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The female perspective on technology

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Abstract
Concern about the imbalance in the number of males and females in the physical sciences and engineering has been expressed for many years. A number of recent publications suggest that scientists and technologists should stop thinking of girls and women as lacking in ability or as problematic because they are not interested in technology, and should instead start to analyse and question the nature, history, procedures and aims of science and technology.

A variety of suggestions has been made for addressing the imbalance between males and females in the physical sciences and engineering. Frequently such suggestions have arisen from a perspective which considers girls and women as unsuitable because they lack the 'right' abilities, as troublesome when they do not conform to established procedures or deficient in some way because they do not seem to see the opportunities technology offers them personally, and the world in general.

The only evidence for biological differences in intellectual ability indicates that women are generally better at tests of perceptual speed, memory, verbal ability, precision tasks and mathematical calculation while men are better at visual-spatial tasks (the ability to visualize and mentally manipulate two- and three-dimensional figures), at 'target-directed motor skills such as guiding and intercepting projectiles', at so called 'disembedding tests (finding a hidden shape in a complex drawing) and at mathematical reasoning. (Kimura, 1992) Reviewing psycho-metric tests Gray acknowledges boys are better at spatial reasoning but is unclear about why such reasoning is important (in Kelly, 1981). Writing in 1983 Harding noted that there was inadequate research into the abilities required for technology. Gold argues that differences in intellectual ability are not an issue and justifies this by pointing to the higher representation of women in the medical and biological sciences. (Gold, 1990)

Research into differences in the behaviour of girls and boys indicates that boys tend to play competitive games in large groups and that they make absolute rules which are rigidly interpreted for coping with conflict. Girls on the other hand play in smaller groups and although disagreements occur less frequently than with boys, if this happens the game is abandoned. Girls are said to be more tolerant of rules for they are more sensitive to, and careful of, the feelings of others. The importance of human relationships to women has been well documented. Gilligan's work on decision making, indicates that men often see an issue as right or wrong, as 'black or white', whereas women find it more difficult to make a decision because they look at human relationships and acknowledge the complexity of any activity which involves people (Gilligan, 1982).

Head (1985) looked at personality characteristics of adolescent boys and girls and how these link with choosing or not choosing physical science subjects. Some boys, who had cut and dried views on many matters, chose science and technology by foreclosure, making commitments without adequate thought. He noted that this approach was likely to be accompanied by rigidity in thinking. Adolescents who uncritically adopt the concepts, perspectives and values of others are comfortable with technology for it is usually taught as if it were value-free; makes little emotional demand on them and appears to offer clear, precise answers to problems. Head believes that this accounts for the 'rigid, authoritarian attitudes often associated with scientists' (in Kelly, 1987: p.19).

Research indicates that gender differences in values, in perception and in ways of interpreting situations is due to differences in the way the sexes are socialised. In addition to expectations about vocational roles, society has expectations related to attitudes and behaviour. For example masculinity is associated with independence, self-reliance, competitiveness, strength and leadership. Femininity is associated with conformity, communal working, passivity, nurturing and concern for people. In science and technology and in today's economic climate it seems that competitiveness, aggression and single mindedness, i.e. the qualities identified as masculine, are highly prized.

Awareness of differences in motivation and perception is particularly important in technology education. Technology is frequently taught as an impersonal, objective activity, the aim of which is "bringing about change or exercising control over the environment" (HMI, 1985) or with producing marketable objects. Prime (1993) believes that the
“proper purpose of technology is enhancement of the quality of relationships - personal, social, international.” Although the two approaches need not be mutually exclusive, frequently technology is presented as if it is value-free and is primarily concerned with materials, procedures and symbols. Placing technology in context means that at all stages of the process, identifying the task, designing and making and evaluating the process and the outcome, the inter-relationship of the technology with people and with the environment cannot be ignored. Technology in context, technology which is concerned with people and not merely with things, is likely to be more interesting and motivating for both girls and boys. Such increased motivation has consequences for learning underlying concepts, skills and principles and for applying the understanding gained in further, diverse, contexts.

If, as many social scientists and philosophers argue, knowledge is socially constructed, the question to ask is: “Are science and technology essentially masculine constructions?” In a recent book, Alic (1990) shows that the way the ‘technology story’ has been told means that the contributions women have made have not been acknowledged. The female perspective on science and technology has been, and continues to be, overlooked. This means the way technology has been constructed is inaccurate and unrealistic and this is detrimental to science and technology. As Erikson stated in 1965 the implication “when women are truly represented in science - not by a few glorious exceptions, but in the rank and file of the scientific elite - will be the addition, to the male kind of creative vision, of women’s vision.” Fox Keller (1985) suggests this will mean a ‘thoroughgoing transformation of the very possibilities of creative vision, for everyone.” Without the feminine perspective, technology is limited and diminished. The perception and creativity of half the world’s population is being ignored. The world of women puts great stock on experience, inventiveness, spontaneity and improvisation. Diversity of skills is valued, as are personal loyalty and a sense of continuity whereas the technological system demands innovation, constant change and personal achievement. Technological order is geared to maximising gain whereas the strategies of women are more often than not aimed at minimizing disaster. (Franklin, 1990) Often the influence is implicit and part of the informal ‘hidden curriculum’ which means that assumptions are not challenged and school transmit attitudes and values which reinforce sex-role stereotyping. (Riggs, 1993)

Research into the way boys and girls are treated in technology found that ‘work attributed to a boy is rated higher than identical work attributed to a girl’ (Spear, 1984) Cawthorne (1988) found that teachers were more likely to discuss boys with colleagues and with parents and had more to say about boys. Her observations of CDT lessons showed that teachers talk more to boys than to girls and that boys talk more in class than do girls.

During practical activities girls are often in the background acting as organisers, recorders, providers and labourers. They slip into, and are expected to perform supportive, ‘housekeeping’ roles. Such a role can be restrictive and is frequently undervalued. Teachers need to be aware of such situations and value organisational skills and be prepared to intervene when appropriate. Many girls and women have accepted the ‘deficit’ model of themselves i.e. they often put themselves down and lack confidence. Teachers’ expectations and labelling can be a major cause of lack of confidence. Female students and teachers of both sexes, seldom question the content and teaching strategies of technology lessons.

Diverse and creative approaches to assessment are needed: assessment techniques need to be examined for bias (Burrage, 1991; Murphy, 1991). For example it is acknowledged that boys score higher on multiple-choice type assessments whereas girls are better at essay-type answers when they can explain their thinking. (Harding, 1993) Evaluation and assessment in peer groups are also conducive to building girls’ confidence.

Teachers are frequently resistant to ideas and suggestions such as those outlined above and have been known to refuse to consider the arguments.

“There is evidence that teachers are reluctant to accept anti-sexist initiatives.” (Whyte, 1986:229)

In an area such as this there is always the danger of generalising and this has to be recognised. However,

“Because hackles are easily raised by generalizations made about girls and boys and stereotyping, the issue is often avoided. This prevents us paying attention to many constructive suggestions for action.” (Versey, 1990: p. 10)
It is important to be sensitive to the danger of generalising and oversimplifying but we can be over-sensitive and thus avoid discussing the issues. Like all human activities, education is controversial, to be meaningful it has to be challenging and result in change. Teachers need to understand that controversy cannot be avoided or ignored. Teachers of technology have a particular role to play. Because of the way technology has been seen to evolve and the way it has been traditionally taught, there is a need to scrutinise lesson content and the context in which the content is set (Harding, 1987). A simple example is to look for metaphors which relate to activities more often associated with males. Textbooks also need to be examined. Analysis of science textbooks has, in the past, included few references to women. Researchers have also commented on the small number of representations of people of either sex in the science and technology textbooks. Hence the notion that science and technology are about things, not people, is reinforced. It is not just a case of 're-telling' the story, teaching and learning strategies also need to be examined. Active learning strategies such as role playing and opportunities for using imagination and creativity can be part of all teaching, regardless of the subject content.

References