Keeping gender on the technology education agenda: An issues paper

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Introduction
The issue
Consider the gifts you received as a child or have given to children. What toy might typically be given to a five- or ten-year-old boy? What toy might be given to a five- or ten-year-old girl? Would the same toys be considered suitable or would trends of differing selection of toys based on the gender of the child emerge? What effects, if any, might such typical different experiences children are exposed to through their access to toys-based on their gender-have?

It is no longer contentious to suggest that toys and games play an important part in the construction of typical male and female gender roles-along with many other factors including family and friends, media, religion, sport and so on. This social construction of gender is the process through which a sense of ourselves as gendered human beings emerges. It seems that access and exposure to toys is also part of a child's technological education, beginning at an early age as they learn to play with and manipulate the toys they use. In this way, exposure to toys is typically part of the differentiated learning experiences between boys and girls as they progress through the common patterns of socialisation. The question is, are we socialising children towards or against technological literacy, based on their gender?

The socialisation process and its effects influence how girls and boys differentially engage in technology education. This paper addresses this issue and highlights the need to keep gender on the technology education agenda. To facilitate an understanding of this, the two key elements of this issues paper-technology education, and gender inclusivity.-will be contextualised in this introduction.

Technology education can be defined as learning activities directed towards the development of technological literacy and competency through a design, make and appraise approach (Taylor, 1994). Gender refers to understandings about feminine or masculine behaviours which are learnt through socialisation (Allard, Cooper, Hildebrand and Westlands, 1996). The coming together of these two factors-technology education and gender-form the basis of this paper, "Keeping Gender on the Technology Education Agenda". The documents A Statement on Technology for Australian Schools (Curriculum Corporation, 1994a), Technology: A Curriculum Profile for Australian Schools (Curriculum Corporation, 1994b) and the National Action Plan for the Education of Girls 1993-1997 (Australian Education Council, 1993) have aided in setting the agenda in the areas of technology education and gender inclusivity.

As an issues paper, this manuscript aims not to provide answers but to promote questioning by highlighting factors which influence the delivery of technology education in a gender inclusive manner. Issues mitigating against and the way forward for gender inclusive technology education will be highlighted by examining gender inclusive practices which can be used as a basis for the technology classroom.

What is technology?
There are many understandings and definitions of technology. For example, in a recent student textbook written for students in years 7-10, the definition of technology is stated as:

...the use of scientific and engineering skills and knowledge for the purpose of researching, developing and creating products to fulfill a given need or solve a particular problem (Stevens, Ramsay, Heenan & Heenan, 1997: iv).

This section presents another way of making meaning of "technology" and locates technology education within this framework. According to MacKenzie and Wajcman (1985), technology has three levels of meaning. At the first level, technology refers to physical objects-cars, vacuum cleaners, computers; on the second level it includes human activities-that is, the use of the physical objects; and the third level is the "know-how"-the information required to use, repair, design and produce the physical objects. Each of these levels of meaning of technology shall be developed in the following paragraphs.

Level 1, the physical objects which constitute technology, range from the simple, such as ballpoint pens, knitting needles and kitchen utensils, to the complex, for example bicycles, washing machines, genetic engineering and complex management systems. MacKenzie and
Wajcman (1985) contend that technology is socially constructed, shaped by economic, political, social and cultural factors, as is gender. Mackay (1991) agrees with this, noting that technology cannot be neutral, as it is designed for a particular purpose, and so mirrors the prevailing social relations. Therefore technology brings with it a degree of responsibility. For example, the development and viewing of television could take some responsibility for deteriorating family life, just as the inventor of the nuclear bomb could be asked to take responsibility for the destruction of Hiroshima. Further, technology opens options to some individuals while closing options to others. For instance, the construction of roads makes it possible for those with the economic means and skills to access them to be mobile. But simultaneously, it socially isolates those without the economic means and skills to take advantage of that technology.

The second dimension of technology focuses on the use of physical objects. Without the human element, technology is a collection of objects with no purpose. Any definition of technology must address its purpose and role in relation to society and human activity. For example, an automobile is a lifeless conglomeration of steel, aluminium, rubber and plastic, of little if any value if it does not meet humanity's needs and requirements. As MacKenzie and Wajcman (1985) explain, without human activity technology is devoid of purpose and reason. In other words technology that does not serve humanity's purpose is pointless. Thus technology, in its many forms, is entwined within the fabric of human existence. It is an essential component of human society and endeavour.

The final level of technology refers to knowledge, the "know-how" to make technology meaningful. "Know-how" gives those that possess it a degree of actual or potential power (MacKenzie & Wajcman, 1985). This is where technology education fits into the technology puzzle. Technology education helps to prepare students to live and work in an increasingly technological society by equipping them for innovative and productive activity (Curriculum Corporation, 1994a). However this "know-how" must also respond to the social shaping of technology, and critically question the consequences of technological innovation. In studying technology the dimensions of culture, energy, environment, ethics and gender must be addressed in relation to the development and use of technology, as recognised and advocated in "Appropriate Technology: A Teachers Guide-Make the Future Work" (Gordon, 1996).

This paper will concentrate on the gender dimension and technology education which are located within the third level of understanding technology, and in this way, the appropriateness of gender inclusivity for technology education can be highlighted.

What are the problems with technology from a gender perspective?

Marginalisation of women's technologies

As outlined above, technology is often seen only in terms of physical objects-industrial machinery, cars, and artefacts-the first and lowest level of meaning of technology. Gordon (1996, p.97) suggests that things often identified as technological in nature "seem to privilege the things men make and do" over the "things women make and do", a link with the second and third levels of technology meaning, which recognises that technology is a social phenomenon manifesting the values of those that design and use it (Gordon, 1996).

From a gender perspective the problems with technology relate to the social phenomena of power, prestige, and status, which are all hallmarks of a patriarchal society which encourages the dominance of masculine technologies over feminine technologies. A patriarchal society recognises as important those technologies which have typically related to the paid world of work-machinery and equipment whose use produces an economic, measurable outcome-typically those technologies associated with males. Within this framework, less important technologies are those associated with the unpaid sector, with comparatively diminished or no paid economic outcomes-that is, those associated with females. As a consequence, within such a paradigm, masculine technologies are valued over feminine technologies as they have a measurable, monetary value. It could be argued that the "real" value of unpaid (or comparatively low paid) technology far outweighs those of paid technologies, but that the monetary criteria for measurement of value is the one which dominates our society and thereby marginalises traditional women's technology.

Further understanding of the marginalisation of traditional women's technologies needs to consider women's invisibility within an historical framework; the trend in linking technology to masculinity; and the role of patriarchal society in reinforcing these perceptions.

Women's invisibility - an historical framework

Traditionally, areas of technology have been affiliated with femininity or masculinity, with accompanying differences in the value and importance attached to them. Women's invisibility stems from a lack of recognition for technological innovation, and "the things that they are recognised for are not typically defined as technological" (Gordon, 1996, p.99). For example, MacKenzie and Wajcman (1985) highlight knitting as a technology which requires manual dexterity and computation but it is not generally recognised as a technology, due to gender stereotyping and related assumptions about technology. After all, home knitting is a
craft typically undertaken by women, now a recreational activity of no particular value!

Women's invisibility is apparent not only in this example of the use of technology but also in the design and development of technology. This is reinforced by the fact that women were not allowed to hold patents in nineteenth and early twentieth centuries for their inventions (Gordon, 1996). Instead, women had to seek male benefactors to take on board their ideas, under the stewardship and control of the male. Such a pattern of lack of power reflects the general role and perceptions of women in society in that era.

Furthermore, male dominance of technology has been achieved by the exclusion of women from areas deemed by them to have and require technological expertise. For instance, during World War Two when there was a demand for technological skills and literacy in the paid workforce, in the absence of men, women more than adequately filled the jobs requiring such "technical expertise" which were previously performed by men. Once the war ended and men returned home, women were no longer required to fill these positions and were actively forced from their pseudo-technological roles. Through this experience it became easy to see that women had displaced men in what had previously been considered to be men's work, and that women were more than capable of performing equally. MacKenzie and Wajcman (1985) explain that part of the reason for women's active exclusion after the return of men from the war may be that technological know-how is traditionally and historically a source of men's power which is needed to feel in control, through an active disempowering of women.

Ironically, research indicates that females were the first technologists who, due to the demands of nutritional stress and caring for families, invented the digging stick, the carrying sling, the sickle, pestles and pounders, and methods for preservation of food (Tanner cited in Cockburn, 1991). Until the Neolithic age, women appeared central to the organisation of social life, but during the Bronze Age a shift towards male dominance emerged (Cockburn, 1991). It was in the Bronze Age that men secured control of key technologies and denied "women the practical experience upon which inventiveness depends" (Wajcman, 1991, p.21), thus gaining control over the types of technology which were considered to be highly valued.

Prior to the Industrial Revolution, women supplied their families' own needs in terms of food, drink, clothing and utensils as manufacture was organised on a domestic basis, with no distinction between home and work. But it was during the Industrial Revolution that the distinction between paid work and unpaid work first began to emerge, and the opportunity for women to develop skills was most severely eroded (Griffiths, 1985). Arnold and Faulkner (1985) contend that it was in the shift towards capitalism and away from craft knowledge and agriculture where women became marginalised. Technology which saw the progressive mechanisation of production resulted in the de-skilling of women in areas valued in terms of their technological importance. This move towards a masculine culture of technology is fundamental to the way in which the gendered division of labour is still being reproduced today.

Women's continued alienation from technology

Women's alienation from technology is accounted for by Wajcman (1991) in terms of the construction of technology as masculine, as outlined in the previous section. As such, technology is a cultural product which is historically constituted by knowledge and social practices. Cockburn (1985) describes different childhood exposure of individuals to technology, role models, and segregation of the labour market as fundamental to the construction of technology as masculine. Further to this, the impact of technology is rarely examined from the woman's perspective, and as Wajcman (1991, p.792) warns "it is impossible to divorce the gender relations which are expressed in and shape technologies from the wider social structures that create and maintain them".

To be in control of the latest technology is highly valued and conveys a degree of power on those in command of the technology-and this is most often men. Yet why-in an era emphasising the equity of men and women-are emerging technologies not gender neutral? Wajcman (1991) argues that research strongly supports the notion that computers, for example-relatively new technology with the potential to redress this gendered construction-are seen as pre-eminent male machines. This assumed and often purposely promoted social construction is evidenced in many ways. For example, a seminar organised and conducted in July 1997 by the National Council of Women of Australia was titled Women Taking on Technology. The promotional information supporting the seminar called for potential female participants with the catch cry "everything you want to know about today's technology, but were afraid to ask". The hidden message is that women are afraid of computers and are bravely "taking on" this masculinised technology field. But why are women afraid to ask-why aren't they answering the questions? Why is a seminar being organised specifically to allow women to find out how to make electronic banking meet their needs, and how to make telephones work for them, or to have computer talk and terminology explained in plain English, or how to master the VCR? Are there equivalent conferences for men? One can only ponder this dilemma, but to hazard a guess would be to say that the masculinisation of certain technologies has been so exclusively harnessed as to make some women feel alienated and frightened by the technologies, and excluded from their everyday use. For some, it is not considered to be a suitable trait for women to be technologically
literate, competent and independent as this in some way suggests they are not conforming to traditional female stereotypical images.

**Patriarchal society**

Patriarchy, which recognises the male as head of social organisation, helps to perpetuate the subordination of the interests of women in preference to the interests of men (Weedon, 1987). The role of women is defined in terms of its relation to the patriarchal norm. Dichotomies which help structure knowledge of roles of males and females and their place in the wider social world inform technological thought and are distinctly masculine (Wajcman, 1991). By way of example, dualities such as reason/emotion, public/private, strong/weak, with the first listed trait being seen as masculine and dominant and the latter being associated with being female.

The absence of women's technical confidence or competence leaves men making technological decisions. For instance, the development of reproductive technologies has given women choice in terms of fertility and contraception, but who is setting the agenda? Some feminist thinking contests that reproductive technologies are an effort by men "to appropriate the reproductive capacities which have been, in the past, women's unique source of power" (Wajcman, 1991, p.38). Stanworth (1990) sees reproductive technologies as a double edged sword, that is, it provides women with a choice, but it also puts women in a position to be controlled by the (predominantly) men who develop, manipulate and control these technologies, and access to them. Is the goal of reproductive technology to replace natural reproduction, with every female to be sterilised at birth (the ultimate form of contraception), and conception occurring in the laboratory as a means of guaranteeing the fabrication of genetically perfect babies (Wajcman, 1991)?

Wajcman (1991) contends that an emphasis in society on technologies dominated by men conspires in turn to diminish the significance of women's traditional technologies such as horticulture, cooking, sewing and child care. This in turn reinforces the stereotype of women as technologically incapable. Technology is often seen as complicated and "high-tech", therefore making it unsuitable for women. Such a contradiction can be found in the home, where men typically are in charge of programming the video recorder, because women are thought not to be capable of the task. On the contrary, women in the home are often responsible for far more "complicated" appliances than the video recorder, such as computerised sewing machines, and microwaves, but these are seen as female technologies of no importance. If the predominant user of the technology is male, it is valued and important; if the predominant user of the technology is female, it is considered to be of lesser value and technological significance. Within patriarchal society, the gender issues remain constantly reinforced by the structures which are set in place.

Such an examination of how technology empowers but also disempowers and marginalises provides insight into the challenges that technology education should address. These three key issues—the historical invisibility of women in technology and of women's technologies; women's continued alienation from technology; and the role of patriarchal society in reinforcing these issues—highlight some of the underlying societal pressures in which the gender and technology scenario sits. So what is the role of technology education in challenging and redressing some of these issues?

**What is technology education?**

Technology education is not just about using technology, it concentrates more on generating ideas and acting on them, as well as in using and developing processes and products that satisfy human needs (Curriculum Corporation, 1994a). However, it must be acknowledged that technology education in Australia has its roots most strongly in domestic and manual arts which emphasised skills and tools, thus emphasising finished products and skill development, rather than processes. As such, technology education tended to be "overly teacher-directed, often emphasising narrow gender-determined skills" (Curriculum Corporation, 1994a, p.5).

Given that home economics, manual or industrial arts, and agriculture have traditionally been responsible for Australian school-based technology education, it is important to acknowledge that these subjects have been hampered by stereotypical images which have labeled them as gender specific. Taylor (1994) argues that the integration of a range of subjects (such as those above) into technology education was an attempt to provide programs that both male and female students would find stimulating and worthwhile and would not be seen to be gender specific, as had been the curriculum tradition. Such a view is reinforced in the rationale of the technology Statement which notes that with changing roles of men and women and employment patterns, it is imperative that students are provided with the opportunity to explore the perspectives of men and women and their respective contributions to the development and application of technology (Curriculum Corporation, 1994a).

At this point, it is pertinent to trace the evolution of technology education in Australia. The historic Hobart Declaration of 1988 identified technology as one of eight key learning areas. Following this decision the development of technology education was mapped, and an extensive literature review carried out. These processes culminated in the release in 1994 of A Statement on Technology for Australian Schools (Curriculum Corporation, 1994a) and Technology-A Curriculum Profile for Australian Schools (Curriculum Corporation, 1994b) these
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The need for technology education to be gender inclusive

Technology education is hampered by historical stereotypes which have the power to marginalise both female and male students in the delivery of technology education. This point is outlined in section 2 of this paper. Pendergast (1995, p.11) claims that "It is only through an inclusive curriculum that the stereotypes will ever be challenged and finally put to rest".

Benzie (1994) also argues that in our rapidly changing world there is an increasing obligation to provide students with an insight into the technological nature of society in a gender-inclusive manner. A broad acknowledgment of the need for gender-inclusive practices was heralded in The National Action Plan for the Education of Girls 1993-1997 (Australian Education Council, 1993), released in response to the gender reform agenda (Kenway, 1995).

Gender inclusivity is defined by the Equal Opportunity Action Plan for Girls in Education 1988-1990 (1988: 4) as an approach which "gives value and validity to girls and women, their knowledge and experience, equally with boys and men's knowledge and experience". Gender inclusivity emerged out of an awareness of the differential social valuing of female and male experiences. The Action Plan was informed by liberal feminism which reinforces the stereotype that women have to be like men to be valued (Kenway, 1995). To redress the gender imbalance, girls were encouraged to participate in "male" subjects, and efforts were made to make activities equally attractive to both male and female students. However, the reverse of males participating in traditionally "female" subjects was not actively promoted. Gender reform today has moved forward to a point where it encourages both male and female students to be critically informed in terms of the way gender is constructed so they can recognise and oppose oppression and advocate for change (Kenway, 1995), rather than valuing certain knowledges and processes over others. In this way, a critically deconstructive approach provides a starting point upon which specific strategies can be considered.

The writing of the Statement and Profile was informed by the National Action Plan for the Education of Girls, but despite this informing influence they have generally failed to be gender inclusive in a comprehensive sense. The Statement has merely recognised the need to address gender issues and has worked within very limited parameters. For example, there are several inclusions in the document which refer to gender, but these do not provide guidelines for a comprehensive, value free gender-inclusive approach. It states that:

historically, the teaching of technology has often been teacher-directed, often emphasising narrow, gender-determined skills for students.

For many women, this resulted in a restricted choice of post-school options, a limited experience in dealing with a wide range of technologies and an undervaluing of technologies commonly used by women. Similarly, many men lack experience in respect for technological processes used in households (Curriculum Corporation, 1994a, p.6).

The underlying assumption in this statement is that technology is gendered in ways that marginalise women and that women need to access male technologies to be empowered. Similarly, it acquiesces to the need for males to experience household technologies associated with women. In so doing, Kenway (1995) suggests that in an attempt to incorporate gender reform practices into the Statement and Profile, gender practices were marginalised by the tolerance limits of the male consciousness of those that controlled their development. This is not escaping the restrictions of patriarchal society but is in fact reinforcing the limitations and assumptions about the way we should be. This view is supported by Pendergast and Reynolds (1994) who argue that the rationale for including technology in the nationally developed
Curriculum is economic in nature—true to the reinforcement of the Marxist values of patriarchal society. This is problematic in that, as Kenway (1995) explains, economic rationalism and corporate managerialism do not serve the interests of gender reform. In fact, the Statement, particularly in its early drafts, was accused of reinforcing traditional views of technology which favour white Anglo-Saxon males and marginalise others including females (Annels, 1993) through such stereotypical assumptions.

The changed roles of women in society are not adequately reflected in the curriculum document, evidenced by the lack of recognition of unpaid work. Women's interests which are addressed seem to be stereotypical in nature, dealing with childcare and food preparation. Girls' genuine as opposed to stereotypical interests need to be incorporated into the curriculum if it is to be gender-inclusive in nature. If technology education is to be credible it must move away from the stereotypical association with gender-based skills, and provide a focus for a discipline which deals with the real world where males and females are both involved in paid and unpaid work, and neither of the binary pair-paid/unpaid-refers to or assumes a gender.

In an attempt to move forward, Gordon (1996) acknowledges that gender is a significant factor in designing and evaluating technology, and identifies four key questions which should be used as a basis for technology education to consider gender appropriateness:

- Will it include, and suit, females/males?
- Will it affect job opportunities for women/men?
- Are unwanted stereotypes being reinforced or challenged?
- Does it add to users' self esteem?

Are these questions currently being used for the basis of the delivery of technology education? Do these questions ensure that gender inclusivity is indeed addressed in technology education? Do these questions provide a starting point shifting away from the limiting assumptions woven into the Statement and Profile? Although there is evidence that the Statement (and the Profile emerging from this) have not moved beyond stereotypical assumptions about technology and the way it is being empowering for women by recommending them access to the male domain of paid work (the valued and valuable aspects of technology), and similarly that male students be encouraged to “experience” household technologies, it is possible that in the classroom a transformation is taking place which is not confined to such limiting parameters. However, it is the view of the authors that without guidelines, it is unlikely that these issues have been adequately identified and addressed, thus limiting the potential benefits of technology education for all students.

Issues mitigating against gender inclusive practices

In addressing gender inclusive practices in the technology classroom, Wajcman (1991) suggests there needs to be a move beyond masculinity and femininity to construct technology education according to a set of socially desirable values which are not based upon gender perspectives. However, a number of issues are working against a gender inclusive approach to technology education, including an emphasis on paid work with a continued dominance of patriarchal society, an historical emphasis on product and narrow technical skills, and teacher dominated classrooms.

Emphasis on paid work

The changing roles of males and females, together with the changing nature of employment, necessitates that all people be competent in the use of technology. Therefore technology education should not be exclusively concerned with the economy and the paid workforce (Bigum and Green, 1993). Such an emphasis is limiting to females and males who are not part of the paid work force, as well as limiting to those who are part of the paid workforce and are missing out on technological expertise received in the home.

The emphasis on paid work over unpaid work has implications for both male and female students of technology education. Men are socialised to pursue work, and regard domestic duties and childcare as secondary (Pease & Wilson, 1995; Thompson & Walker, 1989). This traditional view of fatherhood has reinforced men's position at the boundaries of family life. Male students need the opportunity to experience the "technologies" of the home and family. Research indicates that girls gradually become familiar with male experiences, but boys move further away from the "world of girls" through such lingering traditions as the Industrial Revolution. An emphasis on paid work will continue to isolate males from one segment of the world of technology.

The changing nature of employment makes it essential that individuals are competent in the use of many forms of technology. Women make up 43% of the labour force mainly in the fields of wholesale and retail trade, finance, property and business services, community services, and recreation and personal services (The GEN, 1995). The question is often asked why women are not being attracted to technology fields, specifically questioning the limited number of women pursuing careers in engineering and computer technologies. This kind of thinking demonstrates a rather narrow perspective of technology, and obviously dismisses the technology used in the areas where women typically work: wholesale and retail trade, finance, property and business services, community services, and recreation and personal services.

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"Product" emphasis and teacher-directed classrooms

Technology education must adopt a holistic approach which values the process as well as the product. Such an approach will make technology education more appropriate to both sexes and provide the transferability of skills to other domains outside of the classroom.

Pendergast (1995) contends that there is little point in developing in students the ability to design, make and appraise, unless they are able to transfer these abilities to other contexts at other times. It is suggested by Wellington (cited in Mackay, 1991) that employers want transferable skills rather than narrow technical skills which become obsolete within a short time. According to Bigum and Green (1993) the Statement allows students to become operationally literate, but neglects the critical dimension which enables the ready transference of abilities. Technology education has more to offer than mere skill development.

The nationally developed Statement (1994a) defines technology as "the purposeful application of knowledge, experiences and resources to create processes and products that meet human needs". This definition acknowledges the need for a human element for technology with the reference to meet human needs. However, does this definition still retain the emphasis on the creation of products? Such an emphasis devalues the holistic approach being advocated in this argument, which values the process and the context over the product.

To illustrate this, the following scenario (modified from Gordon, 1996) about a student highlights how an emphasis on "product" can cloud the best intentions. The student suffered from spina bifida, which meant she had limited use of one hand, making her slower at fine motor tasks. The food technology teacher had difficulties with the student because she constantly fell behind the other students. The teacher usually dealt with the situation by taking over the student's work and completing the task. In this way, the teacher valued efficiency and a quality end product. An alternative and more suitable way of dealing with the situation may have been to let the student complete the task, finding the best process for

Case study: Anne, told by a special education teacher

Some years ago, I was teaching in a co-educational school. One of my tasks was to help Anne, a girl with spina bifida, to integrate into mainstream classes. Her disability was relatively mild, but it did mean that she had very limited use of one hand and was slower than most children in fine motor tasks. Most teachers coped with this limitation well, and the girl participated fully in most areas. However, the Food Technology teacher found her extremely difficult to teach and invited me to observe her lesson. What I saw was most revealing.

The lesson began with a teacher demonstration of the techniques that would be used in that day's cooking. Then the teacher wrote the recipe on the blackboard, and set the pupils to cook for themselves. From that point on, the teacher spent her time moving rapidly from student to student, trouble shooting and occasionally taking over. The lesson was conducted at great pace, with constant reminders about the time and what point in the recipe the pupils should have reached. Inevitably, Anne fell behind. The teacher visited her more often than the others and gave her more help. Frequently she took a task over from Anne and completed it for her in order to help her catch up. I suggested, as delicately as I could, that it might be worth letting Anne find her own way of doing things, and that the teacher might leave her to work undisturbed for the rest of the lesson. My colleague looked at me somewhat incredulously, but stayed away from the girl for the next five minutes, casting anxious and increasingly frustrated glances in her direction. Eventually, as Anne fell further and further behind, the teacher could bear it no longer. She came across to her, completed her preparation, and put her cake into the oven only slightly behind the rest. By the time the bell went for the end of the lesson, Anne had a beautiful cake to take home with her. There you are, said the teacher triumphantly. I had to do that or she never would have achieved anything.

This story is not told to denigrate a teaching colleague, but to raise some important questions for the reader:

- What values did the classroom teacher have: what did she see teaching food technology as being about, and how did she believe children learned?
- How did her classroom organisation and her skills as a teacher reflect those values?
- What values did the visiting teacher display, and how compatible were they with those of the classroom teacher?
- How do you imagine this teacher is coping with the national technology documents?
- If you were technology head teacher at her school what, if anything, would you do?

Making the Future Work-Appropriate Technology, a teacher's guide. p. 77
her, thus learning a lot along the way, and achieving something for herself—even though the product may not have been quite up to the standard the teacher may have considered was satisfactory. Figure 1 provides more detail of the scenario and some focus questions.

In the educational arena it is becoming increasingly apparent that a study of technology should involve the examination of real people in real contexts. For this to be achieved there will need to be a move away from the teacher-directed classroom, to the point where the teacher is the facilitator of student learning. This change to a contextual basis for technology education will suit a wider range of learning styles, and will be more appropriate for both sexes.

**Taking action**

**A critical deconstructive approach**

A critical deconstructive approach to the politics of knowledge needs to be adopted in an inclusive curriculum (Alloway, 1995). In developing a gender-inclusive classroom, strategies must take account of the experiences of both males and females, challenges stereotypes and sexism, and make visible the contributions of both women and men (Curriculum Corporation, 1995). In other words, the student needs to be aware of and understand how knowledge can perpetuate inequitable power relations in terms of gender, race, and class. The further aim is to "personally empower students through their understanding of the social construction of gender so they know how to begin to refashion and renegotiate their relations" (Alloway, 1995, p.92).

A gender-inclusive classroom should address: access, participation and equity; valuing of female knowledge and experience; acknowledge differences among girls; and critically examining the construction of gender (Allard et al., 1995). In terms of access, participation and equity, students should all be able to contribute fully to school life without harassment, to have equal access to teacher time and resources, and be given the opportunity to value and draw upon their personal experiences (Curriculum Corporation, 1995). The classroom must provide an atmosphere which is warm and welcoming, and values co-operation over competition (Riggs, 1994). The environment of the classroom should be neutral, and inviting for both male and female students. This is of particular importance in the technology classroom which is often alienating and foreign to both sexes.

Valuing of students' skills and experiences recognises that the starting point for male and female students is often very different (in the technology classroom). The experience of some students is sometimes ignored. Adopting a gender-inclusive approach allows all students' experiences to be acknowledged, valued and reconstructed. A gender-inclusive curriculum seeks to redress imbalances in the classroom by insisting on strategies that will let all voices be heard and valued (Curriculum Corporation, 1995). Acknowledging the differences among students highlights that as a group, girls and boys are not homogenous, and that experience and behaviour is individually and collectively constructed. That is, it is important that all students are not thought to be interested in or to value the same things based on their gender, or other criteria which could be imposed.

The critical examination of the construction of gender, including understanding of the way in which social structures and institutions construct and perpetuate concepts of gender inequalities is important for students to learn. A gender-inclusive curriculum should critically examine the ways in which gender relations are constructed and perpetuated and offer strategies to deconstruct them (Curriculum Corporation, 1995). Kenway (1995, p.47) believes the aim is to: develop an education system which will work to free up females and free up males and which will allow all members of the school to be more fully human in an environment which is safe and challenging and which encourages students to take some risks with their gender identities in order to move beyond the negative constraints that gender can impose.

**Creating a gender-inclusive classroom**

The National Action Plan for the Education of Girls 1993-1997 states that central to a gender-inclusive classroom is the opportunity for all students to take an active part in class discussions, express feelings, and take risks. Any strategies used must be supportive of this aim. Strategies which are of value in a gender-inclusive classroom include co-operative learning, provision of context, a negotiated curriculum, values clarification, critical thinking, reflection, investigations and open-ended enquiries. Kenway (1992) suggests the use of interactive, co-operative, contextual, intuitive, holistic and practical learning and methods in a gender-inclusive curriculum.

**Cooperative learning**

Small group work and co-operative learning have been identified as important teaching strategies both for technology education in a gender-inclusive classroom (Williams, 1994; Allard et al., 1996). Co-operative learning involves any activity which involves two or more students working together without direct teacher intervention (Williams, 1994). Co-operative learning is only an effective gender-inclusive practice when all members of the group are active contributors. If a group activity is characterised by dominant individuals and passivity, it continues to marginalise individuals. Co-operative learning emphasises co-operation over competition because the process is more important than the correct answer, with active listening, equal access, and risk taking being valued (Curriculum Corporation, 1995). The skills of co-operative learning need to be explicitly taught if it is to prove to be of any worth (Allard et al., 1996).
Contextualising
The adoption of a holistic approach to technology education acknowledges that girls learn best when the subject has an everyday context (Gordon, 1996). There is no technological activity without a purpose, thus linking an activity to the wider world increases relevance (Harriman, 1994). Structuring activities around a real, identified purpose makes the technology process worthwhile not only for girls, but also for boys. Girls are interested in the context, and the social relevance of a problem, as they are more interested in people than things (Johnson, 1990). Technology education using an issues approach changes the emphasis from objects to people, highlighting the importance of values in designing, making and appraising. An activity which was previously product-based may be contextualised by providing a scenario for the students.

Values clarification
Values clarification are those activities that offer the opportunity to highlight conflicting values, so they can be explored, analysed and justified (Curriculum Corporation, 1996). Values are an important facet of appropriate technology and students need the opportunity to clarify values against the technology in question. Harriman (1996) highlights the importance of structuring learning so that students determine courses of action, anticipate consequences, make decisions and clarify values. Values clarification enables the student to elucidate responses, and affirm choices (Gordon, 1996). The concept of appropriateness of technology allows students to examine the purpose and usefulness of products. For instance, students could evaluate the appropriateness of the television and its effect on family life.

Catering for differences in approach
In approaching a problem, boys typically adopt a "trial and error" approach while girls typically spend a lot of time discussing and planning before making a start (Riggs, 1994). The classroom environment and activities need to be flexible enough to allow for such diversity and to encourage freedom of style which is not seen to be gendered. This difference in approach is of particular concern if the emphasis in the technology classroom is on the product and not on the process. If an environment is established whereby students are allowed to plan, act and reflect, the different approaches to learning typical for girls and boys should be accounted for.

A negotiated curriculum
The National Action Plan for the Education of Girls states the importance of allowing students to have control over the pace and direction of their learning. Negotiating the curriculum allows for sharing of power with student and teacher, the opportunity for metacognition, and for the student to be involved in self-monitoring, which increases student accountability. The teacher needs to construct learning experiences in such a way that the student is involved in autonomous learning. The use of a contextual basis to learning experiences should allow students to be able to negotiate how to progress with the problem at hand.

Critical thinking
Critical thinking should involve examination, exploration and questioning, in an atmosphere that takes nothing for granted, allowing for insight and consciousness raising. Journal writing for example is used to raise consciousness, because students learn best by critically reflecting, by linking biography, history and social structure. It also gives students the opportunity to interpret how technology has been shaped by dominant culture (Taylor, 1991). For strategies to be gender inclusive they need to provide experiences which tap into the deeper levels of "knowing, look beyond superficiality and reward efforts directed at meaningful learning" (Allard et al., 1996).

To summarise, in incorporating gender inclusive teaching practices in technology education, the curriculum could:
- take account of male and female experiences;
- challenge stereotypes;
- provide a context for all learning;
- use open ended inquiry;
- provide a neutral environment for learning;
- negotiate the curriculum;
- encourage critical thinking; and
- include values clarification.

Learning should be positioned in the context of gender relations of the wider society and as has been highlighted, this context is politically, socially, culturally and economically determined.

Conclusion
What is the benefit of keeping gender on the technology education agenda? That depends on who is setting the agenda. Previously, technology education has been hampered by stereotypical perceptions of technology and gender determined skills. However A Statement on technology for Australian schools (1994a) and Technology-A curriculum profile for Australian schools (Curriculum Corporation, 1994b) can offer the way forward. But first, technology educators must embrace the critical dimension of technology education which allows students to question the interests served by technology. Technology has the power to either marginalise or to empower both male and female students. As technology educators, it is our role to ensure the process of empowerment is facilitated.

References
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