Values and Technology Education

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Introduction

> Technology is, and always has been, about the realisation of appropriate solutions to human problems, problems which arise in every sphere of human activity.[1]
>
> Technology is a disciplined process using resources of materials, energy and natural phenomena to achieve human purposes.[2]

These sample definitions have a misleading simplicity to them, for they imply that there is a ready consensus on the human problems to be tackled and the human purposes to be pursued and that technology provides a proven route to solutions that will be recognised as appropriate and successful. The fundamental questions lurking in the background could easily be missed: What belief about human life and purpose lies behind our choice of worthwhile human activity? How do we define progress? By what criteria is a solution 'appropriate'? The value judgements made throughout the process of technology embody our stance on these questions — there is no neutral, value-free technology.

> The view of technology as 'essentially amoral, a thing apart from values, an instrument which can be used for good or ill' is increasingly discredited. If technology is to be useful it must fit into the pattern of activity which belongs to 'a life style' and a set of values.[3]
>
> Technology is an equity issue. It has everything to do with who benefits and who suffers, whose opportunities increase and whose decrease, who creates and who accommodates.[4]

Technology is part of life; it is not something that can be compartmentalised and separated. It is shaped by perspectives and priorities forged out of experience, culture and belief.

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Values and valuing are most obvious in Attainment target 1 and in Attainment target 4. For example in AT1, whatever methods are used to identify needs, judgements are being made with recourse to values. Thompson's definition quoted at the start of this article could be taken to imply that a solution can be found to any human problem or need, overlooking a common experience that a solution to one human need causes considerable problems for other humans and for the environment.

Encouraging pupils to think that problems can be completely or satisfactorily solved is unrealistic. Unfortunately problem solving that conveniently limits the factors and does not address the wider implications has become a popular approach in schools. It would be more realistic to talk not of problem solving activities but of problem centred activities. An important part of life is learning to live with risk and compromise. This is especially true for Design and Technology.

But perhaps we are misinterpreting AT 1. In looking for opportunities for design and tech activities, the implication maybe that only needs which can be answered simply by D&T are to be addressed. If this is the case then there are two consequences. First the number of needs which can be *completely* answered by D&T are very few and when tackled there should be explicit justification for cutting down the human complexity and for concentrating on the limited solutions that D&T can provide. Secondly we have to examine where market opportunities and creating consumer needs (or should it be wants?) fit into the scene. What assumptions and values judgements are being made in deciding that society should have another type of beer or sweet?

What are the Criteria for Evaluation?

The examination of the constraints that have been acknowledged and the criteria that have been used are then part of the process of evaluation which is the subject of AT 4:

> Pupils should be able to develop, communicate and act upon an evaluation of the processes, products and effects of their design and technological activities and those of others, including those from other times and cultures.[5]
>
> Breadth of vision is required adequately to ascertain the constraints and draw up the criteria. Pupils need to look beyond immediate usefulness and profitability (necessary as these are) to effects on producers, users and those influenced in the by-going, perhaps through environmental side-effects. Purposes need to be considered in the light of ethics:[6]
>
> A beautifully constructed knuckle duster, for instance, may meet all the criteria except the fundamental one — that of desirability of the product in the first place! Selection and weighting of criteria are therefore important processes as are the values which are emphasised by the teacher. Our main point is that evaluation in school technology should reflect a wide range of types of values, with appropriate weight being given to ethical, social, political and environmental questions alongside questions about efficiency and economics.[7]

The Processes of Technology are Value-laden

The values issues in the outcomes and impact of technological activity are often acknowledged, with such thoughts as 'It is not guns that kill people, it is people who kill'. Whereas values issues in the process of technology are overlooked.

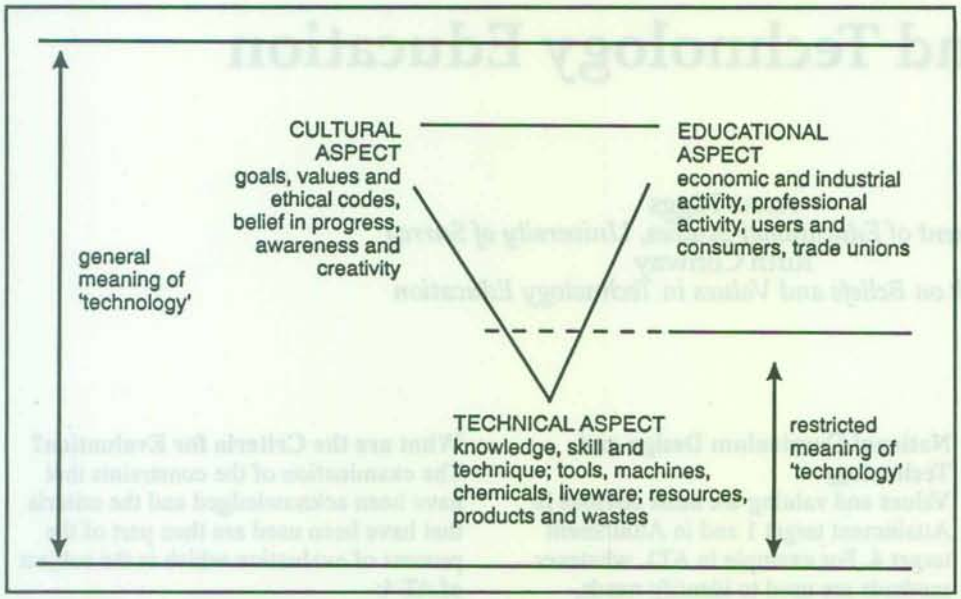

Figure 1: Diagrammatic definitions of 'technology' and 'technology practice'.[11]

> Only the discussion of ends is commonly regarded as ethically relevant, and if ethically relevant decisions have been made, the remaining problems seem to be only technological problems.[8]

The implication is that technological problems involving judgements about design and process are value-free. But 'present day environmental concerns such as the greenhouse effect, oil pollution and the destruction of the ozone layer, are due to the inappropriateness of the methods used to answer perceived needs. The discussion of the appropriateness of the methods used is one of the main sources of controversy in the area of biotechnology. Few individuals disagree with treating Parkinson's disease or infertility but many disagree with the use of human embryos to do this.'[9]

Pacey discusses the snowmobile, a type of motorised toboggan used for leisure purposes in ski resorts but also used as a working machine by eskimos.

> Whether used for reindeer herding or for recreation, for ecologically destructive sport or to earn a basic living, it is the same machine.[10]

Although the basic machine may be culturally neutral, the web of human activities and the image presented by the machine are not. The streamlining, flashy decoration on the machine and the way it is advertised i.e. using fit, handsome young men, contrasts with the Eskimo in the Arctic experiencing mechanical failure and fuel problems in the extreme cold. The design and the materials used are clearly culturally influenced.

The knowledge, principles of engineering and the techniques, for example the skills used to produce the machines, are likely to be the same across the world and therefore these may be said to be value free. It is the total practice of technology incorporating the knowledge and skills, which is not. Practice includes organisation — planning, management and administration. Practice is influenced by personal and individual experiences.

Pacey argues for a comprehensive technology practice as illustrated in the diagram above.

The corollary for technology education is that it should include training in the art of listening; in social and cultural sensitivity; in how to handle the calculations of risk; in readiness to take into account user experience and examine the underside of economic progress; in skills of projection and future planning that incorporate the choices available (and do not assume a deterministic model.)

Developing Awareness of Values

Defining what we mean by values and valuing is as problematic as defining technology. A value can be said to be that which is held by an individual to which one has a pro-attitude. Values are one's principles or standards. They are all pervasive for they are the person's judgement of what is important and of worth in life. Values come into play in the act of making a choice within a given context and, when faced with a conflict of values, criteria of relevance have to be used. There is a need to:

> justify proposed courses of action by reference to principles and values and that these principles and values themselves (have) to be justified in accordance with the hierarchy of preferences in the structure of our values systems.[12]

In sociological terms, values are ideals, codes, customs or institutions for which people of the group have an affective regard. In psychological terms values are the attitudes and norms which an individual prizes.

Conventionally 'facts' are contrasted with 'values', sometimes values are seen as opposite to 'knowledge' or 'science'. However the proper contrast is with 'other values'. People refer to values when making decisions yet often they are non-coherent, implicit and inconsistent. Thus although recourse to values in decision making may be done consciously, most frequently it is done subconsciously, without reflection or acknowledgement.

> People are so used to their values that they just accept them without questioning.[13]

Any education should involve critical reflection and evaluation. This involves not just cognitive and physical skills, but should include those aspects of experience that take feeling, believing and trusting seriously. This is especially true when reflecting on the roots of value judgements.

Beliefs

People are guided and behave according to their beliefs. Beliefs need to be understood by reason but are not the conclusions of rational thinking. Beliefs are ways of interpreting and explaining the world.

> Beliefs are underlying convictions which determine what is valued about the nature of existence, reality, other human beings and the world. Beliefs are expressed in most religious traditions and identified ideologies but they tend to be the hidden assumptions behind values statements which are not openly expressed. Belief is not purely rational or it would not be belief, but neither is it irrational to the point of denying human reason.

> Beliefs can be understood by reason but extend beyond the boundaries of human rationality.[14]

With such an eclectic explanation of beliefs there is no problem in saying that values are closely associated with what people believe and how they see the world.

> Values are grounded, even though at a completely unconscious level, to beliefs widely held in a community. Beliefs are seen as creeds/ideologies but they are really underlying assumptions by which people live. Beliefs are '*conditioned*' into people. Most of us are in orbit around assumptions and beliefs. People need to be educated re assumptions and attitudes. Just stating them is not enough.[15]

Faith

Faith is akin to belief. Intuitive knowledge or experience are acts of faith. Intuition means knowing without being able to say why one knows: It is akin to 'having a hunch', to jumping at a solution to a problem without consciously having worked out the solution. Faith involves venture; it involves acting on intuition or experience. It involves practical testing.

It can also mean giving absolute value to someone, something or an idea. For example a person may give absolute value to the possession of money. Such a person regards money as his or her principal weapon against everything that threatens them as a person. The person trusts in, and relies on money in order to feel secure. Having faith in something or someone has direct consequences for the values held. Putting one's trust in money may lead to ruthlessness and acquisition of wealth regardless of the consequences for others.

The Challenge

The aim is then to be explicit about the values involved at all levels of technology and to justify these. For many reasons this is an immense and difficult task but it is one which is far too important to ignore. A major problem is the realisation that most people are making decisions based on unsubstantiated assumptions and unquestioned beliefs. Behavioural attitudes may be an indication of values held but even they can be misleading. How can we encourage each other and pupils to be explicit about values positions?

We are challenged to identify and justify, to be 'up front' about the collective values guiding technological development in society and within technology education, and those which guide technologists — including the budding technologists in our schools.

To do this teachers need to be aware of political, economic and social structures and to be able to ask questions such as: Who establishes priorities for research and development? How participatory and accountable are such bodies? How can we account for the division of labour on gender, class and ethnic lines? What are the power and decision-making structures?[16]

The picture of science and technology as a mainly male, white middle class occupation is gaining credibility. If this view can be justified, what are the consequences for technological development and for technology education? What are the values being transmitted as pupils become immersed in technology projects? How can they be helped to reflect on the value judgements made about needs and opportunities, constraints and criteria?

Is there a need for a Special Interest Group in DATA on Values and Technology Education?

Justification for such a group centres around research and mutual support. Research is needed at many levels. We need to address the philosophy and values of the technological curriculum. We need to find out if and how pupils are being encouraged to explore valuing in technology. How do teachers see their responsibility in this area? Do teachers feel competent to deal with values issues? More specifically which values most frequently impinge on decision making? What criteria are being used in prioritising, in evaluating and in making judgements? How are value conflicts, involving processes, individuals, groups and communities being resolved? Are some values being emphasised while others are not considered?

A 'Values' interest group within DATA could be a forum for sharing ideas and experience. What models and approaches have been tried and evaluated? How can collaboration between colleagues from different subject areas be encouraged? How can the experience and expertise from a variety of curricular areas be pooled?

The interest group could also co-ordinate information about resources, perhaps manage a data base of such resources. It could act as a linking system for teachers. It could follow up on the offer made by James Pitt in his article (page 34 of this journal) to act as a 'clearinghouse' for socially orientated projects.

Some of us who are involved in an informal network: 'Beliefs and Values in Technology Education' would be prepared to co-ordinate such an exchange on research and project information, which we would hope to summarise in a poster and a seminar at next years DATER conference. With this in mind we would welcome comments and suggestions.

References

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