

# DEVELOPING A VALUES-BASED APPROACH TO TECHNOLOGY EDUCATION: ETHICAL APPROPRIATENESS OF DESIGN SOLUTIONS

Glenn Finger & Romina Jamieson-Proctor  
*Centre for Learning Research, Griffith University*

The importance of values in Technology Education has become a major concern as technology curriculum documents are designed and implemented. The *Technology Years 1 to 10 Syllabus* (QSA, 2003) in Queensland places emphasis on aspects of appropriateness as students develop and examine design solutions through working technologically. This paper reports the findings of an investigation of student teachers' confidence and preparedness in being able to consider the ethical appropriateness and the strategies they would employ to promote student considerations of ethical design solutions to design challenges. Consistent with Fleer and Jane's citation of Levinson's conclusion that "few teachers, whatever their specialism, can handle the ethical aspects of contemporary science and technology issues with much confidence or experience", an analysis of student teacher responses revealed an array of strategies including avoidance of controversial or 'touchy' issues, use of a(n) (un) common sense approach, honesty, a search for 'truth', and a respect for personal values and beliefs. The key implication which emerged from the student teacher responses was that technology education requires values-based pedagogical approaches to enable student teachers to confidently deal with the ethical appropriateness of design solutions.

## Introduction

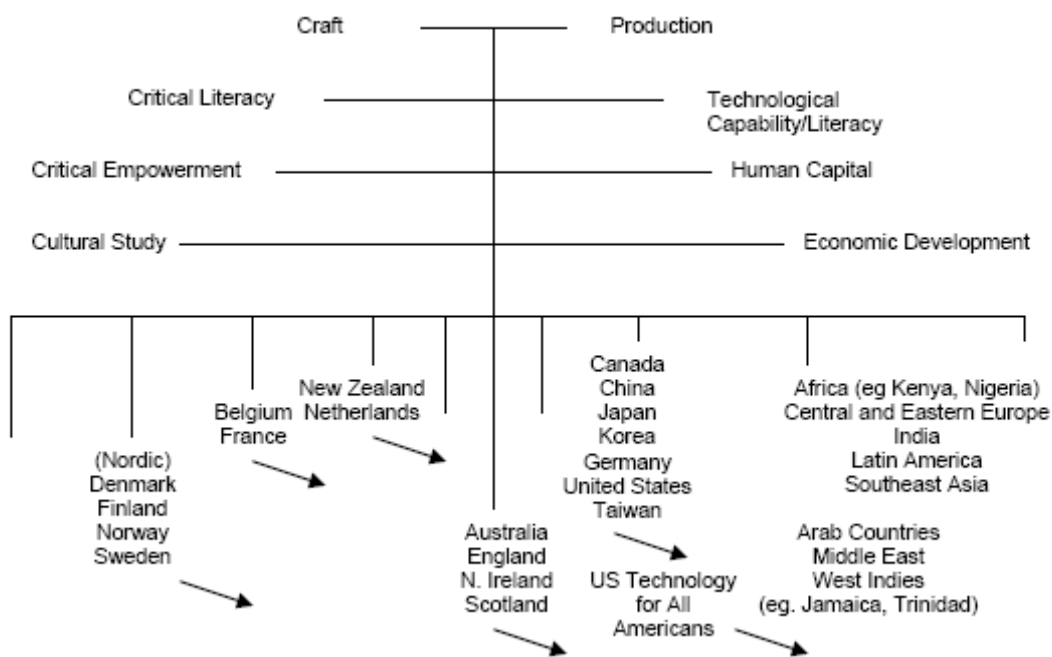
The importance of values in Technology Education has become a major concern as technology curriculum documents are designed and implemented. The *Technology Years 1 to 10 Syllabus* (QSA, 2003) in Queensland places emphasis on aspects of appropriateness as students develop and examine design solutions through working technologically. After presenting Petrina's argument that technology education is not values neutral, and requires resituating in its ideological context and as a cultural study, this paper reports insights into student teachers' confidence and preparedness in being able to consider the ethical appropriateness and the strategies they would employ to promote student considerations of ethical design solutions to design challenges.

## Values and aspects of appropriateness – *Technology Years 1 to 10 Syllabus* (QSA, 2003)

In *The Politics of Technological Literacy*, Petrina (2000) argued that, in many instances, the construct of technological literacy "is neutral, and something nobody 'could be against'" (p.181) and cites evidence of this in the work, among others, of Colelli (1994), Dugger (1995), and Pucel (1995). Petrina also noted that "the counterpart of this concept is 'technological capability', which has been defined similarly and as neutral in its European and North American contexts" (Petrina, 2000, p.181). Therefore, Petrina indicated that

"Both constructs have been used hand-in-hand to buttress cases for the economic supremacy of the US or the economic recovery of England in a global, neo-liberal, capitalist market. Both constructs have been tightly linked to the economic interests of private corporations and the state in these countries. In practice, each has been used as a referent to whatever gets taught. Those who prefer a critical component, as opposed to one that is conservative and neo-liberal, to the end of education are faced with a dilemma: Enact a project to renovate these constructs or introduce a different language which embodies a critical discourse." (Petrina, 2000, p. 182)

Petrina, in his work, proceeded to resituate technological literacy through a reconstruction of the end of technology education through a "renegotiation of power from the state and economic control of technology education toward a power for ecology, justice, labour, and the public" (Petrina, 2000, p.182). In undertaking this, Petrina resituated technological literacy within a critical tradition evidenced in the work of theorists such as Lankshear and McLaren (1993), Friere (1982), and Willinsky (1990). In theorising the international emphases in technology education in the late 1990s, Petrina noted that for "countries enfranchised through global capital, there has been a gradual shift of emphases in technology education toward economic development and competitive supremacy" (Petrina, 2000, p. 190). In relation to technology education in Australia, as displayed in Figure 1, Petrina proposed that Australia had shifted towards a greater emphasis on production, technological capability/literacy, human capital, and economic development.



**Figure 1: International Emphases in Technology Education in the Late 1990s (Grades 9-13) (Petrina, 2000, p. 190)**

Using Petrina's framework in Figure 1 as an overview, we have found it difficult to holistically locate the Years 1 to 10 Technology Syllabus (QSA, 2003) developed for implementation in Queensland schools in Australia, but rather find that there are important elements of the syllabus which can be located at various points in the framework. That is, the key messages and orientation of the syllabus provide some tensions between elements and positioning within the framework. In terms of the politics of technological literacy, it would be easy to accept Petrina's 'gradual shift' thesis as statements by political leaders and senior bureaucrats have justified the place of this KLA largely in economic terms. Indeed, the syllabus has been developed within a very strong enterprise, economic, business, manufacturing and profit-driven, employability, skills shortage discourse.

However, central to this syllabus is a recognition of values and technology as

"There is a relationship between people's values and beliefs and the technology they create and use. Their values and beliefs influence, and are influenced by, technology and its impacts on individuals, societies and environments" (QSA, 2003, p. 1). Furthermore, when 'working technologically', defined in this syllabus as interweaving technology practice, information, materials and systems with considerations of appropriateness, contexts and management, the syllabus states that "people make choices and value judgments about the relative merits and impacts of the processes and products of technology" (QSA, 2003, p.1).

As we see it, a strength of the syllabus is its design for students to consider many perspectives in making judgments about the appropriateness in terms of seven aspects of appropriateness – aesthetic, cultural, economic, environmental, ethical, functional and social appropriateness. Moreover, the valued attributes of the lifelong learner in Technology are articulated as – a knowledgeable person with deep understanding, a complex thinker, an active investigator, a responsive creator, an effective communicator, a participant in an interdependent world, and a reflective and self-directed learner. There is certainly rhetoric related to aspects of a critical technological literacy paradigm.

While there is the inclusion of economic appropriateness and, undoubtedly, an explicit orientation towards innovation, enterprise, and associated notions of human capital, production, and technological capability/literacy in this syllabus, there are also explicit requirements for examining other aspects of appropriateness and encouragement of a creative design process which promotes critical literacy, critical empowerment, and cultural study. The space is provided for enabling Petrina's important contribution in arguing for technology education to be resituated as a cultural study, where "Critical pedagogy and critical literacy can be seen as practices that work to question and transform conditions, ideologies, and institutions which are structured to maintain inequality" (Petrina, 2004, p. 193).

Neither values-framed nor culturally-framed pedagogies view technology as values neutral. Values-framed pedagogy scaffolds the development of students' critical empowerment, critical literacy and cultural study. Culturally-framed pedagogy builds upon values-framed pedagogy and recognises that technologies are a product and process of particular cultures. They shape and are shaped by other processes within a society. Engaging in this pedagogy implies an investigation of socio-historical aspects that, with particular reference to technology education, should include the issues of individual power and control within an increasingly interconnected world (Catells, 1996; Fler & Jane, 2004; Hardt & Negri, 2000; Petrina, 2000). The *Technology Years 1-10 Syllabus* (QSA, 2003) reflects values-framed and culturally-framed pedagogy when it urges that:

"Students examine historical, social, cultural, spiritual, political and economic constructions of technology and the varying perspectives of people.

...students develop repertoires of knowledge, practices and dispositions that promote equity and equity issues...

They analyse social, political and economic structures created through technological developments (along with the power relations inherent in these structures) and explore ways such structures can work for or against individuals or groups." (QSA, 2003, p. 12)

### **Methodology – insights into ethical appropriateness**

In designing this study, the methodology was guided by the aim of the study which focused on a values-based approach to teaching technology with a specific interest in student teacher preparedness to deal with ethical appropriateness inherent in the *Technology Years 1 to 10 Syllabus* (QSA, 2003). Therefore, we saw the need to work within a qualitative, naturalistic paradigm in which the inquiry is value-bound, influenced by inquirer values as expressed in the choice of the problem itself, and in the framing, bounding and focusing on that problem (Cohen, Manion & Morrison, 2004, p. 137). In addition, the context within which the study took place assumed that, as the student teachers are involved in a learning program, the study acknowledges that the attribution of meaning is continuous and evolving over time (Cohen et al., 2004, p. 137).

The methodology employed engaged more than 120 2<sup>nd</sup> year undergraduate student teachers in responding to a stimulus posted in a Discussion Forum as part of the course Technology Education. That course aimed to prepare them to be able to understand technology, plan for, and develop approaches for teaching technology in primary schools. The Discussion Forum, titled *A Values-based Approach: using technology appropriately*, invited the provision of responses and the creation of discussion threads to the following stimulus:

On page 172 of their book, *Technology for Children* (Fler and Jane, 2004), Fler and Jane cite Levinson's conclusion that "few teachers, whatever their specialism, can handle the ethical aspects of contemporary science and technology issues with much confidence or experience". In addition, Griffith University lists "Ethical behaviour and Social Responsibility" as one of the 9 Griffith Graduate outcomes...I'm sure that you all know these - teamwork, problem solving, critical evaluation, oral communication, written communication, information literacy, professional skills, creativity and innovation, and ethical behaviour and social responsibility – see also [http://www.gu.edu.au/centre/gihe/griffith\\_graduate/toolkit/ethics/hand04.htm](http://www.gu.edu.au/centre/gihe/griffith_graduate/toolkit/ethics/hand04.htm) (Griffith, 2004).

In this Forum indicate: firstly, how confident you feel you are prepared to consider the ethical appropriateness of design solutions which your students might investigate, ideate, produce or evaluate; and secondly, what strategies you would employ to promote student considerations of ethical technological solutions to design challenges; e.g. designer babies (see Chapter 10, p. 172).

### **Analysis of student teacher responses**

The following discussion provides summaries of the analysis of student teacher responses to the Discussion Forum stimulus in terms of their confidence in dealing with ethical appropriateness, and the strategies which student teachers indicated they would use to deal with ethical appropriateness.

### **Confidence – values-framed pedagogy and ethical appropriateness**

An analysis of the responses overwhelmingly suggested that the student teachers tended to believe that they were growing in confidence to teach technology initially as a values neutral creative design process, but had given little thought to developing a values-based approach to teaching technology. Through the use of the text for the course (Fleer & Jane, 2004), there was evidence that students had begun to consider pedagogical diversity through their required reading and thinking about designing pedagogical diversity. However, students indicated that they were mostly confident with the development of discrete technology experiences (e.g. designing bridges to meet a design challenge, designing a new uniform) and the use of symbiotic technology or purpose oriented technology which used a real world problem as a starting point and then drew upon other curriculum areas to develop a design solution (e.g. developing design solutions to transport problems in the local region).

Moreover, students indicated that from their development of a deeper understanding of the aspects of appropriateness integral to the syllabus, they had become more aware of the power of this syllabus to engage students in critiquing design solutions they developed, and that they now understood that the statement consistently emphasised by their lecturer that "no technology is purely beneficial". Complementing this, the Discussion Forum relating to values-based approaches provoked responses which reflected a new awareness that technology was not values-free. However, the following response was indicative of a general lack of confidence expressed by the student teachers in dealing with ethical appropriateness in relation to 'how to go about it':

"...whilst of course I am willing to consider the ethical appropriateness of any design solution a student might pose to me, I don't feel that I have an adequate understanding of how I might go about it." (Natalie, 24 October 2005)

The findings tend to suggest that throughout the course, student teachers had also made links to several courses undertaken earlier in their degree program which they hadn't believed would relate to this area of curriculum study. Those courses included *Sociocultural Understandings, Introduction to Education, and Multiliteracies*. In particular, to illustrate this, multiliteracies, which is now used by literacy educators to "focus on the ways in which literacy education will continue to change in order to equip students with the skills necessary to be active and informed citizens in present and future societies, and to address the challenges posed by a changing world" (Anstey, 2002, p. 13) had elaborated on the three dimensions - multimedia and technology, cultural and linguistic diversity, and critical literacy. "History teaches us that 'literacy' refers to a malleable set of cultural practices that are shaped and reshaped by different, often competing, social and cultural interests" (Luke & Freebody, 1999, p. 5). Students conveyed some understandings that technology developments are situated within and interact with rapidly changing, social, cultural, economic, and educational contexts.

Several students conveyed deep understanding of technology as not being value-free or values neutral in relation to their work with information and communication technologies (ICT), by articulating that they could also see ICT the notion of ICT as a tool was naïve. Rather, they understood that ICT as an example of new and emerging technologies could not be seen as neutral and without understanding of context. The required incorporation of considerations of context, appropriateness and management in the planning of design challenges seemed to have led to a growing awareness among students of this, but few seemed comfortable with design challenges that proceeded beyond discrete and symbiotic pedagogical approaches. Student teachers were less comfortable working within valued-framed and culturally-framed pedagogical approaches which are approaches arguably necessary for confidently dealing with ethical appropriateness.

### **Strategies – ethical appropriateness**

From an analysis of student teacher responses to the Discussion Forum stimulus, five strategies for dealing with ethical appropriateness were identified; namely, avoidance, (un)common sense approach, honesty, a search for 'truth', and respect for personal values and beliefs. Examples of student teacher responses are provided in the following summary. We have also highlighted that some responses reflected an eclectic approach whereby several of those approaches might be adopted simultaneously – sometimes in illogical relationships such as one student teacher's comment that "I believe that there is always a best answer but at the same time I respect the perspectives of other people" (Mary, 22 October 2005).

#### *Avoidance*

The following student teacher responses provide evidence that, when faced with an ethical and/or potentially controversial issue, the strategy employed is avoidance.

"I actually faced this dilemma in the classroom whilst on prac. When Hurricane Katrina hit New Orleans, I struggled with what to tell the students but decided it was best not to discuss it, since I was not well enough informed...In short, I decided that it was best not to discuss the situation" (Jackie, 27 October 2005)

"I feel that I would NOT approach these ethical issues by completing a design challenge about them nor would I feel ethically right to give the students a bias (sic) point of view." (Bill, 28 October 2005)

#### *(un)common sense approach*

Evident was a concept of common sense, which implies that there is also an uncommon sense. While no student teacher indicated that they would employ an uncommon sense approach, the assumed common sense approach is contestable – for example, what is meant by a common sense approach? how is common sense determined? Conflicting interpretations of what common sense meant could be detected. In some responses, the common sense approach emphasised a search for the middle ground, in other instances it tended to suggest that if the topic was too controversial then "use your common sense and avoid it" (James, 23 October 2005), while some responses implied that "simply everyone knows how to use their common sense in dealing with issues such as designer babies" (Alison, 29 October 2005). Further examples to illustrate the preference for a common sense approach as a strategy for dealing with ethical appropriateness included:

"The confidence I feel as a teacher considering the ethical appropriateness is all about common sense." (Elizabeth, 29 October 2005)

"Everyone seems to agree with the basic idea of using common sense to determine what will be right for your class." (Karen, 28 October 2005)

#### *Honesty*

In terms of frequency, honesty was proposed by only three student teachers, for example, "I have experienced some of these questions both as a teacher and a parent and firmly believe that honesty is the best policy." (Amy, 22 October 2005) This strategy begs more questions – such as, is it ethically appropriate to ever be dishonest?

#### *A search for 'truth'*

The following example illustrates that, for some of the student teachers, there is a 'truth' which can be found.

"The truth to me is FACTS...plain and simple. The things that are happening in our world are not always pretty and children need to be informed of the FACTS.

...The class I am in at the moment discusses current events...however the information is a bit mixed up...they can be informed of the correct information." (Tom, 27 October 2005)

That kind of approach is incongruent with the spirit and intention of the *Technology Years 1 to 10 Syllabus* in assisting students to

"analyse social, political and economic structures created through technological developments" (QSA, 2003, p. 12) as well as mitigating against the considerations of "many perspectives before making judgments about the appropriateness of:

- Design ideas
- Processes and products
- The possible impacts of these on users or environments." (QSA, 2003, p. 2)

Some student teachers, more appropriately qualified the search for the 'truth' and the importance of facts:

"I believe it is our job to not 'hide the truth' so long as our responses are ethical, unbiased and respectful of all." (Joe, 24 October 2005)

"I agree facts are powerful and should be the definitive final word on an issue, but it's best to be aware that sometimes the facts are not always the facts...there are countless irrefutable facts in our world, all of which demand accepting. But I am concerned with how quickly some 'facts' are accepted before proper unbiased examination." (Ashleigh, 29 October 2005)

#### **Respect for personal values and beliefs**

This approach, while proposed as a theme, reflected some diversity in that some student teachers referred to this as an opportunity for teachers to model respect for cultural diversity and multiple perspectives, and

some student teachers felt that we also needed to do more than listen and overtly provide strategies for dealing with personal bias and prejudices.

### **An eclectic approach**

While the analysis undertaken here was able to suggest the approaches discussed, frequently the Forum responses from individual student teachers were an eclectic mix of several approaches. For example, one student teacher indicated that to avoid controversial technology issues reflected a common sense approach.

"I too would use my common sense and try to avoid any issues that may address cultural, religious or political beliefs as they would undoubtedly cause concern..."

### **Conclusion**

The importance of values in Technology Education will continue to be a concern as technology curriculum documents are interpreted and implemented. Following the use of Petrina's framework to attempt to locate the intention of the *Technology Years 1 to 10 Syllabus* (QSA, 2003) in Queensland, this paper reports the findings of an investigation of student teachers' confidence and preparedness in being able to consider the ethical appropriateness and the strategies they would employ to promote student considerations of ethical design solutions to design challenges. The analysis of student teacher responses revealed an array of strategies including avoidance of controversial or 'touchy' issues, use of a(n) (un) common sense approach, honesty, a search for 'truth', and a respect for personal values and beliefs. The key implication from this paper are the continuing challenges to develop values-framed and culturally-framed pedagogical approaches to teaching technology to meet the dual requirements of ensuring that technology is not seen as being values-neutral or value-free, and that more sophisticated strategies are developed for providing future teachers with the confidence and strategies to deal with aspects of ethical appropriateness.

### **References**

- Anstey, M. (2002). *Literate Futures: Reading*. Brisbane: State of Queensland, Department of Education.
- Catells, M. (1996). *The rise of the networked society*. Oxford: Blackwell.
- Cohen, L., Manion, L., & Morrison, K. (2004). *Research Methods in Education. 5th Edition*. New York: RoutledgeFalmer.
- Colelli, L. (1994). *Tech Prep and Technology Education: A Positive Focus for Competitive Literacy*, ITEA, Reston, VA.
- Dugger, W. (1995). Technology for all Americans. *The Technology Teacher*. 54 (5), 3-6.
- Fleer, M. and Jane, B. (2004). *Technology for Children. Research-based approaches. 2nd Edition*. Frenchs Forest, Australia: Pearson Education.
- Friere, P. (1970). *Pedagogy of the Oppressed*. Translated by M.B. Ramos. New York: Continuum.
- Griffith University. (2004). *Ethics and Responsibility Toolkit*. Retrieved 15 September, 2006, from [http://www.gu.edu.au/centre/gihe/griffith\\_graduate/toolkit/ethics/hand04.htm](http://www.gu.edu.au/centre/gihe/griffith_graduate/toolkit/ethics/hand04.htm).
- Hardt, M., & Negri, A. (2000). *Empire*. Cambridge, MA: Harvard University Press.
- Lankshear, C. & McLaren, P. (Eds). (1993). *Critical Literacy*. New York: State University of New York.
- Luke, A. and Freebody, P. (1999). A map of possible practices: Further notes on the four resources model. *Practically Primary*, 4 (2), 5-8.
- Petrina, S. (2000). The Politics of Technological Literacy. *International Journal of Technology and Design Education*. 10, 181-206.
- Pucel, D. (1995). Developing Technological Literacy. *The Technology Teacher*. 55 (3), 35-43.
- Queensland Studies Authority (QSA) (2003). *Technology Years 1 to 10 Syllabus*. Queensland: QSA.
- Willinsky, J. (1990). *The New Literacy*. New York: Routledge.