Implementing technology curricula in New Zealand

Martin Ball

Abstract

The preparation and writing of curriculum documents is one of the many endeavours of the Ministry of Education (MOE). This paper takes a teacher's personal view of whether, and to what degree, a mismatch exists between curriculum documents and school practice. The technology education documents particularly referred to here are: Technology in the New Zealand curriculum (MOE, 1995), its antecedents, under titles such as Workshop Craft (Department of Education, 1986), and the current draft NZ curriculum (MOE, 2006).

Introduction

Mawson (1998) suggests that there is a current mismatch or lack of acceptance of the curriculum which can be traced back many decades through repeated attempts at a "centre-out" model of curriculum development in which the Ministry decides the new direction to be imposed on practitioners. This is particularly relevant at this time because of attempts to consult widely and in depth with the profession and other stakeholders about *The New Zealand Curriculum- Draft for Consultation* 2006 (MOE, 2006). This paper seeks to demonstrate that, in contrast to Ministry attempts at great leaps forward, incremental change is a better description of what is happening in schools. This paper will relate features of evolving technology education curricula to first-hand experiences from a NZ intermediate example-school (SchoolX). In comparing curriculum documents with school practice (see Table 1) we may compare two different viewpoints: the former which seeks to frame an idealised model and the latter which constructs meaning, within time-constraints, from available resources.

Education Subculture

In their literature review of Technology education, McLaren and Dakers (2006) state in their introduction that

> Words and phrases such as creativity, design centred approaches, higher order thinking, environmental awareness and sustainability, enterprise, ethical values,

> etc. have not been translated into the core of the pedagogy common place in implementation. Many countries continue to report of the difficulties of managing the required paradigm shift in overall value and purpose that the new curricula strive for and implementing the associated pedagogical changes that are required to facilitate this (p.1).

This paper will examine some of the possible reasons for these 'difficulties' by comparing the behaviour of two different groups of people; those who write curriculum documents and those who must read and implement them.

The 'issues' of technology education are not the same for each sector of the education service (primary teachers and secondary teachers). Petrina (2003) commented on C. P. Snow's "two cultures" by concluding that "there are two cultures, but they only exist in education." Using his own specialism, computer-aided-design (CAD) as an example, while referring to the placing of technology in a socio-political context. These disparate cultures are evident in New Zealand among the secondary sector staff who often have had a 'technical' education, yet have been told to implement a socially contextualised curriculum, while in the primary sector, classroom teachers have been asked to incorporate a new document in what they see as overcrowded timetables. Technology exemplars (MOE, 2004) to assist with teaching and assessment were published in 2004, just in time for the *next* curriculum draft (MOE, 2005) published only months later. (see Table 1). The 'issues' in intermediate schools are further confused by their unique position in New Zealand, straddling the primary-secondary interface. They are also subject to the expectations of client primary schools which send students to them for their technology education.

There may indeed be two cultures operating among their generalist and specialist staff. So we should not be surprised that a micro-divergence could be expected especially in the sub-culture of intermediate schools.

Table 1: Comparison between Ministry directions and those of SchoolX

YEAR	IMPLEMENTING TECHNOLOGY IN NZ -MOE	ACTIVITIES AT SCHOOLX RELATING TO TECHNOLOGY
1986	*Forms 1-4 Workshop Craft Syllabus for Schools* (1986)	SCHOOLX…roll was330...currently 250 Material fees are differentiated for each specialist subject
1990	*Workshop craft curriculum* document	4 specialist "trade" staff currently employed
1992	The Earth Summit advocates Environmental Education for all	SchoolX continues to service other school's year 7 & 8 workshop craft
1993	*The New Zealand Curriculum Framework* released Technology curriculum statement first circulated in draft	
1995	Technology curriculum document published and gazetted for introduction for the 1999 school year.	School X deciding which machines to sell
1997	MOE funds a range of professional development contracts during 1997 and 1998.	One trade-qualified teacher in sole charge of Technology Wall demolished between workshops
1998	ERO's 1998 report on readiness to deliver the technology curriculum	School discusses integration Discontinuance of servicing other schools with workshop craft.
1999	1st yr of full implementation for *Technology in the New Zealand Curriculum*. A few contracts for professional development in the technology curriculum undertaken in 1999.	Planning on the 2yr cycle 6 out of 7 technological areas covered Project each pupil takes home is a paper-towel-holder. Budgets: Art;$1500, Tec;$3500 (divided into 3 separate sums by trade) Employment of a non-trade, primary-qualified teacher in technology Activity fee covers all specialisms but more goes to ICT
2000	ERO reports on 397 accountability reviews [23 intermediate]...completed during the period from September 1999 to June 2000 (Education Review Office, 2006).	
2001		Removal of sewing prefab. Sewing-machines kept and serviced Start building performing arts centre Remodel adjacent foods/kitchen space
2002		Pupils make inclinometers (for maths) as technology project Continue to sell equipment. CREST scheme attempted
2003		$3500 investment in lego robotics Royal Society teacher-fellowship; technology reliever a generalist primary teacher "Authentic Task" methodology adopted school wide (like New Basics/Rich Tasks) "Foods" taken by class-teachers. Sewing machines unused
2004	*Technology Curriculum Exemplars* published [relating to the 1995 document]	
2005	*Technology essence statement* working paper and draft of next Technology curriculum for 2008	Budgets: Art $3500, Technology $1500 (one all-in sum)
2006	*The NZ Curriculum -Draft for consultation* published and sent to all schools	Mobile bridge finished, following whole-school design project

The Family of Curricula

At times there seems little reasoning behind what knowledge is important enough to constitute a subject (learning area) and what can be integrated across other learning areas. It appears that if a body of knowledge is seen to be important, a learning area is able to be created to ensure it is taught. This process is random with some bodies of knowledge forming new learning areas and others becoming guidelines to help teachers integrate the knowledge into an already crowded curriculum.

Guidelines for Environmental Education (MOE, 1999) is a document similar to the seven curriculum documents. Its authors thought fit to publish it as an invitation towards integrated or trans-disciplinary studies. It would be hard to argue that Technology was more, or less, important than Environment Education, in a school context. It could even be said that they are two sides of the same coin: the material world; natural and artificial. Historically, Technology, and its antecedents, has been taught by specialists who formed an identifiable proportion of the teaching population whereas no such body of Environmental specialists already existed when the Environmental document was written. It is reasonable to draw a conclusion that, worthy though both these subjects are, their place in curriculum documents has been determined more by employment and staffing issues than by educational theory. At the operational level, we see many schools still timetabling such subjects as techni-craft, hard materials and soft materials (yet these subjects do not exist within the technology curriculum). Again we might suspect that the reluctance to discontinue old titles may be influenced by staffing and resources rather than the theoretical taxonomy of the curriculum.

Yet in the 2006 draft NZ curriculum (MOE, 2006) we see Languages being allocated a separate 8th learning area, as if to confirm a belief in categorisation as the only effective way for the Ministry to instruct practitioners and to confer status. In contrast, Environmental Studies was not given a ninth document perhaps only because the authors begged for it *not* to be dealt with in that way, even though it is a body of knowledge, skill or competency as easily identifiable as Technology, Languages or The Arts. Support for this view might be seen in the following alternative example from Scotland's curriculum document for 5 –14 year olds:

> Technology education is addressed as a strand within the 'Environmental Studies: 5-14 National Guidelines' (Learning and Teaching Scotland, 2000) in which the spirit of publication 'Technology Education in Scottish Schools: A Statement of Position' (SCCC, 1996) is firmly embedded. The central theme in technology education is that all pupils will be afforded the opportunity to acquire a broad-based 'technological capability' through an extensive and diverse range of activities and experiences. Technology education is a distinct form of creative activity in which human beings interact with their environment - be it natural or built - in order to bring about change (Scottish Executive Education Department- SEED, 2006).

The coining of the term Technology for the NZ curriculum supports a perception that there exist identifiable clusters of human thought and activity on either side of the boundary between the artificial and the natural. Beyond the natural is the imagined (Compton & Jones, 2004) and we might refer to these respectively as; 'technology', 'the environment' and 'the arts'. This would be a tenable argument for these categories if, in practice, those writing the MOE document for the 'natural-environmental' world had lobbied for a similar treatment instead of opting for a cross-disciplinary approach; precisely the opposite position to those who wrote the Technology document. However, in the new curriculum (MOE, 2006) reference to the natural environment occurs at least once on the following pages under "learning area" headings of: Values (p. 10), Arts (p. 14), Health (p. 16 & 17), Mathematics (p. 19), Science (p. 20), Social Science (p. 22) and Technology (p. 23). The term is also used throughout the document, to refer to artificial environments. So it is possible to see how the term 'environmental studies' could have been used as a major division of the curriculum encompassing the study of artificial and natural environments, but the traditional titles were retained.

The Secretary of Education wrote that "the extent to which environmental education is incorporated within the curriculum will continue to be determined by the board of trustees of each school" (Fancy, 1999, p. 5). We might ask whether this decision was made by careful taxonomic reasoning or whether it was because technology was specifically serviced by a large group of teachers with specific job descriptions whereas the curriculum topic 'the environment' was serviced by none. It might be seen that the sub-classification of the curriculum is based more on historical work patterns in the profession than theoretical analysis such as that referred to by researchers Compton and Jones (2004). Having said this, it is difficult to tell whether

there is actually any difference between what is happening to pupils in classrooms in Scotland, where Technology is a subject *within* Environmental Studies, or in NZ where the environment is a boundary on the edge of Technology. Do the names really change the learning? Could it not be argued that Technology is just as all-pervasive as The Environment and similarly could be spread throughout the tissue of all curricula?

An internet search shows that many primary schools still use the term "techni-craft" for the activity provided offsite to year 7 and 8 students and that the term is still widely used. The term is used on the ERO website (Education Review Office, 2000). An ERO report on a school in 2005 includes that term to name an off-site Technology education centre, and the activities described seem unchanged from the pre 1995 curriculum. We may ask whether it is just shorthand or whether the actual service has remained unchanged.

Under a model characterised by Mawson (1999) as 'enterprise culture' the nation is no longer perceived to need trades but creative thinkers who are 'technologically 'literate' (p. 45). A conceptual leap is made from this stated necessity to the compelling of primary pupils to undergo a curriculum called Technology. Did its authors really mean innovation? It could be that the kind of creativity and ability to move 'from thought to thing' might be taught better through the performing arts than through a named Technology curriculum. Here we stumble again over the administrator-behaviour of pre-packaging the whole curriculum into categories used in the 'adult world' and assuming that these titles have the same function and meaning for eight year olds. Beyond this is also the assumption that, even in the adult world, people create innovation exclusively within these categories. The success of Weta Workshop (2006) in special-effects movies is an exemplar of a *lack* of differentiation between Technology and the Arts and any other academic category, such as English, for that matter. Yet there are still questions raised about which document should include such media. Media Studies is included as a small facet of the English document. Will this provide the linkage with the teachers most likely to promote progress in such a multifaceted and physical domain?

Time and other Resources

Another example of classification as an administrator-response to default can be seen in the shifting of Dance from PE to The Arts, the revival of Home Economics within Health and Physical Education (previously in the technology education domain) and the naming of Statistics as something separate from Mathematics but still in the same document. This behaviour is an enduring and consistent response by curriculum authors as an attempt to change practitioner behaviour; i.e. if something is not being covered then it must have been mis-filed, hence, if it is re-filed under another category then the practitioners will respond. The urge to reclassify seems almost obsessive. It seems to be a compulsive response to the latest perceived failures of any contemporary curriculum.

The current seven curriculum documents do not specify how much time each is supposed to take to deliver. This is in contrast to some other governments which recommend a proportionality between subjects. For example, Norway (Ministry of Education, Research and Church Affairs) (see Table 2) and Iceland (Ministry of Education, Science and Culture 2002)(see Table 3) both lay down time-units (percentages, hours, periods) to be spent on each major division of the curriculum.

Table 2 Time allocation (45 minute periods) in Norway to curriculum subject (Ministry of Education, Research and Church Affairs, 2006)

Subject	Stage 1-4 Lower primary	Stage 5-7 Upper primary	Stage 8-10 Lower secondary	Total
Christian knowledge and religious and ethical education	266	266	247	779
Norwegian	912	589	532	2033
Mathematics	532	437	418	1387
Social studies	190	285	380	855
Art and crafts	228	380	228	836
Science and the environment	152	247	342	741
English	95	266	342	703

Music	152	228	114	494
Home economics	38	114	114	266
Physical education	228	266	304	798
Compulsory additional subjects			304	304
Class and pupil council activities			95	95
Free activities	247			247
Periods per year	3,040	3,078	3420	9,538
School and pupils' options	152	114	152	418
Finnish/Saami as a second language				1111

Table 3 Time spent on each compulsory subject in Iceland (Ministry of Education, Science and Culture, 2002)

Time spent on Iceland's curriculum document.	
%	**Compulsory subjects**
19	Icelandic
17	Mathematics
9	Natural sciences
10	Social and religious studies
10	Physical education
11	Arts and crafts
11	Modern languages
4	Home economics
6	ICT
2	Life skills

In NZ that decision of proportionality of time is left to the Principal and Board of Trustees of each school. The NZ Ministry does not seek to use such proportionality as an administrative tool but, rather, specifies only the learning, which in turn is supposed to affect teacher-behaviour. Thus it is possible under the NZ system of curriculum implementation to specify curricula ambitions unrelated to that most basic

school resource; time. Ignoring Environmental Education, each of the current 8 learning areas can, theoretically, specify an unlimited range and depth of skills, competencies, knowledge attitudes and values. This flows from the position that this method of curriculum design requires only the categorizing of knowledge but not the limitation thereof. So, like the water rights granted from, the Waitaki River (New Zealand Government, 2006) it is possible to grant more output-water than there is input-water, or in the case of curriculum implementation, more teaching to be done than there is time to do it. Inevitably someone is short-changed and that decision rests on the local power relationships within a school. The Arts curriculum gives an example of the concern this can cause (Van Aalst & Daly, 2004).

> Other key concerns that were also raised related to time requirements to implement the new curriculum (in particular from primary schools) and issues relating to timetabling. Most of these concerns were about "not having enough time" to train, develop, deliver, and assess in other curricula areas let alone the arts curriculum.

Or at this statement from the Curriculum Stocktake;

> Primary teachers were more concerned with the `overcrowding' of the curriculum, whereas the feeling that the technology curriculum had led to less coverage of the basic skills training concerned teachers at the intermediate and secondary levels (MOE, 2003).

In trying to fit practice to the curriculum document or ‘doing what we can with what we’ve got’, the teacher-in-charge of Technology education at SchoolX responded to the sandwiching of Textiles, Woodwork and Metalwork in the 1995 curriculum not only by integrating planning or activities but by literally demolishing the wall between the Metalwork and the Woodwork shops (see Table 1). This was not merely a symbolic gesture and went in parallel with a series of equipment sales including all the Metalwork benches and the removal from the school site of the prefabs, hitherto used for Textiles. This was followed in successive years by the conversion of the cooking room to be more compatible with hosting events in the adjacent new Performing Arts centre built on the site of the ‘Textiles’ prefab in collaboration with a local charity. The new directions suggested in the document left even the slimmed-down workshop partially redundant. It was, however, markedly relevant to the kind of ‘rough-making’ demanded by The Arts curriculum. Again we see the mismatch between the ‘categories of knowledge’ approach at the government level and the ‘resources’ approach within a school. This mismatch is also evident in the persistent

disconnection of the academic staff at all levels in the education system and we can see how a compounding effect can occur when the authors of the system are out of phase with *two different* groups of practitioners charged with its implementation.

When we look at the implementation of the technology education curriculum in the context of the whole NZ curriculum and in comparison with other jurisdictions, we can see administrators struggling with, or ignoring, the redundancy of the "subject" concept. This has given rise to movements such as The New Basics and Rich Tasks in Queensland (Department of Education, 2005), which attempt to educate pupils in the same way as they will operate later in life as adults; i.e. by bringing all their skills and knowledge and competence to bear at the same time. This used to be the philosophy of elite schools which were educating a ruling class but is now being embraced by mass-educators in response to their decreasing ability to predict future social, economic and industrial conditions. At SchoolX this approach also supports the investment in Lego/Mindstorms equipment (see Table 1) enabling 'Robotics' to be taught as a discipline with which to increase the failure/improvement rate well above that possible with one-off or from-scratch use of materials. Under the 1995 document this approach could be squeezed in under the 'control' aspect of the Electronics and Control area of the Technology Curriculum but under the 2006 draft it can be seen as a mainstream discipline comparable with previous technological areas.

Bosses or Clients

Some problems of implementation could be construed in terms of who a teacher perceives to be the client. At the operational level, material-fees are collected from parents who expect value for money and presume their child will make a high-quality product with the money they have given to the school. This adds to the pressure to ensure 'success' in technology education, which is at odds with the curriculum document in which risk-taking and hence a high failure rate is encouraged. Under pressure from colleagues and parents to ensure a completed item with limited materials, a workshop teacher might well ignore the 'risk-taking' tactics encouraged in the curriculum (MOE, 1995, p.8). This highlights the discrepant uses of the term "product" in the adult world of technological practice and the school world of

technology education where the 'product' is the student, not the coffee table, which the student has made.

> …the development of conceptual knowledge is hampered by pressure to design and make products and by a lack of activities specifically focussed on concepts in their contexts of use (McCormick, 1997, page 154, as cited in Reddy, Ankiewicz, Swardt, & Gross ,2003).

In parallel with the attached chronology (see Table 1), planning at SchoolX trended away from small, durable, 'take-home' products to curriculum-based tasks such as Robotics, or meeting other curricula needs such as mathematics equipment eg. inclinometer, or collective tasks such as a bridge over a stream for environmental studies, even though the parents are still paying an undifferentiated 'activities' fee. So here is a mismatch between curriculum design at the Ministry level and timetable design in a school. The latter takes account of such questions as: what is my place in the school day?

What is my relationship to the rest of the staff? What do my immediate clients expect? [colleagues, parents, children] rather than my distant client [the state]. What can we learn from the materials we can afford? What can we learn in the time available? It is not difficult to see how the status of curriculum authors could shrink, relative to more immediate bosses/clients. The fate of successive curricula documents seems to have been influenced by practitioners' perceptions of who they were working for.

At the operational level in schools, where curriculum implementation takes place, curriculum documents do not live in isolation. In the rhythm of the school day and week, any physical [i.e. non-written] task is seen as a 'leavening of the loaf' of school existence. It is difficult for a teacher to justify yet more paper-based learning [research, diagrams, flowcharts, presentations] when colleagues are literally begging that 'the pupils need a change of scene'.

Nuthall (2002), after decades of rigorous research into what actually happens in classrooms, wrote "there is still a long way to go to establish practical, generalisable, evidence-based, professional knowledge to replace the tacit beliefs about teaching and learning that currently limit teachers' ability to learn from experience" (p. 31). If the

researchers are not answering teachers' questions and the teachers are not using research, what hope is there of a simple curriculum document competing with the strong and immediate influences typical of school life. It is also possible that parents too, are less worried about the theoretical packaging of technology education and more concerned about how their children respond to it (Lee, 2003). In this model of proximal zones of influence, the Ministry is a distant and weak boss/client compared to more immediate agents.

Conclusion

Mawson (1998) wrote that "although the Ministry has funded a substantial number of professional development contracts over the last four years there does not appear to be the impact on classroom practice that one would expect" (p 46). "With regard to the development of technical/technology curricula in the twentieth century it would appear that the political agenda of the government of the time was the prime motivation behind all the changes in this [20th] century" (p. 38). He also states that the current rewrites and reviews of the Technology curriculum may, in spite of huge efforts at consultation, be going the same way; public indifference or incomprehension leaving the enterprise as the stranded creature of the current government. In this scenario, recent administrations have embraced the 'innovation' culture as a model of economic behaviour just as previous administrations embraced industrial or domestic skills.

Paradoxically, school staff at the operational level seem to have outpaced the Ministry's efforts to write a curriculum document which attempted to use classification as a means to ensure compliance. The Technology Essence Statement (MOE, 2005) explains the dropping of the prescriptive sub-titles or 'areas' within the Technology because:

> Classroom practice and research has clearly shown that learning in technology often goes across a number of technological areas and contexts and beyond those named (p. 2).

In other words, teachers have based their own decisions on local influences and, de-facto, this is now recognized. Indeed the 2006 draft states explicitly that;

> While the New Zealand Curriculum sets the national direction for learning…each school will design and implement its own curriculum… schools have considerable freedom in deciding exactly how to do this (p. 26).

It would be tempting to construe a disconnection between curricula documents and their implementation as a failure of those documents and their authors but that would ignore the relationships between practitioners and their perceived clients. In 1995 the 'syllabus' model was replaced by a national curriculum framework (MOE, 1993). This has led in turn to the current model of curriculum document which recognises that it is not possible to tie up the curriculum package so securely as to prevent deviation on the one hand, or ensure total inclusion on the other. The most recent draft curriculum (MOE, 2006) takes a further step back from the operational level as if recognising that the personal/professional relationships, or lack of them, between colleagues/parents may have an overriding influence on teachers' perceptions of how, and how much, a document should be obeyed.

REFERENCES

Compton, V., & Jones, A. (2004). *The Nature of Technology: Briefing Paper prepared for the New Zealand Ministry of Education Curriculum Project.* Retrieved 4 December, 2006 from http://www.tki.org.nz.ezproxy.auckland.ac.nz/r/nzcurriculum/docs/nature-techn.doc

Department of Education. (1986). *Forms 1-4 Workshop Craft. Syllabus for schools*. Wellington: Government printer.

Department of Education, Training and the Arts. The New Basics Project [Electronic Version]. Retrieved 23 November, 2006 from http://education.qld.gov.au/corporate/newbasics

Education Review Office. (2000). Technology in the New Zealand Curriculum: Its Implementation in [Electronic Version]. Retrieved 23 November, 2006 from http://www.ero.govt.nz/ero/publishing.nsf/Content/9E57CECC2BBFA502CC25704A001301BC?Open

Fancy, H. (1999). *Forward*. Retrieved 24 November, 2006. from http://www.tki.org.nz/r/environ_ed/guidelines/forword_e.php.

Lee, K. (2003). So what do parents want and expect from a Technology Education programme? -An exploration. *International Journal of Technology and Design Education, 13*(2), 105-115.

Mawson, B. (1998). Facing the challenge: Student teachers, secondary schools and technology. *SET Special, 5*, 1-4.

McLaren, S., & Dakers, J. A curriculum for excellence review of research literature. Design and technology education [Electronic Version], 1-14. Retrieved 23 November, 2006 from http://66.102.7.104/search?q=cache:iz-u-DwoWV0J:www.acurriculumforexcellencescotland.gov.uk/images/Technology_tcm4-252177.pdf+technology+education+%22A+curriculum+for+excellence+review%22&hl=en&gl=nz&ct=clnk&cd=1

Ministry of Education. (1995). *Technology in the New Zealand Curriculum.* Wellington: Learning Media.

Ministry of Education. (1999). *Guidelines for environmental education in New Zealand schools*. Retrieved. 18 January, 2006 from http://www.tki.org.nz/r/environ_ed/guidelines/forword_e.php

Ministry of Education. (2003, 18 August 2003). Teachers' experiences in curriculum implementation: General curriculum, mathematics and technology. 2004, from http://www.minedu.govt.nz/index.cfm?layout=document

Ministry of Education. (2004). *The New Zealand curriculum exemplars, technology*. Retrieved. from http://www.tki.org.nz/r/assessment/exemplars/tech/index_e.php

Ministry of Education. (2005). Technology essence statement- Draft November 2005. Retrieved 18 January, 2006, from http://www.tki.org.nz/r/nzcurriculum/whats_happening/technology_e.php

Ministry of Education. (2006). *The New Zealand Curriculum- Draft for consultation 2006*. Wellington: Learning Media.

Ministry of Education, Research and Church Affairs. *Educational content and learning strategies for the twenty-first century*. Retrieved 23 November, 2006, from http://odin.dep.no/kd/english/doc/reports/014001-220012/hov003-bn.html

Ministry of Education, Science and Culture (2002). *The Educational system in Iceland*. Retrieved 24 November 2006, from http://bella.stjr.is/utgafur/skolenska.pdf

New Zealand Government. *Whole of government submission on the Waitaki catchment water allocation regional plan*. Retrieved 23 November, 2006. from http://www.beehive.govt.nz/Documents/Files/Waitaki%20Government%20submission.pdf#search=%22waitaki%20%20%22flow%20rate%22%22

Nuthall, G. (2002, 25 October). *Knowing what we know and need to know about effective teaching.* Paper presented at the Teachers make a difference: What is the research evidence? NZCER Conference, Overseas Terminal, Oriental Bay, Wellington.

Petrina, S. (2003). Two cultures of technical courses and discourses: The case of computer aided design. *International Journal of Technology and Design Education, 13*(1), 47-73.

Reddy, V., Ankiewicz, P., Swardt, E. D., & Gross, E. (2003). The essential features of technology and technology education: A conceptual framework for the development of OBE (Outcomes Based Education) related programmes in technology education *International Journal of Technology and Design Education, 13*(1), 27-45.

Scottish Executive Education Department (SEED). (2006). Introduction to 5-14 technology [Electronic Version]. *5-14*. Retrieved 24 November from www.ltscotland.org.uk/5to14/techsubjectpage.asp.

van Aalst, I., & Daly, C. (2000). Summary report on feedback from survey forms and written submissions about: The Arts in the New Zealand Curriculum (Draft) [Electronic Version]. *Summary Report on Feedback about The Arts in the New Zealand Curriculum (Draft)*. Retrieved 24 November 2006 from http://www.minedu.govt.nz/index.cfm?layout=document&documentid=4478&data=l&goto=00#P152_10937

Weta Workshop. *Weta Workshop website*. Retrieved 23 November, 2006, from http://www.wetaworkshop.co.nz/awards/2006