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**Deconstructing  
Discursive Borders:  
Conflicting discourses of femininity  
and techno-scientific rationality in the context of  
educational computing**

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Women's participation in computer based industries is markedly gendered, as women form the majority of individuals employed in routinised, deskilled and lowly paid jobs. At the school level then, the underlying 'problem' of 'girls and computing' is not simply a matter of girls' participation in computer-related work, but the reproduction of a problematic relationship between the socially and politically informed categories of gender and technology. In this paper I initiate the deconstruction of some of the fundamental assumptions underlying the debates and research on educational computing at the secondary school level and problematise common conceptualisations of gender in both research and reform of school-based practice. This is then used as a basis for arguing an alternative direction for research that focuses on the dominant discourses of gender and technology, and centralises girls' agency in the reform process.

## Introduction

The focus of much of the gender equity research in educational technology has been quantitative, defined in terms of the under-representation of females in technological industries and in related courses in school and tertiary education. Collins, Kenway and McLeod [1] point out in a recent Australian study that girls under-representation in VCE computing options represents the creation of 'masculine territory' in a newly developing curriculum area.

Henwood [2] argues that existing reforms aimed at addressing the under-representation of women in engineering and technology are limited by liberal discourses that employ dualistic frameworks of gender identity and work cultures which obscure the mutually constitutive relationship that exists between them<sup>1</sup>. Equal opportunity strategies have therefore shown limited success because of (i) the primary focus on causal factors rather than processes, and (ii) limiting and simplistic conceptualisations of gender and technology. Both neglect the interplay between individual and structural factors and the role of resistance and negotiation that girls, as active agents, are constantly engaged in.

Such an oversimplification of the debate conceals the underlying meaning systems or discourses which inform structural and social processes, so I begin from the premise that we need to deconstruct the layers of meaning that are created by the interplay between dominant discourses of gender and technology. This paper attempts to challenge and redefine the 'problem' that has been traditionally located with girls' 'difference' to boys, based on a largely unproblematized dualistic and fixed notion of gender. I argue that the problem is not one of *girls'* problematic relationship to technology, but resides with the problematic and complex relationship between the discourses of social relation categories regarding female gender, and technology.

In the first part of this paper I draw attention to two important aspects (or layers) of the issue generally neglected in the empirically school based research studies and which I argue need to be treated critically. Firstly the distinctive context of educational computing in which social patterns materialise within and emerge from the technology itself, and secondly the unchallenged maintenance of the female-male dualism in the treatment of gender, that underwrites such a context. In the second part I go on to elaborate a possible direction for research that centralises girls' agency and critical awareness, based on two distinct feminist perspectives that problematise such a construction of gender.

## Limitations of existing empirical research

Within much of the empirical literature, the cause of such under-representation has been fundamentally located with girls themselves, their choices, perceptions and attitudes, while leaving both the social structure and the dominant technological paradigm unchallenged. The root cause of 'girls' problem' has been explained by reference to socialisation theory which is expressed in various ways such as psychological characteristics (fear, anxiety, lack of confidence), lack of information, misperceptions regarding technology itself, and differences in learning styles and interests naturalised as cognitive differences<sup>2</sup>. The two emphases being on either 'what is done *to* the girls' (socialisation) or 'what the *girls do* 'wrong' as a *result of* socialisation. Both deny girls agency and therefore fail to connect with their lived experiences. The frequent references made in the literature to girls' choices as 'non-choices' or 'default' positions, are in marked contrast to boys' 'self-selection' of the 'right' subjects. In other words, the flavour of the literature is that girls *lack* what boys have.

A second type of research [3], focuses on structural factors such as the effect of textual and media images, the lack of female role models and the 'packaging' of the subject area. However, such analyses have focused only on explicit examples of inequity which neglects the underlying ideologies and values. Although this research redirects blame to the system, it nevertheless resorts back to socialisation theory to explain how such effects are manifested. As a result girls are once again positioned as passive recipients rather than active agents.

Much of this literature is positivist in nature and therefore assumes the existence of an external reality. In other words, empirical research is based on a view of gendered identity as a concrete and fixed phenomenon. Such a view is linked to the humanistic treatment of the self as unitary and rational, which denies the conflicts experienced by individuals who, in actively seeking to be correctly gendered, are required to suppress those aspects of self that cross the gender divide [4].

Before discussing how this traditional and dualistic notion of gender is produced, reified and manifested within the context of educational computing, I first turn to an examination of the context itself.

## Contextualising the technology as socially and historically situated.

In order to understand the implications of particular constructions of gender in the context of technology, we need to understand the context in which such constructs are operationalised. Therefore we need to recognise how the context of educational technology (computing) is socially and historically situated. The particular context of 'computing' has a unique dimension that distinguishes it from other educational contexts. Such a context is composed of both a material reality which is at once fixed and dynamic (the technology itself), and a social and cultural context in which the former is embedded. The former represents the petrification of social interests which are concealed within the culture of its use which maintains an illusion of neutrality. Winner [5] points out that the language often associated with technology is limited to categories that construct such objects as neutral. The use of words such as 'tools' and 'uses' conceals the meanings of particular designs and arrangements and therefore silences considerations of how these might interact with dynamic constructions of gender. One of the ramifications of this on the research is that it tends to conceal the ways that existing forms of technology have been shaped by the interests of particular groups and as Wajcman [6] points out, by those who have been excluded from its development. This has implications for the way the research problem is

constructed. If the technology is treated unproblematically as representative of mainstream interests, then the problem is focused on the group of students who appear to have an uneasy or more alienated relationship with the technology. These students are therefore *seen* as performing less well or less confidently. In other words the problem is located with the individual.

The embodiment of particular social interests in turn often contributes to the extension of such interests, through the reproduction of practices that maintain them. Wajcman points out that historically women were actively excluded by craft unions, while male skilled craftsmen struggled to retain control over the technology by controlling who had access to the machinery through the appropriation of skilled work. Such patterns of exclusion materialised in the technology as the separation of skilled from unskilled applications. Cockburn's [7] analysis of the typesetter is an example of how sex-bias has been embedded into the technology itself. By separating skilled (setting) from unskilled (distribution) work and control from routinised operation, the separation of male from female work removed the need for technically skilled female workers and established certain patterns regarding women's involvement with technology. The development of the modern day typewriter as Cockburn points out was simply an extension of this, a tool for women to use, the skill from the original typesetting process removed and with it the control and maintenance of the technology. In such ways the construction and reconstruction of particular social patterns are reified through the social construction and practice of the technology itself.

Strictly speaking then, the technology is not simply an 'inanimate resource' but has a social history of its own which interacts with current social practises in particular ways and therefore informs and is informed by practices of gender. It is therefore imbued with not only the specific effects of its designers' interests and idiosyncrasies but also the historical and current social patterns that have effected the broader development of computer technologies [8]. The encapsulation of such interests and patterns in the design of hardware and software and the culture of use, effects how it is used and by whom [9]. The complexity of the technological context therefore increases as we start to 'blur the boundaries' that are created by reductionist attempts to define and contain it in neutral terms. There is a need therefore, for empirical sensitivity and specificity in the research on gender equity in educational computing rather than the generalisation of themes. The usefulness of the latter is questionable in accessing specific processes that describe the lived realities of individual girls and in therefore affecting meaningful reform.

## **The gender dualism within the educational computing context**

### **As a discursive research tool**

Over the last three decades gender equity research in educational 'computing' has been characterised and directed by the largely unproblematised treatment of gender as an explicitly dichotomous and static concept, defined in terms of 'girls' *difference* to boys'. The focus of much of the empirical literature has therefore been with identifying such differences. In her work on girls and mathematics, Walkerdine [10] has referred to this concern with *proving* the performance equivalence of girls with boys, as the 'empiricists trap'. Such an approach is problematic for several reasons. Firstly, it is incompatible with the goals of the research which are to 'solve the problem' of gender-based differences and in effect reifies rather than abolishes those differences as its very definition *defines* difference. Bryson and de Castell [11] problematise the use of 'gender' and 'equity' by educational initiatives arguing that the notion of 'gender equity' is a contradiction in terms, given state and institutional uses of both terms. They point out that while 'gender' is defined in terms of

'difference', 'equity' is defined as 'sameness' or 'similarity'. Secondly, this reification has the effect of naturalising such difference and risks essentialising 'girls' as a group. Thirdly, the adoption of binary categories conceals the variation that exists within those categories and tells only one kind of story.

Another implication of this dualism, is the tendency for the research to assign opposing qualities to girls and boys in a hierarchical fashion. Girls are frequently referred to as passive, anxious and misinformed in contrast to boys who are perceived to be active and confident. Similarly different value judgements are made regarding girls [and boys] who express the same qualities, while such judgements are generally negative when both sexes act in contrast to their assigned qualities [12].

To understand how this dualistic and hierarchical form of gender is entrenched in the research and practice of educational computing, we must look at the gendered nature of reason and rationality.

### **A theoretical construct: 'Rationality' versus 'Femininity'**

Many research studies have reported gender differences in attitudes towards computing. In particular girls are described as more critical of the technology, such a view interpreted as a less favourable position. Such judgments are only rendered meaningful within a particular framework or from a particular and privileged view of technology. Sofia [13] challenges the dominant assumptions regarding technological rationality, arguing that

"within a general climate of technological utopianism. "technophilia" an excessive and uncritical love of equipment, is not only taken for granted as normal but equated with technoscientific rationality, while a lack of enthusiasm for new computer technologies is readily diagnosed as its pathological opposite" "technophobia" (p29)

One could turn this on its head by starting from a position of ambivalence, a critical standpoint from which a more technocratic stance is rendered irrational and hence problematised. If such were the case would 'boys' now 'become' the problem? By questioning the framework within which notions of competence and achievement are located, we reveal the subjective nature of such assessments. However it is not quite as simplistic as this. Girls less favourable position is more than a random choice of frameworks however, the notion of rationality which is linked to dominant notions of competency is defined *in relation* to femininity, that is *in opposition* to it, in other words as a gendered concept. Wajcman [14] argues that technical competence is an integral part of dominant forms of masculinity, while technical expertise is a source of men's power over women. Similarly, Cockburn [15] points out that technical skill has been defined against women both materially- within the designs of certain technologies such as the example of the typesetter previously referred- and linguistically in the way girls'/women's technical competence is denied and their 'lack' referred to, often joked about in daily life. This thereby constructs a problematic situation for students positioned simultaneously as 'girls', expected to actively position themselves in ways socially appropriate to their gender (in opposition to 'boys' and hence technical competence), while positioned as students expected to learn and become competent with such skills.

However although the focus of research has been quantitative, such claims of women's under-representation in technological-based industry must be qualified. Women are not under-represented in computers-related work *per se*, but such involvement is gendered and

considerably less influential, as women form the majority of individuals employed in routinised, deskilled and lowly paid computer-based work [16]. Women's participation is marked by an estranged relationship with the technology which limits women's involvement at the level of control, development and implementation of the technology, and has pertinent implications for women's social and economic position in society. Having discussed the notion of gendered rationality, I suggest it is necessary to look at how this dualism manifests itself in two particular aspects of the educational context and how these are complicit in constructing and maintaining such a relationship. Firstly, the curricular construction of VCE computing options and how the divisions of content reflect such gendered reasoning and affect girls' choices. Secondly, the role of dominant discourses in the classroom, of educators and institutions in limiting the ways girls are able to present themselves, and be *seen* as competent computer users. In other words, how dominant discourses deny recognition of girls' competence in aspects associated primarily with masculine identity.

### **The gendered dualism of control and use: curriculum division of programming and computer use/I.T.**

The gendered division of labour described by Cockburn [17] in her analysis of the development of the typesetter is evidenced in the curriculum construction of VCE computer options. Such options embody the division between control (programming) and use (I.T) of the technology, described by Cockburn as the removal of 'technological intelligence' from operation. Such 'intelligence' is manifested as mathematical formalism. Walkerdine argues that "rationality and mathematical thinking is bound up with cultural definitions of masculinity such that femininity is treated as antithetical to such rationality" [18]. Girls are therefore positioned as outsiders in the technological domain, only able to legitimately use the technology in modified forms as tools, while still maintaining their social position as 'correctly' gendered.

Such a curricular division creates curricular camps, which Beynon [19] describes as complicit in the creation of the female 'I.T. slaves' and the male 'managers'. It is therefore necessary to understand to what extent such curricular divisions are complicit in constructing discourses that affect girls' choices.

### **Social positioning within the educational context**

Social positioning is actively taken up by girls in seeking to be visibly and 'correctly' gendered, and is manifested in particular ways within the school context. Volman [20] observed acts of 'helplessness' in a Year 8 information and computer literacy class by girls positioned as 'outsiders' (boys were positioned as 'experts'). She describes both positions as problematic, the 'expert' repertoire as one that suggests knowledge and skills that the pupil does not really possess, while the 'outsider' repertoire denies knowledge and skills that the pupil does possess. We need therefore to examine and challenge the positioning that occurs, working with girls to clarify their experiences by explicitly addressing the treatment of gender as a public category [21] and the desires of individuals to be 'correctly gendered' in order to be seen as socially competent.

Such positioning however, is not simply a result of individual agency or 'choice', but is reinforced by teacher and institutional discourses. In her work with girls and mathematics, Walkerdine [22] argues that girls' success is rated less highly than boys' and therefore denies girls the position of high achiever. At the other end of the spectrum, while boys'

academic failure is viewed as lack of effort, girls' failure is viewed as lack of ability. Similarly Culley [23] comments on the differential positioning available to girls in discourses on achievement and 'powerful' computer users. She points out that regardless of a boy's success he is still viewed as an enthusiastic and powerful computer user while girls, though achieving well academically, are not seen as expressing 'real interest or 'expertise'. In other words such a position is denied to successful girls. Elkjaer [24] argues that contemporary gender images do not include competent and confident girls and women and incompetent and frightened boys and men and therefore boys are positioned as 'competent' even when they are not.

Recognition of girls success therefore appears to be regulated by the assessment of particular forms of knowledge as publicly and politically powerful. Parlo Singh [25] argues that girls, denied their success and achievement in the more politically powerful and statusful aspects of computing such as programming, seek recognition in the less valued aspects such as general I.T or typing skills.

It is fundamentally important therefore that girls (students) are encouraged to develop a 'critical literacy' towards textual themes regarding gendered identity in order to understand the politics of such positioning. In doing so, the possibilities for achieving greater agency to challenge and resist certain positionings while having access to the possibilities of creating new ones become more realistic goals.

### **Theoretical perspectives for new research directions**

In this next section I attempt to theorise and outline a new direction for research which involves the development of a critical awareness of the ways discourses regulate individual actions and shape experiences. I draw on two theoretical perspectives to do this. I employ feminist standpoint perspective as a political strategy from which to centralise girls' voices as a critical perspective of a marginalised group from which to ask questions<sup>3</sup>. Secondly I utilise a feminist poststructuralist position which addresses individual forms of resistance by focusing on the contradictions girls face in positioning themselves as technologically competent, as a result of conflicting discourses at both the local and the institutional level. The latter therefore challenges the female-male dualism and humanist notions of 'identity' employed by much of the existing literature. Such a challenge is based on a notion of gendered identity that is dynamic, multiple and in need of constant maintenance. I argue that gender does not exist outside of language and the meaning systems we construct, rather, we use language to *act out* our gendered identity [26] [27].

### **Listening to girls**

Collin's [28] use of the 'outsider/within' metaphor provides a useful way to redefine the commonality of girls without recourse to biology. In other words girls are viewed as entering computer training within the dominant discourse which has been dominated by white men. Therefore, while they are located *within* the culturally male dominated domain of computing, they are located as *outsiders* in their relationship to such a domain.

Stepulevage and Plumeridge [29] use this notion to explore the issues that women in a computer science course face and how this affected the learning process in the case of programming. This is something that needs to be explored in the earlier stages of education, to examine how girls access dominant learning styles, to what extent they develop their own

in response to their 'outsiders' position and how this effects assessments made regarding their achievements.

### **Hearing girls: Examining the conflicts**

Denzin argues that structure precedes experience, as the subject is "...constantly caught up in the webs of discourse..." [30] and that therefore there is no singular and 'true' telling or representation of that experience. Similarly Bar On [31] argues that the experiences of the marginalised are restricted within the dominant ideology, both limited and shaped by it and therefore not totally free of the biases and distortions that taint the perspectives of the dominant and privileged. How, for example, do girls perceive their situation outside of the sexist discourse in which they are constrained? Kenway, Willis, Blackmore and Rennie [32] caution that while

"...girls' perceptions of gender and power...have a certain local and surface validity..., that this validity is limited by their specific locations within power relationships and by their frequent innocence about broader and more subtle patterns of power and the ways in which such patterns contribute to the production of meaning and their subjectivity." (p64)

In other words we must problematise girls' 'difference' from boys, and challenge the dualism that supports the myth of female technological incompetence. To do this we must reveal the contradictions and conflicts that girls must negotiate and examine the discourses from which they speak. This is necessary in order to assist girls in understanding how they are positioned within the technological context, and to introduce discourses that legitimate 'crossing the 'gender' boundary'. However this is not unproblematic as it involves negotiating the tension between 'voicing' girls and 'hearing' them. As I have already argued, individuals are active in the ongoing development of their gendered 'identity' and as such are actively involved in negotiating and resisting the positions available/offered to them, rather than being passively socialised into them. This 'choice' however is still directed by social forces but these act through the political use of discourse in controlling patterns of desire [33]. In other words these desires maintain the female-male dualism, manipulated in such a way that they are linked with the need to be recognised as one half of the binary rather than the other so that an individual can enjoy the 'rewards' of being correctly gendered. Many girls therefore desire to be positioned as 'feminine' which means actively positioning themselves in opposition to anything that is linked with being male and thus which threatens their social acceptability, such as 'technical expertise'.

It is necessary then to investigate to what extent this occurs, to reveal the conflicts with which girls are faced, for example, how are girls positioned and how do they position themselves in relation to those more 'statusful' computing applications that lead to greater career opportunities? How are these positions limited by the dominant or available discourses on gender and equity? To what extent is the lower number of girls in computer programming options compared to more 'general' I.T. options a result of compromise between conflicting discourses on femininity and rationality? How do girls who participate successfully in the former reconcile these? What are the disincentives or dangers of doing so? Such questions require an understanding of how individual girls construct their own meaning systems and how these are both informed by and inform dominant discourses on technology (computing) and femininity.

However this is not to imply that girls are solely responsible but that we need to understand the conflicts that they face in order to create meaningful reforms. This is rendered

meaningless however if we do not simultaneously challenge the meaning systems of institutional and state discourses which act to regulate the actions of those at the local level.

## Conclusion

A new research direction for addressing the asymmetric and hierarchical positioning of women in technological-based industries, must be based on a critical deconstruction of the socially and politically dominant discourses of gender and technology, and the mutually constituting relationship between them. In order to understand what is happening at the school-based level, we need to examine the conflicts and contradictions girls experience, posed by conflicting discourses of technological competence and gendered identity. Failure to acknowledge such conflicts limits what reforms can actually achieve. As I have argued, language through discourse is complicit in positioning the girls in particular ways that are in direct opposition to the legitimated standards of the public world. Through these subject positionings, the social structures and practices construct femininity in opposition to the legitimated standards of the public world.

Particular attention needs to be paid to the distinction between research approaches that rely on socialisation explanations that position girls as passive while simultaneously 'blaming the victim', and those concerned with how meaning structures inform both what is 'sayable' about girls' technological competence and girls agency in positioning themselves within those structures. Such a distinction is crucial if we are to use the latter to uncover the contradictions and conflicts girls face, and use these to rupture existing patterns of hierarchical power positioning.

Such a proposal however throws up two main tensions which need to be treated carefully. Firstly, the tension between 'voicing' girls and 'hearing' them. In other words we need to value 'girls' perspectives as relevant and valid, but draw attention to the ways in which we are constituted by discourse and subject to the limitations of what discourses are available. The issue here is not to discount girls' voices but to make visible the politics of how girls are positioned, in order to find ways to expand the range of positions available, and create more choices. Secondly, research and reforms must acknowledge and examine the particular social investments of individuals in dominant discourses, in terms of desires and threats. In other words, certain social rewards provide incentives for girls to choose to be socially competent over technological competence, such as socially popularity. Similarly, the dangers posed to girls and women, traditionally assigned to the private spaces of society, of crossing into domains of publicly acknowledged forms of power, provide strong disincentives for girls to do so.

The research question must shift from the 'woman question in technology' to the 'technology question in feminism', in which technology is viewed as another manifestation of politics, rather than as symbolic of 'naturalised' female-male difference which serves to justify existing gendered power relations<sup>4</sup>.

## Notes

1. Throughout this paper I refer to 'discourse' by which I define, in a very broad sense, the meaning systems and structures of social and educational institutions which are conveyed through language.
2. For a general review of the phases of research refer to Preston 1993 in the reference list [3].
3. I am using Sandra Harding's version of feminist standpoint theory [in 'Rethinking Standpoint Epistemology: What is 'Strong Objectivity'?' in L. Alcoff and E. Potter (eds.) *Feminist Epistemologies* (Chapter 3). New York/London: Routledge] which argues that the positions of marginalised groups provide useful starting points from which critical questions can be generated about the nature of social reality. Such positions reflect sites of resistance. Standpoint consciously builds in the voices of marginalised groups. I utilise this position however only as a tool to centralise girls' voices and politicise the regulation of their social positioning.
4. I borrowed this from 'The 'Science Question in Feminism'', the title of one of Sandra Harding's books, referring to the need to examine not what is 'wrong' with women in science, but look at how science has been complicit in constructing women as a 'problem'.

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