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Design and technology and the five ‘essential learnings’ of a new curriculum framework

Steve Keirl

University of South Australia, Australia

Abstract

This paper reports on the requirement to revise and refine a technology education curriculum, as a part of a total curriculum review for the Birth to Year 12 age range, with a specific brief to incorporate five (cross-curricular) ‘essential learnings’ – communication, futures, identity, interdependence and thinking. It provides analysis and explanation of each of the ‘learnings’ as they were envisaged in the curriculum brief and how they drew upon constructivist learning theory. It then describes their shaping as they emerged as dimensions of a new design and technology curriculum.

What is reported here seeks to demonstrate the way in which a new design and technology model, with its three strands of critiquing, designing and making, should not only build on established good practice within the field but should also be able to play a central role as one aspect of total curriculum renewal. It is argued that design and technology education ought to be strong and articulate not only for its own intrinsic purposes but also because it can be one pillar of a quality democratic curriculum development.

Keywords: curriculum design, constructivism, essential learnings, technological literacy

Introduction

The South Australian Curriculum Standards and Accountability (SACSA) Framework (DETE, 2001, a and b) has been developed in a period of less than two years and will be fully implemented by the end of 2001. The curriculum offers a *framework* for carers (those working in childcare centres), teachers and educators (‘teacher’ is eschewed in the early childhood sector) to use in their professional work. It is not intended as a document of prescription.

Broad description of the processes undertaken and of the issues faced for the design and technology curriculum were presented to conference as ‘work in progress’ a year ago (Keirl, 2000). The majority of the decisions made at that time still stand. This paper expands on the educationally powerful ‘essential learnings’.

The SACSA framework in outline

‘Development of the SACSA as a single, coherent, birth to Year 12 (age 17/18) framework has been the largest curriculum development activity ever undertaken in this state.’ (DETE, 2001c)

These years are grouped into four bands: the early, primary, middle and senior years. Across the bands run learning areas through which ‘...learners are introduced to bodies of knowledge established by communities of scholars’ (DETE, 2001b: General Introduction: 25). There are three Learning Areas (the psychosocial self; the physical self; and, the thinking and communication self) for children from birth to age 3; seven (one of which is design and technology) for the 3–5 age range; and, eight (one of which, also, is design and technology) for students from reception (age 5) to Year 12 (R–12).

Whilst ‘experts groups’ and writing teams focused on revision and refinement of the learning areas they were also to adopt several key foci:

- on learning through essential learnings (based on constructivism)
- on coherence (holistic development of learners over the years) in the framework
- on enterprise and vocational education (EVE) articulating seven key competencies (KCs)
- on equity (comprising several cross-curriculum perspectives)

- on high expectations for learners using standards.

The R–12 Learning Areas are structured and organised through Strands, the fundamental concepts for which are expressed as Key Ideas. From these the Standards (against which performance is assessed) are developed, each with associated Examples of Evidence.

The philosophy of SACSA is summarised:

It is intended that (SACSA) be used to generate a comprehensive and purposeful curriculum for all children and students to become citizens and life-long learners who:

- are ethically and socially responsible members of society and have a strong sense of their own personal and group identity and respect for those of others
- think and take responsibility for decisions, make connections, generate ideas and innovatively solve problems
- build respectful interpersonal relationships and play an active role in their local and global communities
- contribute to and shape possible futures, while respecting heritage
- are good communicators who use the power and potential of literacy, numeracy and information and communications technologies. (DETE, 2001b:General Introduction: 32)

The essential learnings (ELs)

SACSA takes constructivism as its theoretical basis for the conception of learning:

...the learner is active in the process of taking in information and building knowledge and understanding; in other words, of constructing their own learning. Learning then is the active process of engaging in experience and its internalisation in terms of thinking. All forms of experience can be called upon here... (DETE, 2001b: General Introduction: 10–11)

In answering the question ‘What knowledge, skills and dispositions should children and students develop within a constructivist framework?’ the SACSA document advances the EL’s – understandings, capabilities and dispositions that are personal qualities which ‘...form an integral part of children’s and students’ learning from birth to Year 12 and beyond’ (DETE, 2001a: General Introduction) and which enable people to

engage productively with changing times as thoughtful, active, responsive and committed local, national and global citizens.

The EL’s are not bodies of knowledge. Five have been identified and they foster the capabilities to:

- develop the flexibility to respond to change, recognise connections with the past and conceive solutions for preferred futures (Futures)
- develop a positive sense of self and group, accept individual and group responsibilities and respect individual and group differences (Identity)
- work in harmony with others and for common purposes, within and across cultures (Interdependence)
- be independent and critical thinkers, with the ability to appraise information, make decisions, be innovative and devise creative solutions (Thinking)
- communicate powerfully (Communication).

The EL’s (Table 1 – see overleaf) interweave all aspects of SACSA from Birth through to Year 12 at which point Standards are determined by both the EL’s and the anticipated outcomes of external curriculum sources (e.g. the Senior Secondary Assessment Board of South Australia [SSABSA, in refs.] and EVE).

Design and technology in SACSA

‘Technology’ was consolidated across Australia as one of eight learning areas with the publication of a series of statements and profiles. Those for technology education (AEC, 1994a and b) were the subject of revision and refinement in the SACSA process.

The reshaping of the learning area was conducted by the Technology Experts Working Group (TEWG). This group comprised representatives of seven professional associations, employer groups, universities, and all levels of schooling.

The learning area has been renamed ‘design and technology’ and, while much of the spirit and good practice embodied in the statement and profile have been retained, the new structure is built around three strands expressed as verbs – critiquing, designing and making (CDM). What has been dropped includes three strands whose names are nouns – information, materials and systems.

Table 1: Overview of the essential learnings.

<i>Essential Learning</i>	<i>Aspects of Essential Learnings</i>
<i>Futures</i>	
<p>What knowledge, skills and dispositions are required to maximise opportunities in creating preferred futures? Learners develop:</p> <ul style="list-style-type: none"> ■ a sense of optimism about their ability to actively contribute to shaping preferred futures ■ capabilities to critically reflect on, plan and take action to shape preferred futures. 	<p>This includes:</p> <ul style="list-style-type: none"> ■ understanding patterns and connections within systems ■ understanding world views when analysing future challenges ■ building scenarios of preferred futures ■ demonstrating lifelong learning.
<i>Identity</i>	
<p>What knowledge, skills and dispositions are required to critically understand self-identity, group-identity and relationships? Learners develop:</p> <ul style="list-style-type: none"> ■ a sense of personal and group identity ■ capabilities to contribute to, critically reflect on, plan and take action to shape relationships. 	<p>This includes:</p> <ul style="list-style-type: none"> ■ understanding self, groups and others ■ understanding the social construction of identities ■ relating effectively to and collaborating with others regardless of their identities.
<i>Interdependence</i>	
<p>What knowledge, skills and dispositions are required to critically understand the systems to which lives are connected and to participate positively in shaping them? Learners develop:</p> <ul style="list-style-type: none"> ■ a sense of being connected with their worlds ■ capabilities to contribute to, critically reflect on, plan and take action to shape local and global communities. 	<p>This includes:</p> <ul style="list-style-type: none"> ■ understanding cultural and global connections, patterns and evolutions ■ understanding what is needed for sustainable social and physical environments ■ acting cooperatively to achieve agreed outcomes ■ taking civic action to benefit community.
<i>Thinking</i>	
<p>What knowledge, skills and dispositions are required to develop particular habits of mind, to create and innovate, and to generate solutions? Learners develop:</p> <ul style="list-style-type: none"> ■ a sense of the power of creativity, wisdom and enterprise ■ capabilities to critically evaluate, plan and generate ideas and solutions. 	<p>This includes:</p> <ul style="list-style-type: none"> ■ using a wide range of thinking modes ■ drawing on thinking from a range of times and cultures ■ demonstrating enterprising attributes ■ initiating enterprising and creative solutions for contemporary issues.
<i>Communication</i>	
<p>What knowledge, skills and dispositions are required to construct and deconstruct meaning, and to critically understand the power of communication and its technologies? Learners develop:</p> <ul style="list-style-type: none"> ■ a sense of the power and potential of literacy, numeracy and information and communication technology (ICT) ■ capabilities to critically reflect on and shape the present and future through powerful uses of literacy, numeracy and (ICT). 	<p>This includes:</p> <ul style="list-style-type: none"> ■ understanding the complexity and power of language and data and their pivotal role in communication ■ understanding how communication works ■ making effective use of language, mathematical and information and communication technology tools ■ using communication in a range of modes to achieve identified outcomes.

‘Design and technology’ has been a learning area from age 3 in South Australian curriculum since 1995 (DECS, 1995) and this status continues. Its reconceptualisation is grounded in a 3-D understanding of technological literacy as an underpinning rationale for the new curriculum. This significant development attempts to construct design and technology education holistically while also matching SACSA’s overall design requirements (the key foci, above). Any narrow or instrumental construct would have negated the capability of the field to contribute effectively to the total curriculum – to the general education of all students.

Design and technology and the essential learnings

It was clear from the outset of the SACSA development process – to both the TEWG and the appointed writers – that there was affinity amongst the general spirit of SACSA, the essential learnings and design and technology. This is not to say that there was universal harmony throughout the process. Many matters were only resolved after rigorous debate.

So far as ICT was concerned, there were issues, many minor, and one major, to be resolved. There were the general terminology misunderstandings – all too familiar to those in the design and technology field – the sliding around amongst technology, learning technology, information and communications technology, computers, computer literacy, information literacy and technological literacy. However, as reported (Keirl, 2000), midway through the design process a fourth strand, ‘ICT literacy’ was destined to be added to design and technology. This was not the final outcome and the learning area has emerged with only the CDM strands. ICT literacy is now embedded across the curriculum and through the communication essential learning.

What were the relationships between the thinking behind the design and technology curriculum and that of the essential learnings? Remembering that the two developed alongside each other, another question concerns how they were interwoven – rather than imposed or ‘added on’ as can happen in tokenistic curriculum constructions.

Futures

There was a ready and strong correlation between design and technology and futures. Best practice

already embodied futures perspectives – particularly in the primary sectors where some schools are leading futures education. Design, by its very nature, is a matter of change from present to future – the changing of one set of circumstances into another. Whilst this is a given with which design and technology educators are familiar, there is a key requirement of the essential learning that optimism be a part of futures. It is altogether a different matter to develop in students ‘a sense of optimism’ to achieve ‘preferred futures’. However, it is believed that a good design and technology education shows students that technologies don’t just happen but are the results of the values, intentions and designs of people. In such a way they, too, can have their values and intentions turned into preferred futures.

A key ethical question can be asked: ‘How should the future be?’ and its answer could be based on analysis, drawn from past and current knowledge of the negative capabilities of technologies, of future scenarios which are ethically defensible and which would be democratic.

Identity

Identity is shaped by many factors – for example, by relationships with others, by culture and by location – and the same can be said of the designed and made world. It is difficult to deny that we are who we are by virtue of the very technologies we live with and use. Indeed, it can be argued that we, and our behaviours, are shaped by technologies.

Learning about identity can be shaped through all the strands of this design and technology curriculum – alone and in teams. The challenges of making, the development of technique, the advocacy and defence of designs, and the engagement with criticism are all powerful shapers of identity.

A major single difference between older-style pedagogies of ‘technical’ education and current design-based ones is that the shift has been from the teacher at centre to the learner at centre. Such positioning of the students as the ‘owner’ of their design has significant bearing on the shaping of identity. In turn, the identity of the student (their values, cultural background, community) can be influential in design development. This is a rather different case from that where the student was mere follower of the teacher.

Interdependence

A fundamental of our lives is our interconnectedness not only with each other but also with, and through, the designed and made world. Given the capacity of technologies to shape our identities, it is also the case that they can bring us together as well as divide us. Communities are shaped by interdependence and these can be reshaped and reformed through technologies. The phone or the Internet in one sense brings us together, in another they keep us apart. Similarly, transport systems can have the same effect. Further, amongst nations there are vast differences in technological provision – ranging from super-abundance to life-taking scarcity. A ‘critical’ design and technology education serves to help students learn the advantages and disadvantages of technologies and to balance issues in the common good.

Thinking

We have known for a long time that design and technology education is a powerful education because of its demands for multiple thinking styles. We also know that such an education has the capacity to take as starting points the preferred thinking strengths of students and to lead them into new realms of thought. The field is often described in terms of ‘problem solving’ and considerable research has been devoted to this. However, it is the case that imagination, reflection, analysis, synthesis, intuition, creativity, critiquing and many other thinking ‘genres’ all have their roles in design and technological activity too. Indeed, when it comes to matters of aesthetics, ethics, and existence there is room for rich philosophical thought which, in turn, serves in developing complex arguments to critique, defend and advocate technologies.

Communication

Finally, design and technology offers much towards students’ learning *about* communication and, especially, communication as empowerment. Being able to question and challenge the ideas and positions of both oneself and others is a fundamental of rich literacies. At an instrumental level we may communicate by drawing a plan or sending an e-mail. This is not enough. It is important that students learn to be articulate, critical and capable of communicating sophisticated arguments. All of these traits are engendered through the critiquing and designing strands wherein the student must not just say that some-

thing is a success ‘because it works’ but can engage fruitfully with others in sharing criticism and arguing a case for design solutions. This then transfers into the complex world around and awaiting them, where the need to interrogate new technologies and designs was never more important.

Example drawn from curriculum design...

Space does not allow for elaborate portrayal of the interweaving, in design and technology, of the many elements, including ELs, of SACSA. A single example, drawn from the critiquing strand at Year 8, gives the ‘feel’ of how two ELs are developed through one key idea (of which there are only 24 for the whole of design and technology). Given the outlines of the ELs (presented above) it is possible to see how interdependence and communication are developed *integrally* to design and technology thinking. As can be seen, other ELs are delivered too. From the key idea follows the standard and the examples of evidence. Thus:

Strand: critiquing

Key idea: Students analyse and explain the design decisions and thinking implicit in products, processes and systems made by themselves and others. They develop an initial understanding of the contestable nature of the designed and made world. **In T** KC1 KC2 (Interdependence/Thinking/KCs1&2)

Standard 4, towards the end of Year 8, the student:

Explains the decisions and choices made in designed and manufactured products, processes and systems and identifies alternative possibilities. **In T** (KCs2&6)

Examples of evidence (these ought to be taken collectively) include that the student:

- explains why there are architectural and furnishing differences between designs for particular buildings, and proposes new designs which respect the interests and needs of the users. **In T C** (KCs2,3&6)
- explains why there are many varieties of the same kind of product (e.g. milk-based products, kitchen devices, cameras, clothing items). They find ways of discriminating amongst them, and suggest reductions or refinements of the market. **In T C** (KCs2&6)
- explains the design factors behind a range of rainwear (clothing or equipment), assesses

each on its respective merits, and lists key desirable attributes as a basis of production specification. **In T C** (KCs1&2)

- explains the functions of, and relationships between, the parts of different electronic or mechanical products and systems. They speculate on alternative scenarios (e.g. adaptations of current designs, life without such a product or system). **F In C** (KCs2&6)

Conclusion

Given that those charged with redesigning the design and technology curriculum were to contribute to students' education for democratic citizenship, it can be seen that the design and technology interpretations of the ELs have been rich ones. This could not have happened without a rich basis for the curriculum development – the three-dimensional construct of technological literacy and the CDM strands. These are what give design and technology students considerable ownership of their learning.

However, presenting the curriculum is but one step. It cannot be denied that there are issues that affect implementation and some are not insignificant. The framework is potentially empowering for the design and technology profession to further improve status and deepen relevance and appropriateness for all students. The SACSA document comments that this revision:

...signals the start of a new round of exciting curriculum debate and action, which will benefit learners and is the lifeblood of a dynamic educational system and a healthy democracy. (DETE, 2001b: General Introduction: 33)

It is no less the case for design and technology within this curriculum. SACSA and all students are well served by design and technology that is constructed as dynamic, holistic and critical. Similarly design and technology has much to gain from a role as central curriculum pillar rather than being the garden workshop in the curriculum estate.

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