Chapter 2

Technology and Design Education: Are We Developing Professionals or Technicians?

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In Australia, technology education is a new field of study in tertiary education programs at the primary and early childhood teacher degree level. Since the release in 1994 of the Australian Curriculum Statements and Profiles (Curriculum Corporation of Australia, 1994a, 1994b), which include technology studies, there has been a gradual shift in the curriculum content of many teacher education programs to include technology education. Accompanying this trend has been a small but growing body of research into effective inservice (see, e.g., Chester, 2000; Finger, 2000; MacGregor, 2000; McRobbie, Ginns, & Stein, 2000a, 2000b; McRobbie, Stein, & Ginns, 2000; Seemann, 2000a; Stein, Ginns, & McRobbie, 2000) and pre-service education (see, e.g., Compton & Jones, 1998; Jones & Carr, 1993; Jones & Compton, 1998; Stein, McRobbie, & Ginns, 2000) in technology education.

The Curriculum Corporation define technology education as a process of designing, making, and appraising with information, systems, and materials (Curriculum Corporation of Australia, 1994b). This *Process Approach* to learning is at odds with the public's perception of technology. Most people, including student teachers, consider technology to be a recently developed artifact, such as a computer (Hardy, 1997; Jones & Carr, 1992; McRobbie et al., 2000; McRobbie et al., 2000a, 2000b). Sociological studies of technology (MacKenzie & Wajcman, 1985; Turnbull, 1991; Wajcman, 1991) and contemporary research into technology education (Keirl, 2000; Rennie & Jarvis, 1995; Seemann, 2000a; Siraj-Blatchford, 1997; Symington, 1987; Wellbourne-Wood, 2000) present quite a different image.

The definition of what is technology, and therefore technology education, is still contested (see, e.g., Seemann, 2000b). It is argued in this chapter that how

technology and therefore technology education is conceptualized will determine how teachers plan for this area, assess children's capabilities and knowledge and, more importantly, make decisions about how to build upon children's existing understandings. Professional judgment about the worth or possible mismatch of the content found in national or state technology education documents and expectations of children's capabilities and their cultural experiences (Fleer, 2000; Seemann, 2000b) are not possible when a narrow view of technology is considered.

This chapter critiques the main arguments which surround the introduction of technology education into schools, examines the main approach being adopted in schools and universities and presents a case for introducing a range of teaching approaches to technology education during pre-service education. Although the notion of critiquing curriculum is not new in tertiary education, modeling a range of approaches to the teaching of technology education has generally not been undertaken (Fleer & Jane, 1999). However, strong support for critiquing design and technology education has been advocated: "The action or art of criticizing or passing judgment is highly applicable in Design and Technology Education as well as in life at large. It is something of value to be learned" (Keirl, 2000, p. 128).

TECHNOLOGY AS ADVANCEMENT

> People equate technology with "advanced", "sophisticated", "high" technology, and these are value laden words. But what kind of technology is really sophisticated? People don't equate the best technology with the most "appropriate"; they equate it with the most complex or, even worse, the most expensive. (Siraj-Blatchford, 1997, p. 37)

The myth that technology is synonymous with progress is reinforced by the belief that technology is advancement (Turnbull, 1991). The linear continuum of development from low to high technology implies that societies are moving towards an end point. The "end point" is often constructed as an advanced, sophisticated and civilized state (Yearley, 1988). This assumption is open to question, particularly when notions of consumption and cultural cohesion are considered. In addition, the binary nodes, which are created to support this continuum, are equally questionable: for example, high - low; primitive - advanced civilizations; inferior - superior; and simple - complex.

When one binary node is more highly valued than another, it becomes increasingly difficult to consider different ways of thinking about and using technology. For example, historically there has been a strong association between technology and advancement in Western cultures. This is evident in the area of cooking. A microwave oven is considered a more recent and hence more sophisticated artifact than a gas cook top or even a fire. By default, technology is constructed to mean a recently developed artifact. However, other forms of technology, such as an ice-block stick, baby bottle, paper clip, or digging stick, are not often thought of as technological artifacts. They are simple technologies, which are equally as important as high technologies in society.

Technology can be thought of as more than an artifact. Cultivating a new variety of wheat, seedless tomato, or flower is a technological process. There are many processes and products, which can be considered as technology.

Young children's views on technology also equate to advancement. Rennie and Jarvis (1995) used a picture quiz to identify Australian and English children's perceptions of the term technology. They asked children (aged seven and eleven) to identify from a list of 28 items the items that had something to do with technology. The most frequently listed item was the computer (high technology) and the least frequent was the poodle (technological process). Studies of student teachers, adults, and Australian teachers (see, e.g., Hardy, 1997; Jones & Carr, 1992; McRobbie et al., 2000; McRobbie et al., 2000a, 2000b; Symington, 1987) have also shown these associations.

The view of technology as a recently developed artifact is narrow and places a limit on how teachers can construct educational opportunities for children in schools and centers. It also presents a value-laden curriculum, whereby children are consumers of a Western orientation to progress, advancement, and resource depletion. Technology education programs, which focus on recently developed artifacts or feature lessons which teach children to only concentrate on creating artifacts, do not allow the full spectrum higher order thinking process to be exercised. Children need to consider the implications of artifact production or the social structures created to support and label "advanced technologies."

A linear view of technology creation has also been analyzed from a

technologically determinist perspective. It has been argued elsewhere (Fleer & Hardy, 1996) that many suppose that technological artifacts create social change (for a fuller discussion, see MacKenzie & Wajcman, 1985). For example, many people thought that the introduction of computers would reduce the number of jobs available. The attention being directed towards how computers create change, rather than examining the social context which brings about the introduction of computers. Similarly, workers voiced concern during the industrial revolution regarding the introduction of the power-loom arguing against the use of powered machinery - for fear of job losses. They did not consider the social context which created the artifact or the changing social context brought on through bringing workers together under one roof, whereby employers were exercising more social control - with the loss of cottage industries, the control of production was reduced to a select few.

Technology education which focuses on critiquing technological artifacts may present a technologically determinist perspective to learners. Children need to consider the broader social context that brings about the introduction of particular technological artifacts or processes. Considering how technology affects people reinforces the Western view of technology as advancement. Wajcman (1991) has argued that "... the notion that technology is a neutral force determining the nature of society is a depressing one, robbing us of any power to affect its direction" (p. 163).

Children need to feel that they too shape technology and hence can make a difference in the design and construction of technological artifacts and processes. As Wajcman (1991) argues, "Rather than seeing technology as the key to progress or, more recently, the road to ecological or military destruction, the social shaping approach provides scope for human agency and political intervention" (p. 163).

Another by-product of a view of technology as advancement is the serious omissions in recording our technological histories. Siraj-Blatchford (1997) has suggested that an Eurocentric approach to the labeling and hence recording of the invention of technological artifacts and processes reflects a culturally chauvinistic attitude. Hence, racism can be reflected in aspects of design and technology. Although an anti-racist approach should be used in curriculum content selection, encouraging children to adopt this perspective when examining historical accounts is more difficult to engineer. For example, Siraj-Blatchford (1997) has suggested that some curriculum material published

through the Education authorities in England encourages children to evaluate technologies from other cultures. A letter from the Ghanian village is presented in one of the suggested units of work. This letter requests charity to help establish a water supply system. The unit is organized to encourage British children to decide upon how the villagers are to be assisted. Siraj-Blatchford (1997) argues:

> This is an exercise directing European children to evaluate the technological choices for rural Africans and while a great deal of information is provided about the science and technology, no information is provided about the culture! ... the charitable minority world scientists and technologists provide inappropriate technological solutions to the dependent and (at least implicitly) grateful majority world communities. (p. 38)

Western views on the historical accounts of technological development are frequently presented as a linear continuum. Using different cultural contexts to engender children's capacity to critique this world view of technology reinforces, rather than de-constructs, this perspective of technology. Technology education programs which critique the multiple ways people have developed solutions to problems (focus on cultural similarities and shared needs) are more likely to yield broader understandings of technology.

When technology is viewed within a Western paradigm of advancement, limited curriculum development opportunities arise to re-frame thinking so as to take account of multiple social and cultural contexts. Tinkering with technological artifacts to see what is inside them and using technological tools, although popular in the early stages of defining technology education, did little more than reinforce gender divisions in technology education (Fleer, 1991). For example, girls were encouraged to use screw-drivers and pliers to pull apart machines such as computers and radios. Thus reinforcing the view that technology was about artifacts, those artifacts were closely aligned with tools and machines used by men, and girls and women were viewed as deficient and in need of opportunities to experience these artifacts and tools. Little recognition of women's technologies is evident in this view of technology.

Wajcman (1991) has suggested that technology as advancement, particularly in relation to the development of an economy, has overlooked important and basic technological artifacts and processes in society such as household technologies. Tools and machines which are accorded status and therefore serious consideration are generally those associated with men and their work.

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