envies or competes with her in ICT §§1644-1650. Thus, multiple subjectivities are taken up by Heather, and she keeps us guessing, as she weaves between the taken up subjectivities of lack, her constituted self, and her performativity as an emerging IT professional.

**Conclusion**

Rhiannon and Heather inhabit mobile subjectivities that impact upon how they engage in ICT. They are able to shift seamlessly along the matrixes of their different identities, with an awareness of the subtle and not so subtle ways they are positioned. This fluidity of gendered identity that is taken up by male and female players in the virtual world shows a mobile subjectivity among some IT professionals. This effect could be further utilised. Gender flexibility could create spaces for change in workplace and classroom practice. Gaming could lead into a multi-media training pathway in gaming and/or animation. Yet, each of these women, at the time of their participation in this research, carried vulnerability about acceptance as an emerging woman ICT professional. This is perhaps why Rhiannon prefers gaming to her training, and Heather constructs a powerful subjectivity as an expert programmer. Further research is needed to see whether this mode of subjectivity persisted as they continued in their chosen ICT pathways.

**Discourse of ‘Lack’ Subjectivity**

Another way that women as emerging ICT professionals may take up their subjectivity is “lack”. This discourse derives from the normalisation of gendered attributes in ICT as in a male domain. This seems natural and commonsense, but is artificial. While this positioning may persist, it relies on political contingencies and is capable of change (Lloyd, 2005). So while some women
students are positioned by other students and lecturers within this discourse, they may resist and subvert it.

The most useful application of this concept is to analyse positioning in terms of what participants perceive that they do not have as women and “other” compared to men. This version of lack over determines woman as subject through a combination of “practices, institutions, and discourses” as generally inferior and subordinate to man (Lloyd, 2005, p.19). Power and agency arise out of overcoming this instability through identification. This arose in this project when discourses positioned men as ICT literate, and women as lacking ICT knowledge, and then analysing how this positioning was resisted and subverted.

For example, Rihannon has not experienced the same degree of privilege in her ICT training as she experienced as a gamer. She is positioned in the discourse of “lack” in her education settings. As already discussed, Rihannon has struggled with programing, networking, and multi-media, has been positioned as not capable by the tutors who ignore her ways of seeking help, and she was rejected as a help-desk person. She is annoyed that in her part time work as a computer salesperson, customers position her as unknowledgeable due to her gender, yet she has shared her deeper ICT knowledge to benefit male sales staff whom they do approach. Her student loan is huge, she fears further rejection in failing to win an ICT position in New Zealand, and hopes to work in her own business on the management side with Heather as the programmer, which later Heather rejects. Rihannon resists this positioning of her subjectivity as lack. She completes her ICT degree, and succeeds in being employed in Australia in ICT, on the basis of her business experience. This is a prime example of agency and power arising out of agonistic resistance to the subjectivity of ‘lack’.

NESB speakers position their subjectivity as ‘lack’, combining gender and ethnicity. This is especially noticeable in the two student online focus groups where the “lean” communication is mediated by computer, and involves reading and writing without the benefit of aural and facial cues. For example, one third year international student, ICT3A, with RPL for first year courses, has difficulty communicating in the unfamiliar research environment of online chat. In the second session, she confuses ciphered identities, occasionally has difficulty following the threads, and has also found online courses confusing, especially with self study. These otherwise fluent and able students feel disadvantaged, for example, first year mature students Namiko and Lina. They say they have difficulty understanding the lecturers and underestimate their own ICT ability. They feel positioned in discourses of constraint especially when under
pressure, when they can find it difficult to remain thinking conceptually in English. This impeded their confidence, learning and their communication in this research project.

“Lack” significantly affects women international and resident students, who also must resist being positioned within their cultural setting as “subordinate” and “other” compared with men, unless they are affluent and/or have parents or partners who allow them to live beyond these cultural constraints for example, Latika, Namiko, and Anya ¶922, 268, 458. This subject as process also arises out of positioning by others. It extends to the reported reluctance of some local ICT industries to employ students who lack confidence in interviews and/or have NESB accents which New Zealanders are ill attuned to hearing (Smith, and Asgarkhani, 2007, personal communication).

A third way that this layer of subjectivity arises is in the ways that students position themselves in comparison to male knowledge and experience of ICT. This is prevalent in all groups at all levels. Maire, in her interview, who was an experienced ICT user, saw herself as “on the back foot” coming into her training. In all courses, except Office Applications, she felt completely out of place. “Everyone was talking a whole different language, and even now I don’t quite get it. But there’s so much out there, it’s amazing and I love it and it interests me, but I also don’t want to appear dumb and ask these boys what they are on about” ¶280-292. Maire finds it difficult to find places where she can discuss and relate to other women in terms of ICT. “It’s very limiting” ¶ 340-348. Maire sees that while IT is creative, it is seen as lacking creativity by women in general. The group of women IT students she “hangs out with” are together because they all have the desire to learn- not so much the desire to mentor other women, “though this would be a nice thing”. ¶368.

Surprise was expressed by first year students at the enthusiastic ways that help can be offered to them by younger male students with ICT knowledge. Lack is not necessarily positioned as negative. “He’s quite smooth…And he jumped right over the desk … and he said “How can I help you?” ¶494- 498. This contrasts with their frustration how they are positioned as lack by other young males. Maire: “Others think they know it all. They try to help. Maybe it’s in their voice, their attitude and their demeanour, they just bore me to tears and I just want to hit them”¶ 504. Brigit:“Certainly a lot of guys are…more than happy to help, but often it seems that they are more than happy to help to show you how good they are” ¶343. Emma: “and if we ask questions, they were all like, in a good way, we’ll come to help you but then they come on too strong or they say really inappropriate comments…and they don’t know what…things will offend us and then they wonder why we go all weird”¶283. In other words, they experienced the
subjectivities of masculinities as “lack” in terms of being patronised, or spoken too with sexual innuendo. Graduates recognised that male students also struggled, but also grasped concepts more easily. They all agreed that women learned technical subjects best when it was “hands on and practical”, with a clear purpose and outcome ¶286-309.

Graduates, looking back, contrasted the numerical prevalence of men as a refreshing contrast with being from all girls school environment or feminised workforce. Frankie: “I felt like I did get a lot of help and attention which I doubt I would have got in another field of study…in a good way though” ¶200-202. It helped prepare them for the nature of the industry. Grace: “The fact that there were so many men in our classes prepared me for the software development company I work for now” ¶186. Some graduates preferred relating to men “Men were more straight up and down, and did not have all the intricacies of women” ¶198.

This layer of subjectivity appears to arise from the normalisation of power as a hierarchy, a traditional male structure, where more experienced and more knowledgeable practitioners are valued over new and emerging practitioners who are acquiring their skills. So, while female students may lack ICT knowledge, they rank themselves as more adept, socially, and as parents, and/or with a broader life and work experience. They were able to learn in a motivated manner, in the face of less mature and generally less motivated responses from male students, and uneven curriculum delivery from lecturers. This opened up a space to overcome their positioning as lack, and gain in depth ICT knowledge through hard work.

**Conclusion**

Rihannon is an example of a woman student whose learning and career pathways have lead her to position herself in the subjectivity layer of lack. However, her determination to succeed leads to her success in gaining an ICT position in Australia, which capitalises on her success in ICT sales which she initially undervalued. Another group affected significantly by this positioning are NESB students, including those who are undertaking the graduate diploma, and take advanced papers with third year degree students without a depth of prior knowledge. Interestingly, those in the research who have successfully negotiated the socio-cultural constraints of their NESB backgrounds do not show inclusiveness or peer support as neoliberal subjects for their peers who are struggling. Rather they take up the excluding and privileged position of being more fluent, a position taken up by the kiwi students. Thus, hierarchy and racism may regulate within the learning setting.
Residency as a student is contingent on acquiring points through postgraduate ICT courses. As the South Island becomes more multicultural with new settlers from an Asian background seeking residency, despite the economic recession, this source of tension is likely to continue. It is likely that international student enrolments are not capped, unlike New Zealand citizens and residents. Physical spaces will still be finite, even though funding regimes differ.

Finally, while all women students reported an initial positioning of lack compared with male students in their ICT knowledge and experience, their motivation to learn, coupled with their ability to work hard to acquire these skills, rapidly outstrips their relative disadvantage by the end of their first year of study. Informal groupings of IT women often give support but this could be taken up as an empowering positive space within the ITPs themselves.

The drop in numbers by gender to 10% of the ICT course intakes in 2009 needs to be further researched. The impact of the recession, and the lack of response from women to take up ICT training as a positive move in these more constrained economic circumstances, is inconsistent in the light of women’s experience of being able to rapidly acquire ICT skills. The powerfulness of the discourses constructing ICT as a male domain may be continuing to have a strong effect that deters women from taking up training in harder economic times. The impact of capping ICT student numbers is yet to be determined in terms of the effect on overall student diversity. It may be yet another effect of lack for women.

**Discourse of Deferred Subjectivity**

The third account of this concept sees woman as “deferred.” Deconstruction offers a view of identity as difference, open to infinite reassigning. Feminism needs to imagine “spaces of political otherness” (Elam, 1994, cited in Lloyd, 2005, p.22). This can be applied in ICT where women may experiment with various aspects of ICT, yet not develop a speciality or commit to changing their identity to incorporate ICT professionalism. However, in Lloyd’s view, this concept needs to be supplemented with an approach that is more politically aware, as it cannot stand on its own. It has parallels to my theorising of resistance without resilience, with the risk that deferring leads to withdrawal. Thus, another way that women as emerging ICT professionals may take up their subjectivity is as “deferred.” In this discourse, taking on the identity of an ICT professional is postponed, sometimes indefinitely. A student enrolls in a programme of training, but finds a reason to not fully engage in the courses. Distractions and disruptions are more likely to be experienced as a way of justifying discontinuing the training, or not seeking or continuing employment in the ICT industry. A student is likely to express diffidence and lack of certainty.
when confronted by challenges. To some extent, Brigit engages in the process of ICT professional identity deferment, even though she is a willing research participant. Her interview is more focused on the psychological process of her transgendered transformation\textsuperscript{42-210, 218-222, 250-254, 266}. Brigit spoke for 30 minutes about her personal background before engaging in the formal interview process. She was tentative and expressed surprise when I suggested that we needed to begin recording.

Another student who defers her ICT professional identity is Emma. In the first online group session, she appears enthusiastic and engaged, but is unsure about her IT speciality\textsuperscript{121}, and refers to the distraction of the younger males, some gamers, as a small group of women in the class with her friend Kara\textsuperscript{183- 245}. In the second session, she raises the harassment issue\textsuperscript{181-277}, and does not attend the third session. When approached for an interview, she suggests her friend Kara may be more suitable, but agrees to participate as one of the few younger women students in the project (personal communication). Key disclosures about perceptions of suitability from family and friends show her diffidence about taking on the ICT professional identity. “We didn’t have many computer options…it was an easy option people would take to get credits…it wasn’t cool to do it during school so we kind of just avoided it…None of my friends or students or people I know from school (a girls single sex high school) are studying IT” \textsuperscript{31, 19, 63}. “My parents aren’t even computer people (like her friend, Kara) …it’s just that I’ve always…so it’s kind of weird that I’ve taken an interest. Literally, even like my family, like my aunts and uncles and grandparents they don’t do it either…I was really excited and I was like I have to study this, but what held me back was the stereotype of girls don’t do it, it’s such a nerdy thing…and I’d just end up being in a room by myself…I’ve had it in my head ever since I was young like everyone always thinks it’s a man’s job and like working with pulling apart computers it just seems too difficult ” \textsuperscript{91, 135, 179, 243}. The power of the discourse from an early age to effect peer behaviour and undermine personal commitment is in evidence, in spite of support from her mother and a taster session at her work and the supportiveness of lecturers\textsuperscript{127-131, 139}. At the end of her first year, Emma travelled overseas, but did not re-enter her course of IT training on her return (personal communication). In other words, Emma does not successfully engage in ICT training, or embrace an emerging identity as an ICT professional. Emma postpones this, and does not successfully complete her course. Her taking up this ICT identity is deferred, reflected like a mirror behind her and in front of her like a tantalising possibility that she is capable of realising, and yet cannot accomplish.

In the graduate group, Nyree, whose parents were new settlers, relocated to a north island city as part of her husband’s marketing career. She showed diffidence and deferment towards taking on
the role of an ICT professional. All of her children are highly computer literate, which comes from the encouragement of their parents. Nyree had an NESB background and a learning disability which she overcame during her ICT training. Nyree found it difficult to win an ICT position, as most employers required at least one year’s experience. However, she enjoyed making a new life in a big city, and finding her place in a new neighbourhood. She experiences change as a challenge and responds with resilience. At the time of her research participation, in a buoyant economy, Nyree was successfully using her project manager skills to renovate houses in partnership with her husband (personal communication). Thus while her ICT training assisted the development of her personal confidence and gave her an opportunity to better manage her learning disability, Nyree did not take on ICT as a profession.

These outcomes, however, are still valuable. Since the downturn, Nyree has been exploring a new career path in early childhood education (ECE) so that they can set up a business providing quality early childhood education in their neighbourhood (personal communication). Nyree has experience in raising their three children, aged 15, 13, and 10, was a playcentre leader, and has very advanced interpersonal skills. When asked if she was likely to take on IT skills in ECE, Nyree saw that role like networking and thought it was unlikely (personal communication).

Another graduate who deferred her ICT identity was Grace, who had previously been a health professional. Parenthood took preference over continuing her ICT role, after the first year in the position. Married to a programmer, Grace is happy to choose to be at home with her son, and is pregnant with her second child (personal communication). It is not possible to predetermine where Grace’s career path may lead. However, her children may inherit their parents’ skill sets and aptitudes, and perhaps Grace may re-enter the ICT industry in some capacity in the future, or in an allied field.

**Conclusion**

Deferring of an ICT identity is one of the subjectivities that women students and graduates may take up. In doing so, the ICT identity is postponed, perhaps indefinitely, as parenting or other career or life choices take precedence. Another source of the deferment is possibly that taking on training as an ICT professional may be extrinsic rather than intrinsic. In other words, taking up an ICT professional identity may be seen as responding to external processes such as a career path with potentially high salary rather than a personal ambition. This needs further research. Emma was unclear about her career direction, and was encouraged to take up ICT by her mother, based on her interests in ICT. Yet she felt discomfort both in class and in taking on an ICT professional role in a male domain. Brigit mainly sought a more highly paid position than
available in hospitality, so she would be better able to fund her gender reassignment. Her positioning in a male domain as a person in transition may have amplified any sensitivities about her gender identity. Similarly, Nyree cited a good wage in ICT as being a prime motivator in taking up ICT training. She is now using her skills to pursue other avenues that are more closely allied to her enjoyment of parenting, art and design, and community development. Her partnership with her husband in business ventures is likely to be well fulfilled as an owner of a ECE centre providing quality care. Grace entered ICT after nursing as an alternative career. Now a mature mother, Grace is enjoying being a parent, while her husband continues as an ICT specialist.

With all career pathways, the length of time taken to train and establish a career, such as in ICT, may be subject to change where the person concerned finds other more intrinsically rewarding work that is personally satisfying. It may be paid or unpaid, family or community based, waged or self-employment.

This outcome does not discount the advantages that women gain from having ICT and acknowledged skills that are used in family and community or self-employment settings. It strengthens the knowledge base of our society, and encourages possible diversity of career choice among those with whom these women come into contact, such as other parents, young people and children, and those in the community.

**Discourse of Constituted Subjectivity**

Drawing on Foucault, the constituted subject is produced by power through the mechanisms of interplay between competing discourses and practices. Thus, subjects can be differentially positioned which, for example, can create matrices of inequality where some may speak while others are denied a voice, such as in a programming classroom. De Lauretis (1987, cited in Lloyd, 2005) reconceptualises gender as multiple and contradictory, while modulated by class and race. This concept explores how practices and discourses produce specificity and difference, and how emerging ICT professionals are reconstituted through the mechanisms of subjectivity, agency and power. Thus, women as emerging ICT professionals have an inscribed subjectivity is as “constituted.”

This discourse depicts women as IT professionals as composite. Their subjectivity is multiple, and consists of a variety of discursive strands which intersect and inform each other. Thus, while
each student may share these strands with other students, she also has a unique pattern which she uses to construct her identity. This phenomenon also applies to graduates who are now working in their chosen ICT profession.

Subjectivity as a constituted discourse strikes a chord with the participants, as the field of information and communications technologies is wide. Skills are gained incrementally, with foundation courses in networking, programming, and multimedia leading to specialisation in the second year of the diploma, and the third year of the degree. So, the identities which are built up and comprise an ICT professional are dependent on what specialisation students gravitate to during their studies. So, it is consistent in this process to be also evolving a constituted subjectivity in response to being a female in a male domain.

Thus, one way of constituting their femininities lies in differentiating themselves from masculinities. Essentialist strands of the constituted discourse were prevalent in all the online and face to face focus groups and in the interviews. It was the dominant discourse for participants when describing their subjectivity, agency and power. It was a source of intense discussion, debate, engagement, and reflection, including teasing each other in some groups.

This section explores a sample of these essentialist strands around constituted subjectivity. However, these strands are often contradicted when particular persons speak about themselves and their identities as ICT specialists. Often, the interplay is agonistic, and the counter discourses may arise out of responses to essentialist discourse, and the attempts of others to depict women in ICT or ICT itself in other ways.

One strand of this essentialist discourse is generalised as a binary reversal, with female students positioning themselves positively and masculinity negatively. For example, the first year participants construct their femininity as positive, responsible and hardworking, knowledgeable about practical things such as cooking, managing time, and meeting family responsibilities, and having a positive work ethic that is applied to their training and study. When female participants gave accounts of their femininities as not coping, managing, or not engaged positively in their training, they were exposed to challenges and teasing, and so responded with self justification.

Essentialist masculinities are constructed as negative, disruptive to learning, (which created anger in the female students) and knowledgeable about obscure matters within ICT, mismanaging time, and having a lukewarm engagement in their studies. Further, men are reserved about their feelings, don’t understand women and their obsessions about their bodies, and have communication breakdowns. They think “a different way” to women. Issues are “cut
and dried,” “black and white,” ¶ 198 and they have tunnel vision. Men did not go to the levels women did, thinking things out emotionally ¶203.

This narrow approach was also seen as embedded in male ways of engaging in their learning about ICT. For example, “They like to tell a lot of simple stuff in very complex and difficult terminology” ¶ 458 and saw “the one way they have learned as the only way” ¶ 205. When young male students behaved outside of these boundaries within the discourse, and show positive support, the participants expressed surprise at its nature, but accepted the assistance as a variation of masculinity.

These strands reflect women’s meaning making about their behaviour as women, rather than generalisations about women in general. They are composed of reflections on their experience as women, and how these experiences are comprised.

Brigit and Serena as transgendered participants, have constituted subjectivities arising from their gender orientation. Serena does not directly disclose her gender when recruited face to face. She says “Oh, and there’s something I should say about me” but then goes no further in front of the group at the second project recruitment meeting. But her status is apparent in demographic data, and was confirmed by the ITP contact after the meeting. Serena participated in one online session as a second year student.

Brigit was introduced as transgendered by her friend Heather at the first project recruitment meeting. Brigit follows this up by offering to be interviewed, and providing background research materials. Her interview is a rich source of discourse. Born and positioned socio-culturally as male, yet psychologically identifying as female, Brigit has an ongoing relationship with a woman partner. The poignancy of dreaming of being female in adolescence to wake and still be biologically male shows the pain attached to being in a constant state of flux ¶64. Brigit recounts her positioning in a single sex boys high school as one where she was bullied. Brigit’s emergence as female runs parallel to depression and self longing to be female from childhood, through adolescence and early adulthood¶64. Her gender ambiguity has led to being mistaken as a daughter on the phone and as a way of shocking men into silence when sexually harassing her and other female bar workers ¶ 58-63.

Brigit values friends who have known her blended subjectivity especially her long standing partner who recognised her as a woman while outwardly she was a male ¶74. She agrees that her transgendered self is vulnerable to dissolution, and has led her to take risks leading to self sabotage and not achieving her full potential academically ¶218.Brigit sees computing as a
means of having a well paid career to fund her gender reassignment, and to give support to other transgendered friends doing the same ¶ 214.

Brigit has a unique gaze when viewing femininities and masculinities in ICT training and education. By gravitating to networking, she can combine her technical and people skills: “I always want people to know they can rely on me and that they can trust me … networking, the backbone of the system, everything that relies on this. And despite that I enjoy dealing with people… I can do them both… that is why I ended up in networking” ¶ 242.

Brigit realises the extent she is able to see a difference in how she is now treated as a woman learning about ICT. It feels odd being one of the few, having previously experienced being a male in the majority ¶ 350. Brigit considers the advice that had been offered to her by a female friend that she was most likely “to become a staunch feminist.” Having been raised with the idea of white male privilege, Brigit agrees she is now crossing that barrier and coming at it from the other side, “and suddenly you're going to realise that those same things don't apply any more” ¶ 350.

Brigit sees ICT as a masculine profession which is cliquey and assumes women to be in a minority ¶ 330. Men have been encouraged by their previous hands on experience before training to have a baseline of knowledge in ICT ¶ 334. Women have not been exposed to ICT in the same ways, a “lack.” While the male students are more than happy to help women, “often it seems some are more than happy to help to show how good they are” (my emphasis) ¶ 342.

The more open she becomes about her transgendered identity in class, the more Brigit notices differences in the way that she is spoken to and treated by lecturers: “It's subtle. It's insidious. It's quite subtle” ¶ 362. Some are neutral, but some are quite distinctly biased towards assisting male students, particularly in terms of the time given to them in class. This degree of attention also seems to be expected by male students as their right.

Sometimes Brigit has observed able male students being disruptive and monopolising the lecturer's time in terms of class control at the expense of everyone else and their learning needs. Their attitude seemed to be that they already knew the content and did not have to work in class as the task could be performed very easily later. These male students loved the machine but did not love relationships with people. While some of them passed these courses, they did not apply themselves outside of their area of expertise and found it difficult to complete the rest of the degree ¶ 370-386.
By considering how women were positioned within these classes by both the adept male programmers and the lecturer, Brigit chose firstly to reposition herself into another ICT field, the male domain of networking. It is likely that her discomfort continued. Not long after her interview, Brigit dropped out of her ICT training. One possible reading of this is that Brigit was able to discern how her positioning could be resisted and subverted, reflecting her agency and power at a personal level. Thus, while her constituted subjectivity made her vulnerable, particularly as she moved across the gendered space, Brigit privileged her personal relationships over her ICT training. So, while she was no longer an ICT student, Brigit was able to protect herself by choosing to no longer be exposed. Further research is needed to confirm or re-evaluate this interpretation.

Conclusion

Constituting an ICT identity as a subject in process is taken up by women students and graduates as they acquire ICT professional skills. This process identifies the positioning of femininities and masculinities in ICT training in terms of agency and power. Identification opens up spaces in which women as emerging professionals can take up an ICT speciality and map out a career. When the identity being constituted is also repositioning within femininity, as Brigit is doing, this process involves an opening up of vistas of femininity from a unique perspective, as the familiar is strange and fresh. In this case, power and agency used to pass as a woman may become more important than to constitute a successful ICT identity, which is perhaps why Brigit discontinued her ICT studies.

Discourse of Performative Subjectivity

The final account of this concept is Butler’s personal and social performativity that can be applied to women as an emerging ICT professional. Gender is made through a repetition of stylised acts as iterations that we imitate, each being different. The practices making up performance enable modification with power playing an important productive role. Thus, discourses create different gendered ICT performativities within the shifts of power between female and male ICT students and their lecturers. The final account of subjectivity is performative, with which Butler (1999) has significantly shifted the ground of feminist theorising. Simply put, gender is produced by iterative “acts, gestures, and modes of behaviour” (Lloyd, p. 25) and so gender is an effect of the reiteration of a set of inescapable norms. Thus, power/discourse “produce the phenomena that it regulates and constrains” (Butler, 1993, cited in Lloyd, 2005, p.26).
This concept has interesting implications for theorising women as emerging and new ICT professionals as subjects-in-process. Firstly, the participants are all imitators, repeating the acts gestures and modes of behaviour as emerging and new ICT professionals. Yet, each iteration produces a gendered identity “with a difference” as each is a unique expression. This raw material is able to be worked on, transformed, as it is tenuously constructed politically (Butler, 1990, cited in Lloyd, 2005, p. 27). Thus femininity and masculinity are perpetually open and politics is perpetually destabilizing, disruptive and dynamic. New and emerging ICT professionals are the effect of discourse that establishes what is and is not permissible, what identities are produced and what are foreclosed. Subjects can make sense of their lives however arbitrary or contingent are the historical conditions. They can redeploy identities in subversive and therapeutic ways, to resist their positioning, as identities are “always saturated with power relations” (Lloyd, p. 40).

This final section explores the ways that discourses convey and shape iterative acts, gestures, and modes of behaviour as women ICT professionals. It analyses accounts of performativity as subversive and/or therapeutic, and the ways that identities are saturated with power relations. Lloyd considers the fourth and fifth accounts of subject-in-process are capable of articulating political change and subversion.

Performativity of feminine and masculine subjectivity in ICT

Performativity as a female IT professional often is breaking new ground and recasting “geek” behaviour as “a newer breed of the original IT geek” ¶189. This discourse is taken up by the graduates with work experience in a variety of IT fields. Girl geeks are “approachable” “like to socialise” and talk about non IT subjects, “love geek toys” “new age-intelligent, geeky in our industry, but business and life savvy too” ¶466, 199, 470, 492. They are excellent project managers, and can talk on a technical level within the industry, but also act as a translator between the “IT geeks” and the corporate world ¶189,191. Girl geeks love to go shopping for “trendy office clothes” and enjoy having a good dress sense, with makeup, and looking professional, including suits in frontline work environments that relate to clients face to face ¶227, 231, 237. Frankie, who has just graduated, sees no boundary being crossed “you can still dress hot, and reach for the latest toy” ¶247. Holly who has been in IT for three years agrees, but suggests that credibility depends on both an attractive physical appearance and being competent in IT “as you are judged on both” ¶253, with which others concur. They are unfamiliar with the concept of diversity. Rather they see themselves as reiterating the geek image for themselves.
Jayne is less comfortable with this, and dresses casually to blend in, and cites other examples of older women already in “a man’s world” who do this ¶267.

Being a computer geek as a girl was sometimes not positioned as feminine. Heather does not accept this as embracing her “masculine side” ¶96. Recently, Heather was asked by an old acquaintance, who was a programmer himself, what she was studying, he replied “You don’t look like a computer programmer.” Heather responded, “Well, what does a computer programmer look like?... and the answer was staring him back in the mirror, his reflection right there” as he fitted the geek stereotype himself ¶1643.

In spite of women programmers, who may have a feminine appearance, like herself, Heather saw television marketing as responsible for sustaining stereotypes of computing being a male domain, which constrained women from entering the profession. Virtual worlds are “bright colourful and fun” but the grey boxiness of a computer is an “initial deterrent” ¶978. Heather speculates that girls might find computers more attractive if they were accessorised as coloured pink, or more feminine shades. Maire, who has two teenaged daughters, agrees. “to encourage girls…with girlie stuff, because they want to be very feminine…let them play with it, get them hooked (in multimedia) hey you can create it, your program, your idea” ¶504,520, 524.

Women as emerging IT professionals negotiate their learning in an atmosphere saturated with power relations. Some ICT learning takes place in an atmosphere of negativity, with male students performing as dominant and ICT able, and casting females as subordinate and less able. This prevails regardless of the ability of female students, which was assumed to be less. For example, a male lecturer told all students on their first day “words to the effect of half of you were going to fail.” He later expressed surprise that Heather was not doing a resit, having positioned her as likely to fail, regardless of her performance in class ¶179. Brigit notes “very very heavy cultural norms among groups of guys and women”. Men and women tend to occupy different spaces. Even when women are in a small minority, they often sit alone and observe, rather than with another woman student or try to make a connection with the male students.

Brigit observes that male students behaved directly, and dominated some lecturers; “you do it this way” If lecturers were not helpful, “they’d take over” ¶149. Brigit agrees is it one thing to ask for help from a male student, and be given that help. It was quite another matter to have them give help unasked “do I want to be shown, or do I want to be told or have it explained to me and I don’t think we ask that enough” ¶689. She sees this “as definitely a (male) power thing whether
they consciously acknowledged it” ¶721. Often women were not necessarily conscious of it, “but it still annoys them, and they’re not sure why” ¶737. Brigit resists this constant positioning: “I don’t want to be seen as needing help… I want to be able to stand on my own two feet” ¶479.

Women students often are seen to work very hard studying in a traditional male environment. “They go out of their way to be better than men because they have to…the whole thing of working twice as hard to be (seen as) half as good” ¶793. Brigit notes however some female students do occupy that male space to their advantage. “It’s not often there’s a bridge between them… girls who feel much more comfortable hanging out with the guys…get to learn an awful lot of stuff they might not otherwise.” ¶769.

Tyla, who sits with males in her first year courses, has performativity which is subversive. She enjoys surprising people when she tells them she is training to be a network administrator. She resists negative positioning and takes on being a geek as positive. “They’re shocked. Think I’m a geek…And I go with it, whatever, yeah, I’m a geek…they don’t think a girl should be doing it… I’m positive” ¶369-373. She is assumed to be training as a nurse. “Most people assume if you’re a girl you’re doing nursing…there are so many of them…most students they think you’re a nurse when they see you” ¶377, 395. She resists this by negatively labelling trainee nurses as “gigglers” which is taken up by Karen as labelling them negatively as “a pack of giggling women” ¶381.

**Conclusion**

The regulating effects of the regime of IT professional performativity are resisted by the IT practitioners themselves, as well as the students as emerging practitioners. All are aware of the negativity surrounding their chosen profession, and they are creating iterations and re-citations of their identities in their work and learning spaces. Credibility lies in successful work performance as well as creating a professional look, which the women IT professionals are successfully feminising. Negativity during training and being treated in patronising ways by male lecturers, students and existing male IT professionals is recognised, and increasingly resisted. This includes deliberately associating with male students and taking advantage of the knowledge and power that comes from that. Thus fissures are opening up in the stereotypical performativity of the IT geek male. Girls as geeks are iterating this performativity by blending in femininity in clothing, recognition that IT skills are not gendered, and seeking ways to challenge this popular misconception. Providing more deliberate spaces for women to extend this performativity especially to any female students who are entering IT, and potential entrants such as female high
school students, is suggested as a way of further weakening the hold of these negative regulating forces so it is increasing not a male world.

Summary

As subjects in process, these emerging and new ICT professionals mobilise the layers of their subjectivity. Each is positioned uniquely within the approaches of mobile, lack, deferred, constituted, and performative subjectivity. The interrelatedness of subjectivity and discourse as co-constructed creates effects which in turn shape and are shaped by their positioning. Femininities and masculinities too are similarly co-constructed as subjectivities and discourses within the male domain of ICT.

As neoliberal subjects, women as emerging and new ICT professionals grapple with these multiple layers of subjectivity to find their unique positionings, which are fluid, responsive, yet restrictive and frustrating. Yet they maintain their resilience by constantly negotiating these boundaries, and maximizing the agentic effects of the positioning they adopt explore discard and re-create. They are in fact the new pioneers in a new territory which their desire is making it their own virtual and real world for women, gender and ICT.
Chapter 10: Blending feminism with a business case as neoliberal subjects

Introduction

In this final chapter, I suggest strategies for addressing the issue of recruitment and retention of women in ICT in Aotearoa-New Zealand. I conclude by evaluating the strengths and limitations of this research.

Given the importance of ICT for the knowledge economy, it is suggested that while women will continue to populate the ICT industry regardless of whether their efforts are recognised or supported, there are some strategies that could be adopted to accelerate their recruitment and retention from technofeminist social justice and effective business model perspectives which are not mutually exclusive.

The participants considered what could be done, and this next section summarises some of the strategies that were suggested in the focus groups. Each strategy suggests a coalition of interests between academia, industry and government, which in neoliberal times is resisted, yet is essential as no one sector can of itself overcome the current constraints that are evident in this project. It is a much slower process to effect change through some women as individuals, and this is much more open to the negative effects of economic downturns as current enrolments of women in ICT indicate.

Suggested strategies

The ICT industry could do more to support the efforts of women in training and employment. Suggested practices included 1-2 year paid or unpaid internships or work experience that extended their final year industry project. Third year students wanted the ICT industry to give them greater opportunity to gain employment which advantages the industry as a whole by being more diverse S3_Y3_F2F_30_08_07¶478-488, 540-568. They believed that Government support of such a policy could act as an incentive to the industry through tax incentives and as an encouragement to women.

While stated in terms of the needs of women students, agencies may envisage that other students and employees could benefit, especially if targeted as promoting diversity: gender, age, ethnicity, socio-economic status, and so on. However, specific ratios would be needed that were gender
based, otherwise, this policy could be diluted as a general measure to promote ICT employment is general, rather to empower women as ICT professionals. It is interesting that students, no longer in a welfare state setting, still see a National Government as a potential source of policy to further gender equity, as has happened in the past. That this is done in partnership between academia, industry and the government revisits past policy making from the 1970s in other non-traditional work incentives.

Policies of fairness in terms of equal pay for equal qualifications and experience between men and women were suggested as needing to be taken up within the ICT industry. B’arch believed that younger less experienced males were being given market rates but her own salary remained static. While this could not be verified, other research has shown a gendered wages gap in ICT in New Zealand in favour of men (Crump, Logan & McIlroy, 2007).

Family friendly policies where staff with children could work from home, through telecommuting, was another suggested industry based incentive for gender diversity (Holly, 2007). This strategy was supported by participants with families and those who intended to have a family and work part time as wages were high enough “to sustain both” a family and a career. Whether this is in fact, family friendly, to expect women to both work for their employer, and work as a parent with their children, at the same time, in the same space, needs further exploration. However, some mix of job sharing or agreed variations in contracts from full time to part time to accommodate both employer and employee, as well as having home offices, a home based carer, and blended with day care could be taken up more widely, and monitored for its effects.

It was agreed that support for family friendly policy was somewhat mixed at present in the ICT industry, locally, regionally, and internationally. Some employers had expectations of women employees which they personally considered appropriate for their own partner or spouse. The concept that it is natural for women in ICT to have planned absences for childbirth and child rearing with child care support is still not widely supported. Others based decisions on the negotiation skill of the parent, male or female. Opinion and company policy and practice is subjectively diverse as a result. More research into these areas is needed.

Another suggested source of support was developing ongoing training that supported ICT as a diverse and rapidly changing industry, as qualifications become rapidly outdated, and needed former employees with work breaks to re-enter training to recredential themselves. This effect
could be “a daunting prospect” that may dissuade or at least be very demanding for parents or others who have had some time out of ICT, (Brigit, I_Y3_F2F_30_10_07¶501). She suggests ITPs provide bridging programs to help fill in gaps in technical knowledge and assist with upskilling. Women only workshops, before ICT training, and on re-entry, were suggested as ways of affirming the potential of women, rather than feeling overwhelmed at the size of the retraining task.

Whether this is a more widely held view is not clear. Patti, who works in ICT, and who has yet to complete her qualifications, agrees that it is not easy to learn on the job or study part time. But ongoing professional development is essential (S3_Y2 OL_6_11_07¶412). It is further suggested that educators in ITPs take note of the ways that women students and graduates experience their training and education and its effects. A better understanding of how these discourses of constraint, and the ways that Resistance and Resilience are negotiated in classroom and workplace relations may inspire better practices in each.

**Strengths and limitations of this project**

As a poststructuralist technofeminist work, this research is innovative and uses a theoretical lens which explores the persistent problem of recruitment and retention in the field of women gender and ICT from a new perspective. It builds on initiatives in the research community to look at the ways women are different, and how they respond to the male domain of ICT. This is different from regurgitating the figures or repeating strategies that are from other cultures and systems. It uses mixed method experimentally in theory, and method, including qualitative and quantitative data analysis.

A particular strength is the focus on women students and recent graduates, their subjectivities, positioning, and their agency, as they relate to the discourse of constraint and the counter discourse of resistance and resilience and their material and discursive effects. The use of Lloyd’s subject in process as a multiply layered subjectivity is appropriate in the field of women gender and ICT, and it illuminates the ways that women are positioned and position themselves, as well as the co-construction of femininities and masculinities in ICT. Finally, the research gives a voice to some of the women training in ITPs, which have not often been accessed in ICT research. It is a project that deserves to be disseminated among the stakeholders in formats that will be accessible to those who are considering this persistent problem of the underrepresentation of women in ICT and the global economy.
Some of the strengths are also some of the limitations. For example, poststructuralist technofeminist theorising is dense, concept bound, and critiques, rather than offering comfortable remedies or positions. Reflexivity, trustworthiness and other validity is underdeveloped, and the context of the study overshadows the theorising. The reading and re-reading of the participant’s discourses and positioning in different contexts is repetitive, and in some instances under theorised, particularly the final chapter which still is under development. The lengthy conceptualising of context in Foucauldian style may overshadow the importance of the findings chapters. The mixed method approaches employed bring a level of complexity that is demanding and may not be fully accomplished. Some data gaps in the quantitative section, such as for one ITP and the graduates diminish the level of significance of this data. In all, this small local study is not generalisable, and only gives a partial view of this research field. But that is part of the poststructuralist paradigm.

**Conclusion**

In conclusion, whether as women we can continue to seek and form successful coalitions across the academy, industry, and the community to encourage the uptake of women as professionals remains a constant possibility globally, nationally and locally.

The women in this study are doing so informally, with and without awareness at their institutional level, with and without appropriate industry and professional organisational support, and with and without the awareness and support of their family and peers. They are constrained, yet many find ways of Resistance and Resilience. Some are empowered in taking on these identities as emerging ICT professionals. They inhabit multiple layers of subjectivity as emerging ICT professionals, and use the power of language to reposition themselves positively within the field of women, gender and ICT.

This theoretical perspective recognises that women can strategically and creatively integrate new forms of digital literacy such as social networking, blogs, wikis, podcasts, and gaming through mediums such as smart phones, netbooks, tablet computers, and e-Learning. Chasing the latest tools and toys, though, is not enough. We all need to engage in an ongoing ethical dialogue about the rationale of teaching and learning ICT in an economy where technology is driven by consumerism. What is technology’s purpose? In whose social and economic interests are education policies made and funded? To what extent are we aware of the ways technology is integrated and woven through all aspects of our lives? Where is the ongoing dialogue about the
uses and purpose of power in the knowledge economy? What can democracy mean for our nation states in the 21st century?

Without this framework, potential women students will continue to exercise alternative career preferences, or to learn experientially, informally, and avoid formal institutions and economies. We need to challenge who is marginalised and who is rewarded in the current iterations of the knowledge economy. Otherwise social justice becomes obscured by the fixed positions of the power of exclusion. We can begin this by analysing the subjectification, agency and power of the participants, and how they are positioned and position themselves, as emerging ICT professionals.

Until this occurs, women’s engagement in their teaching and learning of ICT, in spite of the resource and support differences between other Anglophone nation states and themselves, continues a cultural tradition of persistence and independence which they carry forward regardless into their subjectivities, agency and power as emerging ICT professionals. In the very least these efforts deserve recognition and supportive relationships and strategies jointly discussed and implemented in ITPs, business and government policies and practices for the good of all in the global knowledge economy.

References


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Pillow, W. S. (2003). Confession, catharsis, or cure? Rethinking the uses of reflexivity as methodological power in qualitative research. International Journal of Qualitative Studies in Education. 16 (2) 175-196


Hershey: Idea Group Reference.


Hershey: Ideas Group Reference.


Appendices
APPLICATION TO THE UNIVERSITY OF OTAGO HUMAN ETHICS COMMITTEE FOR ETHICAL APPROVAL OF A RESEARCH OR TEACHING PROPOSAL INVOLVING HUMAN PARTICIPANTS

PLEASE read carefully the important notes on the last page of this form. Provide a response to each question; failure to do so may delay the consideration of your application.

1. University of Otago staff member responsible for project:
   (surname) (first name) (title)
   Sandretto  Susan  Dr.

2. Department: Educational Studies and Professional Practice, College of Education

3. Contact details of staff member responsible: 479 8820
   susan.sandretto@otago.ac.nz

5. Title of project: Engendering ICT- how women experience themselves as emerging information and communication technology professionals.

5. Brief description in lay terms of the purpose of the project:

While New Zealand Government's policy frameworks continue to emphasize the economic and social importance of ICT, the need to have women participate in ICT careers continues to be ignored even though significant documented industry shortages have persisted globally for the last two decades. While few women are taking up training and education in this field, this is compounded by a paucity of national and local recruitment and retention strategies to encourage women's uptake of tertiary training programmes in ICT. This project aims to illuminate the nature of this problem in the educational setting of a polytechnic. This project will firstly examine the demographics of the 2007 students enrolled in the three business computing diploma and degree programmes at xxxxx-xxxxxx-xxxxxx--and compare these
with national and international patterns. It will then explore how current women students in a polytechnic training and educational setting take up, resist or subvert existing discourses, in particular, the ICT culture of claimed gender neutrality and the extent to which women are visible within ICT. It will explore the relationship between women students’ subjectivities and agency as emerging ICT professionals and the ways that they themselves make meaning out of acquiring technical skills in the training and education settings of the Diploma of Information and Communications Technology (Dip ICT), the Batchelor of Information and Communication Technologies (BICT), and Graduate Diploma of Information and Communication Technologies (G Dip ICT) programmes. Finally, it will explore possible strategies that may lead to a greater participation of women students in ICT, and the extent to which women students see diversity as leading to transformative change of the ICT workforce, and its goals and outcomes.

6. Indicate type of project and names of other investigators and students:

Staff Research □

Student Research □x

Multi-Centre trial □

7. Is this a repeated class teaching activity?

Yes □ No □x

If applying to continue a previously approved repeated class teaching activity, please provide Reference Number:

8. Intended start date of project:

2 July, 2007
Projected end date of project:

23 December, 2008

9. Funding of project.

Is the project to be funded: No.

(a) Internally

(b) Externally

Please specify who is funding the project:

10. Aim and description of project: (Clearly specify aims)

In the research conducted for EDUX 480, it was found that the New Zealand Government's policy frameworks continue to emphasize that ICT has a powerful, ongoing, economic and social significance for our nation state (Government, 2005). However, the need to have women participate in ICT careers continues to be ignored (Hedquist, 2006; Hendery, 2006). A paucity of national and local recruitment and retention strategies to encourage women's uptake of tertiary training courses in ICT reflects the neo-liberal policy vacuum in an era of significant documented global industry shortages (Bystydzienski & Bird, 2006; Olssen, Codd, & O'Neill, 2004).

Critical discourse analysis (Fairclough, 2003; Luke, 1997) can identify how women and information and communication technologies (ICT) are positioned within current government policy, such as "The Digital Strategy" and related policy documents. It can be used to explore some of the ways that women are being constrained by these discourses. In particular- the ways that the ICT culture of claimed gender neutrality and the extent to which women are visible within ICT arise out of and perpetuate these discourses (Kohlstedt, 2006; Wajcman, 2004).

Further research is needed to make sense of how women take up, resist or subvert these discourses. This research may also suggest ways to encourage diversity that facilitates transformative change within the paid workforce. It
may illuminate possible strategies that could be adopted to encourage women into ICT, rather than perpetuate the current gender concentrated and segregated patterns of training and employment. Such change may influence the ways that ICT is developed and used for the inclusive, participatory, democratic benefit of our citizens within our economy and society.

The aim of the project is to investigate:

1. In what ways does technology construct gender, and does gender construct technology, in the information and communication technologies? How does subjectification as a woman student in ICT constrain, empower, and/or modify her agency?

2. What are the dominant discourses underpinning women students' attempts to make sense of their undergraduate setting of ICT training and education in a New Zealand polytechnic environment?

3. In this local institutional setting, what are the demographics of all of the students who have taken up training and education in ICT? To what extent do these local patterns reflect international and national ones? What are the particular demographics for women students?

4. How do women students experience being a woman in ICT training and education? How do they position themselves and how are they positioned?

5. What discourses do they draw on to explain why there should or should not be a greater participation of women students in ICT?

6. What discursive strategies do they suggest may lead to a greater participation of women students in ICT? To what extent is diversity seen to lead to transformative change of the ICT workforce, and its goals and outcomes?

Using a feminist poststructuralist framework as the research lens (Davies, 1997; 2000; Wajcman, 2004), the project will contextualize this persistent problem globally, and research it locally, in the researcher's region, xxxxxxx, and tertiary institution, xxxxx. It will explore the relationship between women students' subjectivities and agency as emerging ICT professionals and the ways that they themselves make meaning of acquiring technical skills in the training and education settings of the Dip ICT, BICT, and G Dip ICT programmes.
11. Researcher or instructor experience and qualifications in this research area:

Dr Susan Sandretto's research work uses qualitative research methods. Her doctoral research, *Teacher education and social justice: Theorising professional practice* used qualitative research methods with some teacher educators to explore their beliefs and practices on issues of social justice. Dr Sandretto is the primary investigator in a three-year research project with Dunedin primary and secondary teachers that is developing and integrating critical literacy strategies into classroom teaching. In another project, at national level, she is working collaboratively to examine beginning secondary teachers' experiences to identify factors that are promoting or hindering teacher capability and retention. She supervises postgraduate students from honours to doctoral level and teaches undergraduate and postgraduate courses on a range of topics in educational studies, including educational research.

Diane McCarthy is a part time Master of Arts in Education distance student. She completed a Post Graduate Diploma in Arts (Education) in 2006, including EDUX 480. Her research essay explored "The Digital Strategy" and ways that women were positioned within that discourse and its related genre chain. She works part time as an ethics and professionalism lecturer at xxxxxxx xxxxxxx Polytechnic, xxxxxxx in the Dip ICT programme. Her research interests are: practitioner research, integrating technology in tertiary education, and social justice.

12. Participants

(Participants means any person whose behaviour, actions, condition, state of health the researcher proposes to study,' or whose personal information the researcher proposes to collect or use)

Business computing students enrolled in Dip ICT, BICT, and G Dip ICT programmes in 2007 academic year at xxxxxxx xxxxxxx and women graduates from those programmes who completed their programme requirements in 2005 and 2006.

I2(a) Population from which participants are drawn: (in particular, please specify whether any of the following might participate: minors, prisoners, hospital patients, or any one whose capacity to give informed consent is compromised in any way).

Business computing students enrolled in Dip ICT, BICT, and G Dip ICT programmes in 2007 academic year at xxxxxxx xxxxxxx
and women graduates from those programmes who completed their programme requirements in 2005 and 2006.

12(b) Specify inclusion and exclusion criteria:

Inclusion criteria:

- For the quantitative data from student records, business students enrolled in the Dip ICT, BICT, and G Dip IT programmes in 2007 academic year at xxxxxxxxxxxx.

- For the qualitative data gathered from interviews and focus groups, women students enrolled in the Dip ICT, BICT, and G Dip IT programmes in 2007 academic year at xxxxxxxxxxxxxxxx and women from those programmes who graduated in 2005 and 2006.

Exclusion criteria:

- Students enrolled in the six month Certificate of Information Technology (Cert IT) which on completion enables entry to the Dip ICT for students lacking qualifications for direct entry.

- Students who have enrolled in the Dip ICT, BICT, and G Dip IT programmes but who have not attended classes in either semester of the 2007 academic year.

- Male students are excluded from interviews and focus groups.

12(c) Number of participants: (where a sample size calculation is appropriate i.e., for quantitative research, it should be provided)

In 2007, approximately 350-400 students are enrolled across the three programmes. Quantitative data will be gathered about this population.

For the qualitative data, an invitation to participate in the focus groups will be extended to about 40 women students who are currently enrolled. The invitation will also extended to as many as possible of the thirty or so women graduates who began working in the ICT industry in 2005 and 2006.
In-depth interviews will take place with 3-5 of the women who emerge as leaders from within the focus group settings and take up the invitation to do so.

12(d) Age range of participants:

Approximately 17-35

12(e) Method of recruitment:

Women students and graduates will be invited to participate in the research project as volunteers. The open invitation will be extended by student email/voice mail. A lunch hour briefing meeting will also be held at xxxxx.

Women graduates, who have begun work in the ICT industry, in the last two years, 2005-2006, will be traced through the record system and through personal contact with the programme leaders of the diploma and degree programmes, and invited by email/voicemail to participate.

Copies of these emails and voice mails are provided in Appendix A.

12(f) Please specify any payment or reward to be offered:

Lunch will be provided as part of the face-to-face focus group meetings over the lunch hour.

13. Methods and Procedures: Describe the design of the study, the nature of the task required of participants and how the results will be analysed. The various precautionary measures to be taken to avoid harm or discomfort should be described (up to two pages, any questionnaire or survey form to be used must be attached). [If using body fluids or tissues please describe the ultimate fate of the sample; please note these samples must not be used outside of this research]

Focus groups

Once the participants have consented, a focus group for each year group will be set up that includes all programmes. This will enable participants to take part in the study as much as they wish, given their various workload pressures, and enables ongoing conversations to be held with their student
peers, and students from other programmes with the same length of experience in the programme of study.

The participants will be offered a choice of face-to-face or online discussion groups using chat in Moodle, (an open source online Learning Management System). For graduates, an online discussion group will be set up in Moodle.

In summary, the maximum number of potential number of focus groups will be two for Year 1, two for Year 2, two for Year 3, and one online group for the graduates. In practical terms, the mode of each year’s focus group may become either face-to-face, or online, depending on the number of students volunteering, and their preferences. It is anticipated that the focus groups may meet up to 3 times.

Group size may vary from 3-6, depending on the response rate from potential participants. Focus group discussions will be audio taped and digitally recorded, stored on a computer, and the audio tapes transcribed/abstracted, and analysed using critical discourse analysis. Chat sessions are electronically archived, and analysed using critical discourse analysis.

**In depth interviews**

Once the focus groups have concluded, the leader of each group will be asked to undertake a face-to-face or Internet based interview. Each interview will be semi-structured and explore the issues that had been raised in the focus group in more depth. Interviews will be audio taped, digitally recorded, stored on a computer, and transcribed/abstracted, and analysed, using critical discourse analysis. Internet based interviews will be digitally recorded, transcribed/abstracted, and analysed, using critical discourse analysis.

**Frames of reference and topics that will be explored**

At initial meeting of a focus group, the researcher will begin with a brief outline of the project, and its aims and objectives. Students can ask her questions about any concerns they may have about the focus group process, and will be given assurances about of their anonymity, ways of participating, how the conversations will be recorded, transcripts corrected, and their right to withdraw from the project. The same assurances win be given at the beginning of the in-depth interviews. Over the planned 3 one hour sessions, the student focus groups will explore aspects related to their experiences as students in training as ICT specialists. The in-depth interviews will follow up
these aspects in more detail with individuals. The focus group session plan and the interview question schedule are provided in Appendix D.

**Precautionary measures taken to avoid harm or discomfort**

A decision of whether or not to participate in the project may be a source of psychological stress. This factor will be managed by briefing all interested women students about the project, and its aims and objectives, and framed in the context of one strategy to encourage diversity in the ICT workforce. The project is being conducted in the researcher's private capacity as a student at the University of Otago, not as a staff member, or for the School of Computing.

Women students will be assured verbally and in writing that they will not be treated more or less favourably as a result of their participation or non-participation in the project. Secondly, women students will be advised of support systems available for them at CPIT at the conclusion of any focus group sessions and interviews. The researcher will make herself available for any women students or graduates.

14. Compliance with The Privacy Act 1993 and the Health Information Privacy Code 1994 imposes strict requirements concerning the collection, use and disclosure of personal information. These questions allow the Committee to assess compliance.

14(a) Are you collecting personal information directly from the individual concerned?

YES

If you are collecting the information indirectly, please explain why:

**Student Profile**

It is planned to access the Jasper enrolment system and student records in the Faculty of Commerce to gather quantitative data about the demographics of the students who take up training in the two year Level 6 Diploma of Information and Communications Technology (Dip ICT) and the Batchelor and Graduate Diploma of Information and Communication Technologies (BICT and G. Dip ICT). This will establish a profile of the students taking up education and training according to gender, age, ethnicity, year of study, educational
Application Form for ethical consideration of research and teaching proposals involving human participants

background, and experience. The profile will illuminate the self-selection of participants for the research project.

The Privacy Officer for CPIT has been consulted and has granted permission within the Principles of the Privacy Act 1993 and CPIT policy which complies with it. His letter authorises access and use of the specified data directly for the undergraduate programmes, and can be extended to the graduate diploma on the same grounds. This letter is appended to this application. (See Appendix C).

14(b) If you are collecting personal information directly from the individual concerned, specify the steps taken to make participants aware of the following points: (you should make participants aware of these points in an Information Sheet for Participants; a suggested template is attached):

• the fact that you are collecting the information:
  The fact that the participants' focus groups and interviews are recorded is included in the invitation, briefing, information sheet and consent form.

• the purpose for which you are collecting the information and the uses you propose to make of it:
  The purpose of the information and its uses is included in the invitation, briefing, information sheet and consent form.

• who will receive the information:
  Who will receive the information is included in the invitation, briefing, information sheet and consent form.

• the consequences, if any, of not supplying the information:
  There are no consequences of not supplying information, which is included in the invitation, briefing, information sheet and consent form.

• the individual's rights of access to and correction of personal information:
  The participants will receive transcripts of their focus groups and interviews which they may correct. This is included in the invitation, briefing, information sheet and consent form.
14(c) If you are not making participants aware of any of the points in (b), please explain why: Not applicable.

14(d) Does the research or teaching project involve any form of deception?

NO.

If yes, please explain all debriefing procedures:

14(e) Please outline your storage and security procedures to guard against unauthorised access, use or disclosure and how long you propose to keep personal information: (The University requires original data of published material to be archived for five years after publication for possible future scrutiny. The University is responsible for providing data storage space, data relating to projects should be kept in secure storage within the University Department concerned [rather than at the home of the researcher] unless a case based on special circumstances is submitted and approved by the University of Otago Human Ethics Committee. At the end of the Project any specific identifying personal information must be destroyed by the Principal Investigator [as specified in question 1] or relevant Head of Department).

All the data gathered (extracts from student records, names and contact addresses for identification purposes, audio tapes, digital recordings, and transcripts), will be kept in a locked cabinet in the researcher's home. Only the researcher will have access to it. This is due to the special circumstances of Diane McCarthy being a mature distance student living and working in Christchurch, the location of the women student participants and their tertiary institution. As a part time lecturer, she does not have a work based office. Diane's disability means that her computer with assistive technology, which she needs for data analysis and writing, is also located in her home office. Assistance with transcription is being funded by the Disabilities Services at the University of Otago, and carried out there, and will be sent by courier.
So, it would be impractical to locate the research data at the University of Otago, as Diane is required as a Master of Arts candidate to undertake 20 hours of study per week over the two years she is working on her thesis part time. However, once the thesis is submitted, on 23 December, 2008, or thereabouts, the archived research materials will be transferred to a locked cabinet in the supervisor's office in the College of Education, and be kept for the required five years and then disposed of.

14(f) Please explain how you will ensure that the personal information you collect is accurate, up to date, complete, relevant and not misleading:

The quantitative data will be accessed from the student records in accordance with xxxx policy and the Privacy Act 1993 as set out in Appendix C. Qualitative data will be collected directly from the participants.

14(g) Who do you propose will have access to personal information, under what conditions, and subject to what safeguards against unauthorised disclosure?

Only the student researcher, her transcriber, employed at the University of Otago, and the supervisor will have access to any personal information.

14(h) Do you intend to publish any personal information and in what form do you intend to do this?

No personal information will be published that can be attributed to an individual participant. Pseudonyms selected by the participants will be used in for the dissemination of research findings in the form of a Master of Arts thesis and any subsequent publications or conference presentations.

14(i) Do you propose to collect information on ethnicity?

*If the collection of information on ethnicity will be used for drawing comparisons or conclusions between Maori and other ethnic groups or the*
project has clear implications of direct interest to Maori, consultation should be undertaken in accordance with the University's Policy for Research Consultation with Maori (Please see http://www.otago.ac.nz/research/marioricorlsultaticml/index.html). If this process has already been undertaken please attach a copy of your completed Research Consultation with Maori Form with this application.)

Yes. The quantitative data will be accessed from the student records in accordance with xxxx policy and the Privacy Act 1993 as set out in Appendix C. See Appendix E for Consultation with Maori.

15. Potential problems: Explain whether there will be harm or discomfort to participants, medical or legal problems, or problems of community relations or controversy, or whether any conflicts of interest might arise (Researchers also have an obligation to be available after participants have participated in the project, should any stress, harm, or related concerns arise. If it is anticipated that professional services are appropriate, these services for the participants should be clarified as well as risks, limitations and obligations. Participants normally should have the opportunity to obtain information relating to the outcome of the project if they wish.)

The project involves a potential conflict of interest between the researcher's activities as a researcher and her interests as a professional or private individual, as a teacher and spouse of one of the programme leaders. It may involve the participation of vulnerable individuals. It may involve psychological stress for the participants.

Research has identified that women in ICT do not necessarily like to be singled out for attention, especially if they are a small minority (Bystydzienksi & Bird, 2006; Dingle, 2006). They may also experience teasing or pressure from the majority of students who are men, or from other women who do not want to participate. Some students are from a non English speaking background (NESB), and may feel self conscious about being able to understand and be understood. These factors may make some women students feel vulnerable and may act as disincentives to their participation (Bystydzienksi & Bird, 2006; Dingle, 2006).

So, a decision of whether or not to participate in the project may be a source of psychological stress. This factor will be managed by emailing
an invitation (See Appendix A) to each woman student and briefing all interested women students about the project, and its aims and objectives, and method, and framing it within the positive context of being one strategy to encourage diversity in the ICT workforce. Women students will be advised of support systems available for them at CPIT at the conclusion of focus group sessions and interviews. The researcher will also make herself available for any women students and graduates.

Potential conflicts of interest will be managed by assuring women students verbally and in writing that they will not be treated more or less favourably as a result of their participation or non-participation in the project. They will be advised that the project is being conducted in the researcher’s personal capacity as a student at the University of Otago, not as a staff member, or for the School of Computing. Participants will be able to obtain information relating to the outcome of the project if they wish.

16. Informed consent

*Please attach the information sheet and the consent form to this application. The information sheet and consent form must be separate.*

See Appendix B.

At a minimum the Information Sheet must describe in lay terms:

- the nature and purpose of the research;
- the procedure and how long it will take;
- any risk or discomfort involved;
- who will have access and under what conditions to any personal information;
- the eventual disposal of data collected;
- the name and contact details of the staff member responsible for the project and an invitation to contact that person over any matter associated with the project;
Application Form for ethical consideration of research and teaching proposals involving human participants

- details of remuneration offered for participation and compensation payable in the event of harm;
- Exclusion criteria for the project if applicable including Health Concerns. (*If exclusion include a clear statement to the effect that: "People who meet one or more of the exclusion criteria set out above may not participate in this project, because in the opinion of the researchers and the University of Otago Human Ethics Committee, it involves unacceptable risk to them.")

and any other relevant matters

The Information Sheet must conclude with the statement: "The University of Otago Human Ethics Committee has reviewed and approved this project."

The Consent Form must make it clear that a participant:
- understands the nature of the proposal;
- has had all questions satisfactorily answered;
- is aware of what will become of the data (including video or audio tapes and data held electronically) at the conclusion of the project;
- knows that he or she is free to withdraw from the project at any time without disadvantage;
  - is aware of risks, remuneration and compensation;
- is aware that the data may be published;
- is aware that a third party (i.e. transcriber) may have access to the data;
- is aware that every effort will be made to preserve the anonymity of the participant unless the participant gives an express waiver, which must be in addition to and separate from this consent form.

(Applicants should use the pro forma Information Sheet and Consent Form provided by the University of Otago Human Ethics Committee, with appropriate adaptation, unless a case is made and approved that these formats would be inappropriate for the specific project; Research or teaching involving children or young persons require written consent from both the child or young person AND the parent/guardian unless an adequate justification is provided).

Some students may be aged 17-19. Parental consent will not be sought as the students are enrolled in tertiary studies at xxxx and their participation in the project arises out of that enrolment.)
Student consent will be sought in accordance with xxxx policy and the Privacy Act 1993 as set out in Appendix C by the xxxx Privacy Officer.

Fast-Track procedure (In exceptional and unexpected circumstances, and where the research needs to commence before the next monthly meeting of the University of Otago Human Ethics Committee, a researcher may request that the application be considered under the fast-track provisions).

Do you request fast-track consideration? (See Important Notes to Applicants attached)

NO

(Please note that this involves the application being sent around members of the Committee by correspondence and can be expected to take 10 to 14 days)

If yes, please state specific reasons:

18. Other committees

If any other ethics committee has considered or will consider the proposal which is the subject of this application, please give details:

This proposal will also be considered by the Research Ethics Committee at CPIT, chaired by the Dean of Research, Or Keith Boronian. This will occur after the proposal has been approved by the University of Otago.

19. Applicant's Signature: Dr Susan Sandretto

Date: 1/05/07

20. Departmental approval: I have read this application and believe it to be scientifically and ethically sound. I approve the research design. The Research proposed in this application is compatible with the University of Otago policies and I give my consent for the application to be forwarded to the University of Otago Human Ethics Committee with my recommendation that it be approved.
Application Form for ethical consideration of research and teaching proposals involving human participants

Signature of Head of Department: Coriothers..........................                     ........................................

Date: ....... 1/5/07

*(In cases where the Head of Department is also the principal researcher then the appropriate Dean or Pro-Vice-Chancellor must sign)
Appendix A  Invitations to participants

Appendix A1

Invitation to students (email)

Hi there. As you are probably aware, throughout the world there’s a persistent serious shortage of trained and qualified ICT professionals. It affects New Zealand and Christchurch too. As a woman training in ICT, you are helping to fill this shortage, and have the potential for a great and challenging career. But not much is being done to actively encourage women.

As a lecturer, I’ve noticed a drop off in student numbers in ICT, and that usually women students may be only one, or two, and at the most, five or so in the class. Sometimes, there are no women students. This mayor may not personally bother you.

As a student, what motivates my personal Master’s research through the University of Otago is finding out what it is like for women to train in ICT in a polytechnic. Understanding what you are experiencing can be built on to attract more women into the ICT industry. This is just one strategy to overcome the serious shortage, and it’s a good place to start as women are the largest under represented group.

So, if you can spare one to three lunch hours, in Term 3, please consider coming to a focus group at CPIT. There’ll be coffee, tea, and finger food- and you can talk about your experiences with other women students with the same number of years of study in ICT, across the three programmes. If you prefer, the focus group can be held online, through a Moodle web site chat, and held on an agreed evening, for one to three sessions. You may be invited to participate in an in depth interview, once the focus group has concluded.

Anything you share will be kept anonymous to protect your identity, and will be only seen by me, my transcriber at the University of Otago, and my supervisor, Or Susan Sandretto. I will use an agreed pseudonym for you when the discussions are professionally transcribed, abstracted, and published. Logins to any support website will be only for participants and my supervisor.

If you agree to participate, we will all agree to not discuss focus group or interview content outside of those settings, including informally, or formally in classroom
settings and when undertaking any teaching or learning. I assure you that you will not be treated more or less favourably as a student in your academic programme as a result of your participation or non-participation in this project.

If you want to know more, please come along to the lunch time briefing being held on (date, time, and venue). You may also wish to reply to this email. I am also happy to talk to you by phone. If you agree to participate, I will send you an information sheet and consent form by email. Copies will also be available at the briefing meeting.

Hoping to hear from you, and perhaps I may see you soon. Thanks for reading this. All the best with your studies. Cheers Diane McCarthy.

**Appendix A2**

**Invitation to graduates (email)**

Hi there. I'm contacting you as a recent graduate of CPIT. The programme leaders have shared your latest email contact with me. As you may be aware, throughout the world there's a persistent serious shortage of trained and qualified ICT professionals. It affects New Zealand too. As a woman working in ICT, you are helping to fill this shortage, and have the potential for a great and challenging career.

As a lecturer, I've noticed the drop off in student numbers in ICT, and that usually women students may be only one, or two, and at the most, five or so in the class. Sometimes, there are no women students. You may find there are not many women in your part of the ICT industry. This may or may not personally bother you.

What motivates my Master's research through the University of Otago is finding out what it is like for women to train in ICT in a polytechnic, and begin working in the ICT industry. What you have and are currently experiencing can be built on to attract more women into the ICT industry. This is just one strategy to overcome the serious shortage, and it's a good place to start as women are the largest under represented group.

So, if you can spare one to three hour-long chat in Moodle or Skype sessions on a Sunday evening in July-August, please consider joining this focus group. It's with other women graduates from CPIT who are working in the ICT industry. You can talk about your training at CPIT and your work as an ICT specialist, so an understanding of your experiences can be shared, and possible strategies developed. You may be invited to participate in an in-depth interview, once the focus group has concluded.
Application Form for ethical consideration of research and teaching proposals involving human participants

Anything you share will be kept anonymous to protect your identity. I will use an agreed pseudonym for you when the discussions are professionally transcribed, abstracted, and published. Logins to any support website will be only for participants and my supervisor, Dr Susan Sandretto, at the University of Otago.

If you agree to participate, we will agree to not discuss focus group or interview content outside of those settings, including informally, or formally.

If you want to know more, please feel free to reply to this email. I'm also happy to talk to you by phone. If you agree to participate, I will send you an information sheet and consent form by email. Hoping to hear from you soon. If not, thanks for reading this. Either way, all the best with your career. Cheers Diane McCarthy.

Appendix A 3

Script of voice email

Hi there. It's Diane McCarthy here. I'm contacting you as a woman ICT student (graduate) at (from) CPIT. I'd like you to consider becoming a participant in my Masters research project. It's to encourage more women to take up training in ICT- there's a huge shortage out there. Please read the email invitation and see what's involved. Many thanks. Bye.
Appendix 8

[Reference Number as allocated upon approval by the Ethics Committee]
[Date]

ENGENDERING ICT-HOW WOMEN EXPERIENCE THEMSELVES AS EMERGING INFORMATION AND COMMUNICATION TECHNOLOGY PROFESSIONALS

INFORMATION SHEET FOR PARTICIPANTS

Thank you for showing an interest in this project. Please read this information sheet carefully before deciding whether or not to participate. If you decide to participate we thank you. If you decide not to take part there will be no disadvantage to you of any kind and we thank you for considering our request.

What is the Aim of the Project?

While New Zealand Government’s policy frameworks continue to emphasize the economic and social importance of ICT, the need to have women participate in ICT careers continues to be ignored even though significant documented industry shortages have persisted worldwide for the last two decades. While few women are taking up training and education in this field, this is not helped by a lack of national and local strategies to encourage women’s uptake of tertiary training courses in ICT. This Master of Arts in Education project aims to understand the nature of this problem in the educational setting of a polytechnic and its recent graduates. This project firstly examines the demographics of the 2007 students enrolled in the three business computing diploma and degree programmes at xxxxxxx xxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx and compares these with national and international patterns. It then explores how current women students in a polytechnic training and educational setting experience their acquiring of technical skills. It explores the same issues with recent women graduates, and their initial experiences in the ICT industry. Finally, it explores possible strategies that may lead to a greater participation of women students in ICT, and the extent to which women students and graduates see diversity as leading to transforming the ICT workforce, and its goals and outcomes.

What Type of Participants are being sought?

Participation in the project is being sought from women students enrolled and participating in the Diploma of Information and Communications Technology (Dip ICT), the Batchelor of Information and Communication Technologies (BICT), and Graduate Diploma of Information and Communication Technologies (G Dip ICT) courses in 2007. It is also being sought from women who graduated in 2005 and 2006, and who are working in the ICT industry.

What will Participants be Asked to Do?

Should you agree to take part in this project, you will be asked to do the following.
Application Form for ethical consideration of research and teaching proposals involving human participants

As students, you will be asked to participate in a focus group with women who have been in the Dip ICT, BICT, or G Dip ICT for the same number of years as you. Your focus group will be held at either at CPIT in the lunch hour on agreed dates for 3 sessions, or online as 3 chat sessions through Moodle, on Sunday evenings. You will be invited to discuss your experiences as a student acquiring technical skills in your programme at xxxx. You may attend as many of these sessions as you wish.

As graduates, the 3 sessions of your focus group will be held on line through a Moodle chat session or on Skype on Sunday evenings. You will be invited to discuss your experiences as a student acquiring technical skills in your programme at xxxx and as an ICT professional in the ICT industry.

Session 1 and 2 will cover introductions, brief background, and your learning and work experiences. Session 3 will explore ways to attract women students, and possible ways ICT could be transformed, if any, by women as ICT professionals. Once the focus groups have concluded, you may be invited to take part in a semi structured interview that explores these issues in more depth.

Your assistance in this project will potentially enable this persistent problem to begin to be addressed at local and national level, and the findings may be published locally, nationally, and internationally.

Should you feel any discomfort as a participant, or experience any unexpected or uninvited responses from other persons, as a result of participating, you may discuss this with Diane McCarthy, who may refer you to a suitable support person within xxxx.

Please be aware that you may decide not to take part in the project without any disadvantage to yourself of any kind.

Can Participants Change their Mind and Withdraw from the Project?

You may withdraw from participation in the project at any time and without any disadvantage to yourself of any kind.

What Data or Information will be Collected and What Use will be Made of it?

Focus group discussion and interviews will be audio taped and digitally recorded, and professionally transcribed at the University of Otago, and seen and discussed with the supervisor, Dr Susan Sandretto. This project involves an open-questioning technique where the precise nature of the questions which will be asked have not been determined in advance, but will depend on the way in which the interview develops. Consequently, although the University of Otago Human Ethics Committee is aware of the general areas to be explored in the interview, the Committee has not been able to review the precise questions to be used.

In the event that the line of questioning does develop in such a way that you feel hesitant or uncomfortable you are reminded of your right to decline to answer any particular question(s) and also that you may withdraw from the project at any stage without any disadvantage to yourself of any kind.
Application Form for ethical consideration of research and teaching proposals involving human participants

The data collected will be securely stored in such a way that only those mentioned above will be able to gain access to it. The data will be kept in a secure cabinet in the researcher's home, to which only she has access. It will be analysed and form part of the thesis for meeting the requirements of the Master of Arts in Education. This data, after the submission of the thesis, will be transferred to the University of Otago, and subject to the usual policy for the disposal of such materials.

The results of the project may be published and will be available in the library but every attempt will be made to preserve your anonymity.

You are most welcome to request a copy of the results of the project should you wish.

At the end of the project any personal information will be destroyed immediately except that, as required by the University's research policy, any raw data on which the results of the project depend will be retained in secure storage for five years, after which it will be destroyed.

Reasonable precautions will be taken to protect and destroy data gathered by email. However, the security of electronically transmitted information cannot be guaranteed. Caution is advised in the electronic transmission of sensitive material.

What if Participants have any Questions?
If you have any questions about our project, either now or in the future, please feel free to contact either:-

Diane McCarthy or Dr Susan Sandretto
mccarthyd@cpit.ac.nz Educational Studies and Professional Practice, College of Education
University of Otago

Home Telephone Number:- 384-1252 University Telephone Number:-479 8820

This project has been reviewed and approved by the University of Otago Human Ethics Committee
ENGENDERING ICT - HOW WOMEN EXPERIENCE THEMSELVES AS EMERGING INFORMATION AND COMMUNICATION TECHNOLOGY PROFESSIONALS

CONSENT FORM FOR PARTICIPANTS

I have read the Information Sheet concerning this project and understand what it is about. All my questions have been answered to my satisfaction. I understand that I am free to request further information at any stage.

I know that:

1. My participation in the project is entirely voluntary;

2. I am free to withdraw from the project at any time without any disadvantage;

3. I am aware that a transcriber has access to data. Personal identifying information such as audio tapes and digital recordings and electronic postings in chat sessions will be destroyed at the conclusion of the project but any raw data on which the results of the project depend will be retained in secure storage for five years, after which they will be destroyed;

4. This project involves an open-questioning technique where the precise nature of the questions which will be asked have not been determined in advance, but will depend on the way in which the interview develops and that in the event that the line of questioning develops in such a way that I feel hesitant or uncomfortable I may decline to answer any particular question(s) and/or may withdraw from the project without any disadvantage of any kind.

5. Should I feel any discomfort as a participant, or experience any unexpected or uninvited responses from other persons, as a result of participating, I may discuss this with Diane McCarthy, who may refer me to a suitable support person within xxxx.

6. The results of the project may be published and will be available in the library but every attempt will be made to preserve my anonymity.

7. I understand that reasonable precautions have been taken to protect data transmitted by email but that the security of the information cannot be guaranteed.
Application Form for ethical consideration of research and teaching proposals involving human participants

I agree to take part in this project.

(Signature of participant) 

(Date)

This project has been reviewed and approved by the University of Otago Human Ethics Committee

OTAGO

This project has been reviewed and approved by the University of Otago Human Ethics Committee.
Application Form for ethical consideration of research and teaching proposals involving human participants

Appendix C
17 April 2007

PRIVACY REQUIREMENTS ARISING FROM RESEARCH PROPOSAL

Mrs Diane P McCarthy [xxxx ID # 98 457 780, xxxx employee # 72100] is a permanent part-time lecturer in xxx School of Business in the Faculty of Commerce. Mrs McCarthy proposes to carry out research as part of her University of Otago Masters thesis. Her research proposal will be submitted to the research ethics committees at both the University of Otago and xxxx.

Mrs McCarthy's field of research includes analysis of the reasons why there are fewer women studying at xxxx for the diploma and degree qualifications in information and communication technologies. Her thesis will include recommendations on future recruitment and support.

Mrs McCarthy has consulted me as Privacy Officer because she will need access to the personal information of all 2007 students enrolled in the two programmes. The data she requires includes gender, age, ethnicity, year of study, pre-existing qualifications and experience. This information is available from xxxx student management system, Jasper, and from student files (including application forms) held in the Faculty of Commerce.

The disclosure of personal information at this level for this purpose is permissible because (1) Mrs McCarthy is an employee of the agency (xxxx) (2) the purpose is related to the provision, development, and marketing of tertiary programmes (see purposes stated in Personal Information and the Privacy Principles xxxx Student Handbook 2007, page 27), and (3) the information is to be used for statistical and research purposes and will not be published in a form that could reasonably be expected to identify any individual student [IPP10(f)(ii) and IPP11(h)(ii)].

After initial analysis of student profiles, Mrs McCarthy proposes to conduct further research with subsets of students. A general message will be sent to the students inviting them to attend a briefing and to voluntarily become part of the next stage of the research. Thus further use and/or disclosure of personal information will have the authority of the individual student [IPP10(i)] and IPP11(d)].

In my view the access to, use of, and disclosure of personal information as proposed by Mrs McCarthy meets the requirements of xxxx policy on Disclosing Personal Information about Students and Staff [14 March 2007 version] and the Privacy Act 1993 with which the xxxx policy complies.

6.

xxxx \xxxxxx
Council Secretary
Privacy Officer

CPRE\#: PRY MCCARTHY RESEARCH 17 Apr 2007
Appendix D

Focus groups session plan

Frames of reference and topics that will be explored

The initial meeting of each focus group will begin with a brief outline of the project, and its aims and objectives. Students can ask questions about any concerns they may have about the focus group process. They will be assured about their anonymity, ways of participating, how the conversations will be recorded, transcribed, and corrected, support, and their right to withdraw from the project.

Over the planned 3 one hour sessions, the student focus groups will explore the following aspects.

Initial session

Brief personal introductions- who, what programme, and what ICT areas they have enjoyed most so far

Brief background information, about how they became interested in ICT, any work experience they may have had, and what they hope to achieve after they graduate

Their initial experiences in their course

Issues that will be explored in the next session

Second session

Recap the purpose
Relate situations that have arisen in courses that have been affirming and helpful (Following Brookfield, 1995)
Relate situations in courses that have been puzzling or confusing (Following Brookfield, 1995)
• Relate what may have helped things to be less puzzling or confusing
Issues that will be explored in the next session

Final session

• Recap purpose
Briefly reflect on the issues that emerged in the second session
Relate what may have helped things to be less puzzling or confusing
Invite suggestions as to what could be done to encourage more women to participate in the ICT industry as professionals
Invite suggestions as to what effect more women mayor could have, if any, on the ICT industry

The focus group with graduates will follow the same format in first and second sessions. The final session will explore:

- Their initial experiences in the ICT industry
- Invite suggestions as to what could be done to encourage more women to participate in the ICT industry as professionals
- Invite suggestions as to what effect more women mayor could have, if any, on the ICT industry

**Question line for In-depth Interviews**

1. Tell me about your background. To what extent have people and events in your life encouraged you to train and work in ICT?

2. During the focus groups, you have discussed situations in the course that have been affirming and helpful. Could you please elaborate on these, by giving more detail and examples?

3. You have also discussed situations in the course that have been puzzling and confusing. Again, could you please elaborate on these, by giving more detail and examples?

4. What, on reflection, do you think may have helped things to be less puzzling and confusing? Why is this?

5. So, what could be done, if anything, to encourage women to participate in the ICT industry as professionals?

6. What effect will more women in ICT have on the ICT industry, if any? Why do you think that?

7. Is there anything else that you would like to add, before we finish?
Appendix E

7. Research Consultation with Maori

We strongly advise researcher to print and retain a copy of this page.

Thank you for your research proposition. This message is to confirm that one of the following will occur:

1. Your proposition will be forwarded to the next meeting of the Consultation Committee; or
2. Additional information may be required by the Administrator and needs to be provided in hard copy through the internal mail; or
3. You may be asked to attend the next meeting of the Consultation Committee.

You will be contacted via email in the near future.

<table>
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<th>Title of proposed Area of Research</th>
<th>Engendering ICT: how women experience themselves as emerging information and communication technology professionals.</th>
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<td>Principal Investigator 1</td>
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<tr>
<td>Title</td>
<td>Dr</td>
</tr>
<tr>
<td>First Name</td>
<td>Susan</td>
</tr>
<tr>
<td>Initial(s)</td>
<td>E.</td>
</tr>
<tr>
<td>Surname</td>
<td>Sandretto</td>
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<tr>
<td>Department</td>
<td>Education Studies &amp; Professional Practice</td>
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<td>Campus</td>
<td>Dunedin</td>
</tr>
<tr>
<td>Email</td>
<td><a href="mailto:susan.sandretto@otago.ac.nz">susan.sandretto@otago.ac.nz</a></td>
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<tr>
<td>Telephone</td>
<td>479-8820</td>
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Principal Investigator 2

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Principal Investigator 3

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While New Zealand Government’s policy frameworks continue to emphasize the economic and social importance of ICT, the need to have women participate in ICT careers continues to be ignored even though significant documented industry shortages have persisted globally for the last two decades. While few women are taking up training and education in this field, this is compounded by a paucity of national and local recruitment and retention strategies to encourage women’s uptake of tertiary training courses in ICT. This project aims to examine the nature of this problem in the educational setting of a polytechnic.

This project examines the demographics, including ethnicity, of the 2007 students enrolled in the three business computing diploma and degree programmes at Christchurch Polytechnic, Institute of Technology (CPIT) and compares these with national and international patterns. It then explores how current women students in a polytechnic training and educational setting take up, resist or subvert existing discourses, in particular, the ICT culture of claimed gender neutrality and the extent to which women are visible within ICT. It will explore the relationship between women students and their subjectivities and agency as emerging ICT professionals and the ways that they themselves make meaning out of acquiring technical skills in the training and education settings three business computing programmes. Finally, it explores possible strategies that may lead to a greater participation of women students in ICT, and the extent to which women students see diversity as leading to transformative change of the ICT workforce, and its goals and outcomes.

Potential outcomes include:

i. Maori women/iTMs experience of ICT training at a polytechnic

ii. The extent to which Maori women are visible in ICT training at a polytechnic

iii. Possible strategies to encourage their greater participation in ICT careers

iv. The extent to which Maori women perceive diversity in the ICT workforce as encouraging better ways of developing and using ICT

This focus is indirect. The potential exists that women students who are enrolled or who have graduated from a polytechnic’s business computing programmes, and who have identified as Maori, choose to participate.

N/A
NGAI TAHU RESEARCH CONSULTATION COMMITTEE
TE KOMITI RAKAHAU IKI KAI TAHU

29/05/2007 - 14
Tuesday, 29 May 2007

Dr Susan E. Sandretto
Education Studies
Dunedin

Tena koe Dr Sandretto

Title: Engendering ICT- how women experience themselves as emerging information and communication technology professionals.

The Ngai Tahu Research Consultation Committee (the Committee) met on Tuesday, 29 May 2007 to discuss your research proposition.

The Committee considers the research to be of interest and importance.

The Committee acknowledges that the researchers have identified Maori as potentially represented in the study.

The Committee strongly encourage that researchers collect ethnicity data as part of the project and recommend the use of the Census question on ethnicity.

The Committee suggests dissemination of the findings to relevant Maori health organisations, National Maori Educators organisations and Toitu te Iwi at Te Runanga o Ngai Tahu receive a copy of your findings.

The Committee would also value a copy of the research findings.

Nahaku no a, na

Mark Brunton

Mark Brunton
Kaitakawaenga Rangahau Maori
Facilitator Research Maori
Research Division
Te Wbare Wananga o Otago
Ph: +64 3 479 8731)
email: mark brunton@otago.ac.nz
Web: www.otago.ac.nz

The Ngai Tahu Research Consultation Committee has membership from:
Te Runanga o Otakou Incorporated
Kati Huirapa ki Puketeraki
Te Runanga o Moeraki
Academic Research Committee (ARC)
Subcommittee of Academic Board

Research Approval Application Form

This form is designed to be completed electronically. Complete Sections 1 and 2, plus Section 3 if relevant to your application.

Section 1: Researcher Details
This section is mandatory for all applications. The purpose is to give the ARC your contact details and to assist in prioritising applications if necessary. Keep a copy as it is to be attached to any subsequent application related to the same research proposal.

Name: Diane McCarthy
- Faculty/Division: Commerce
- School: Business
- Phone: 384-1252 (home)

Employment:
- Full time (tenured)
- Full time (contract): expiry date
- Proportional (tenured): proportion
- Part time: approx hours year 225

Teaching Position: Yes

Degree teaching:
- Research Conditions: Yes

Associated Researchers, if any:

<table>
<thead>
<tr>
<th>Name/s:</th>
<th>Dr Susan Sandretto</th>
</tr>
</thead>
<tbody>
<tr>
<td>Institution:</td>
<td>University of Otago</td>
</tr>
</tbody>
</table>

Support Research supervisor, mentor or colleague available for support/advice on this research:

Name/s: Dr Susan Sandretto; ref Sections 1, 2, 3, & 11 of University of Otago document

Institution: University of Otago

Qualification Is this research part of study towards a qualification? Yes x No

If Yes Qualification: Master of Arts in Education

Institution: University of Otago

Previous Research Outputs List your research outputs within last 3 years (this is requested to give the ARC an idea of your experience and past productivity). Type directly into this box or (preferably) attach print out from the Research Web site.

Submission of Applications
Please attach this completed form to each separate application related to this particular research project or program. Forward each application to the ARC, c/o Vicki Christoffersen, Academic Division (ext 8229 for inquiries).
Section 2: Research Proposal
This section is mandatory for all applications. The purpose is to provide the ARC with a summary of the proposed research, including the overall "research question" and methodology.

Researcher Details
Please attach Section 1 (Researcher Details)

@Research Overview

Title of Research | Engendering ICT: how women experience themselves as emerging information and communication technology professionals

Type of Application | Research Project individual, discrete project with a specific research output, within a specified expected timeframe
| Research Program ongoing program of research which may cover several projects related to the same/ similar research question; maximum approval period 2 years, but -- be extended to- ifother app. ----

Category of Research | Fundamental Strategic X Applied Scholarship X Creative
| Refer Research & Scholarly Activities policy APP 8.3

Proposed Start Date | 2 July 2007
Likely Finish Date | 23 December 2008

Overall research question (what you are trying to find out; keep it short, eg max 50 words)
In what ways does technology construct gender, and does gender construct technology, in the information and communication technologies? How does subjectification as a woman student in ICT constrain, empower and/or modify her agency?

How will this research inform or enhance your teaching and/or other roles at CPIT?
The research outputs may enable the development of strategies of recruitment and retention of women students into ICT qualifications, encourage diversity, and may assist with meeting the supply and demand within the ICT industry locally, nationally, and globally. This may strengthen the School of Business and School of Computing in these areas. The output will enable me to develop my research skills in an area of strategic importance to this institution and tertiary training in ICT in New Zealand. Refer S 10 for full aim and description of the research project and its possible implications.

Research Design
Type in this box or attach the following details (max 2 pages). If your proposed research is part of a qualification, simply attach the research proposal approved by the institution in which you are enrolled (including ethics clearance if relevant).

a) Background (brief summary of current knowledge related to the proposed research; cite references)
Refer to S. 10 and the references at the end of the document.

b) Proposed methodology (how you plan to answer the research question)
Refer to S.12 and 13 in the document.

c) Significance of the research (what it adds to the current body of knowledge/ discipline/ field of inquiry)
Refer S 5 & 10.

d) Likely timeline (breakdown of major steps of the project or milestones related to research program)
Refer S. 8 and 14e. The anticipated key mile stones, as extracted from the research proposal document are: Research Proposal and Seminar Semester by 17 May 2007; Ethical Approval Process concluded June, 2007; Method: July 2007; Bibliography; end of Semester 1, 2007; Full Literature Review, Mid Semester 2, September, 2007; Data gathering and transcription July- August, Semester 2, 2007; Analysis of Data Oct- December, 2007; Draft chapters, for the thesis will be written under supervision as an ongoing activity, not left to the final stage. Papers may also arise and be submitted for publication and presentation at appropriate conferences during and after the writing process. The first draft is planned to be completed by July 2008. The completed Masters thesis is expected to be submitted for examination by 23 December 2008.
**Outputs** Expected research output/s from this research (how you plan to disseminate the results of the research, eg journal publication, report, exhibition, performance, conference).
Publication may be possible in the 2007 and 2008 NZARE conference proceedings, the New Zealand Journal of Educational Studies, the 2008 annual NACCQ conference proceedings, and journals such as Gender and Education, and Gender, Work and Education, all of which are peer reviewed. A book chapter may be possible through the University of Illinois series Women Gender and Technology, edited by Mary Frank Ross, Deborah Johnson, and Sue V. Rosser.

<table>
<thead>
<tr>
<th>6 Faculty/Division Endorsements</th>
<th>This confirms that the relevant Faculty/School Research Committee/s has considered and supports this proposal:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chair, Faculty/School Research Committee Signature</td>
<td>![Signature] 9 August 2007</td>
</tr>
<tr>
<td>Date</td>
<td>9 August 2007</td>
</tr>
</tbody>
</table>

This confirms that the time allowance indicated is appropriate and is available to the researcher:

<table>
<thead>
<tr>
<th>Time Allowance</th>
<th>N/A</th>
</tr>
</thead>
</table>

Director/Head of School Signature

Date

This confirms that all administrative matters related to the research have been considered.

Director/Dean Signature

Date

9 August 2007

(6) **Submission of Application**

When this application has been endorsed by the Faculty/School, submit to ARC, c/- Vicki Christoffersen, Academic Division

Date application submitted to Faculty/School Research Committee

1/6/07
Academic Research Committee (ARC)
Subcommittee of Academic Board

Research Approval Application Form

Section 3: Ethics Clearance (via Ethics Subcommittee)
This Section is required if human or animal subjects are involved. The purpose is to ensure that all ethical considerations related to human or animal research participants/subjects are identified and addressed. This includes research completed as part of a higher qualification.

The methodology involves human participants/subjects x

If so, complete the following Ethical Conduct Checklist and:

a) submit it with Sections 1 and 2 to your Faculty/School Research Committee
b) when your application has been endorsed by the Faculty/School Research Committee, submit Sections 1, 2 and 3 (including the Checklist) to ARC Ethics Subcommittee, c/- Chair, Jan Kent, Humanities
c) when you have ethics clearance, attach the signed form below to the rest of your application to submit to the ARC.

The methodology involves animals

Refer: Guidelines on the use of Animals in Teaching & Research - [www.rsnz.org/advisory/anzccart/](http://www.rsnz.org/advisory/anzccart/)

If so:

a) submit Sections 1 and 2 to your Faculty/School Research Committee
b) when your application has been endorsed by the Faculty/School Research Committee, submit Sections 1, 2 and 3 to Animal Ethics Committee, c/- Faculty of Health & Sciences
c) when you have ethics clearance, attach the signed form below to the rest of your application to submit to the ARC.

Ethics Endorsement to be completed by relevant Ethics Chairperson
Researcher | Diane McCarthy
Research Title | Engendering ICT

This confirms ethics clearance from the ARC Ethics Subcommittee /

Chair, ARC Ethics Subcommittee: Rea Daellenbach
See attached info sheets and consent forms.

6 August 2007.
Ethical Conduct Checklist

Submit this checklist with your research proposal to your Faculty/School Research Committee and, after the proposal has been endorsed, to the ARC Ethics Subcommittee (c/- Chair Jan Kent, Humanities). Refer to 'Ethical Conduct of Research' policy APP 8.5 for further details and model forms.

<table>
<thead>
<tr>
<th>Researcher</th>
<th>Diane McCarthy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research Title</td>
<td>Engendering ICT</td>
</tr>
</tbody>
</table>

a) Information for the Participant

1. An information sheet is available and attached ................................................................. x
   See sample sheet attached to Ethical Conduct policy APP 8.5

2. The information sheet contains the following explanations:
   a) the nature and purpose of the research ................................................................. x
   b) possible hazards/risks of the activities ................................................................. x
   c) the participant's rights to:
      • decline participation or withdraw from the activity ........................................ x
      • have privacy and confidentiality protected ......................................................... x
      • receive information about the results in an appropriate form ................................ x
   d) safe-keeping of the consent forms and data ........................................................... x

b) Recorded Interviews (if applicable)

The participants will be informed of the following:

• that the interview is being recorded (audio/video/electronic/digital) ........................................... x
• that they may stop the recording at any time ........................................................................... x
• who will use the recording and how .................................................................................... x
• who will transcribe the recording, if not the researcher ......................................................... x
• who will see/use the transcription
   • storage and disposal of
     the recording .................................................................................................................. x
     the transcription ............................................................................................................... x

Note: it is your responsibility to ensure the above issues are addressed during the research.

c) Consent

1. Participant consent form/ forms attached .............................................................................. x
   Consent form complies with principles underlying participants' rights
   See sample forms attached to Ethical Conduct policy APP 8.5

2. For any other consent required, tick the appropriate box and attach copies
   • guardian/proxy consent ........................................................................................... O
   • institutional/organisational consent ............................................................................. O
   • 'completion implies consent' statement attached to questionnaire ............................ O
School of Information Technology & Electrotechnology
ETHICS COMMITTEE SUBMISSIONS

Part 1: Background Information

Title: "Engendering ICT" .................................................................
Date (start): July 2007 ................................................................. Date (finish) November 2007 ..................................................
Staff responsible: Lesley Smith (facilitator) . Diane McCarthy (author).

Brief description: Students within the BIT programme are to be surveyed and interviewed to determine their experiences as emerging ICT professionals. This is part of a collaborative research project between two South Island ITPs. .................................................................

11.

CATEGORY A:

Staff undertaking research or practice that involves:

- Identifiable personal information;
- Taking / handling of any form of tissue / fluid sample from humans / cadavers;
- Any form of physical/psychological stress;
- Situations which might place safety of participants / researchers at risk;
- Administration / restriction of food, fluid or drug to a participant;
- Potential conflict between applicant’s activities as researcher, clinician or teacher and their interests as professional / private individuals (inc. students, clients, patients);
- Any form of deception.

Submit to Otago Polytechnic’s Ethics Committee (on separate form).

Copy of both forms to Head of School

CATEGORY B:

Staff research outside Cat. A but still with current ethical considerations
- Or student research that otherwise would be Cat. A

I have considered the ethical implications of this research and consider it to be Category B. I furthermore undertake to carry out action/s:

- permission and information sheets provided
- voluntary participation

... to mitigate any risks.

Head of School comment:

Date 31.7.07

Reviewed by SITE Ethics Com: ..........................................

SIGNATURE

DATE
### Part 2: Details of ethical issues involved and actions taken

<table>
<thead>
<tr>
<th>ISSUES AREA</th>
<th>COMMENT</th>
<th>ACTION TAKEN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human / animal subjects</td>
<td>Female students within BIT programme will be surveyed and interviewed</td>
<td>Yes</td>
</tr>
<tr>
<td>Evidence that participants understand purpose of study and possible consequences to themselves or others of their participation</td>
<td>Participants attended voluntary briefing, receiving Project information sheet and consent form.</td>
<td>Yes</td>
</tr>
<tr>
<td>Potential threats to physical, emotional, cultural well-being</td>
<td>Evidence that participants understand purpose of study and possible consequences to themselves or others of their participation</td>
<td></td>
</tr>
<tr>
<td>Voluntary participation without pressure (i.e, threat of adverse consequences, inducement)</td>
<td>Ethical approval gained from three ethical committees for each institution. Supervision by E. Sandretto.</td>
<td></td>
</tr>
<tr>
<td>Gathering of potentially sensitive information</td>
<td>Research protocols established (trained researcher, retention of information, security of information)</td>
<td></td>
</tr>
<tr>
<td>Availability of results</td>
<td>Availability of results</td>
<td></td>
</tr>
</tbody>
</table>