

# Technology Education in New Zealand: The connected curriculum

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## Abstract

This paper aims to identify what actually takes place when policy directives bring together Technology Education, Enterprise Education, and the wider Community Partnerships. Since the introduction of a national technology curriculum to New Zealand schools in 1999 there has been little critique as to the intentions of the curriculum.

In late 2005 a Ministry of Education two-year Education for Enterprise (E4E) project was contracted to run a professional development programme with a group of 16 schools, to examine ways in which teachers' capability to include education for enterprise can be developed. Specific focus was to be on technology education and the fostering of links with the wider community. This paper will introduce research carried out to analyse the professional development programme and look at the impact it has had on classroom practice with consideration given to the ideologies behind the initiatives.

Models of implementation will be identified and exemplars of real practice in the primary classroom will be highlighted. Attempts to align technology and enterprise education will be explored and an argument for technology education making a real difference will be put forward.

The paper highlights these key factors:

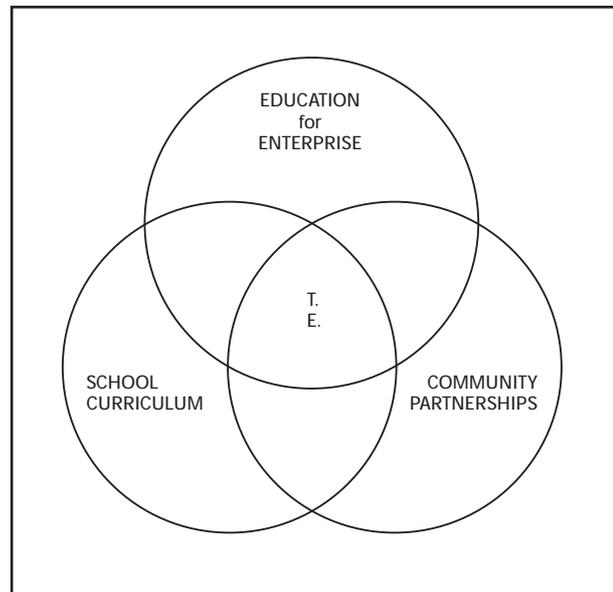
- The nature of a creative connected curriculum;
- Practice in primary technology education;
- Tensions between reality and ideology;
- Fourth generation evaluation.

## Key words

Education for enterprise (E4E), connected curriculum, primary technology education

## Introduction

This paper introduces technology education as the central pivotal theme of a tripartite relationship which may make a difference in the primary classroom. The paper is based on a recent research project which aimed to identify what actually takes place when policy directives bring together Technology Education, Enterprise Education, School Community Partnerships and the notion of a Connected Curriculum.



*Figure 1. An integrative connected model with technology at its core*

Since the introduction of a national technology curriculum to New Zealand schools in 1999 there has been little critique of the intentions of the curriculum. In late 2005 a Ministry of Education two-year Education for Enterprise (E4E) project was tendered to run a professional development programme with a group of sixteen schools, focusing mainly on the primary sector, to examine ways in which teachers' capability to include education for enterprise can be developed. Specific focus was to be on technology education and the fostering of links within the wider community. This paper will introduce the professional development programme and highlight the ideologies which drive the initiatives..

In New Zealand, there has been a shift in education policy away from liberal-humanist education towards a more vocationally focused curriculum. The change has come about partly as a response to economic targets and objectives set by national policy makers. An example of this shift, which follows human capital theory, can be seen in the growing emphasis on making education more responsive to the needs of industry and business. Followers of human capital theorists believe expenditure on education is expensive, and should be considered an investment like any other. This economic rationalist agenda has been a significant influence in the

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development of technology education in New Zealand over the last twenty years.

In 1996 The New Zealand Education Review Office produced a publication called *School Business Links*. In this document they identified that many schools had relationships with local enterprises. They also highlighted how there was little information held with regard to why these were established and what benefit, if any, there was for teaching and learning. (See *Education Review Office, 1996*.) Around this same time, the technology curriculum was published and was seen by some as the way to bring these *relationships* more formally in to the curriculum. In fact the curriculum itself contained a statement which clearly foreshadows this intention.

*The link between schools and the community, including business and industry, tertiary institutions, and local authorities, is important to a well developed, inclusive technology curriculum. (Technology in the New Zealand Curriculum, 1995, p. 17)*

Various stakeholder tensions such as the economic imperative have been used to propagate technology education's position within a national curriculum framework (see Jones, 1997). More recently these have manifested themselves under the guise of enterprise education. In late 2005 a Ministry of Education two year E4E project was tendered to run a professional development programme with a group of sixteen schools to examine ways in which teachers' capability to include education for enterprise can be developed. Specific focus was to be on technology education and the fostering of links with the wider community. This paper introduces the research which ran alongside the professional development programme and looked at the impact it has on classroom practice with consideration given to the ideologies driving the initiatives.

In 2006 the New Zealand Ministry of Education released a new draft curriculum for consultation. This draft curriculum had an introductory page about technology which included the following statement:

*Technology education connects students with a range of employment opportunities, particularly those that are enterprising and innovative in nature. (Ministry of Education, 2006, p.23)*

The New Zealand Curriculum released in 2007 is a statement of official policy relating to teaching and learning. It describes a vision by setting the direction for student learning.

Included in this vision is a desire to develop young people 'who will be creative, energetic, and enterprising' and 'who will be confident, connected, actively involved, and lifelong learners.' They should be confident and this is reflected by them being 'enterprising and entrepreneurial'. (Ministry of Education, 2007, p. 8).

This enterprising theme is developed further in the curriculum when discussing key competencies which are described as capabilities for living and lifelong learning. Under the *Managing Self* competency it is suggested that students who manage themselves are enterprising.

What is Education for Enterprise (E4E)?

*Education for enterprise provides an opportunity for students to do the following within the context of curriculum learning:*

- apply their wider school learning in real life situations
- make decisions about their learning rather than having decisions made for them
- have opportunities to exercise individual and group initiative, inside and outside the traditional boundaries of schooling
- exercise personal and shared responsibility, rather than being dependent on the teacher to solve problems and resolve issues
- develop and apply knowledge and skills that will underpin successful transitions to participation in economic and social life.

(Ministry of Education, 2009)

When describing the curriculum area of technology itself we are informed that technology will make enterprising use of knowledge and skills. This enterprise relationship is explicit in the policy directives and was also the focus of this research. If technology education in New Zealand is seen by policymakers as a key medium for delivering E4E (Education for Enterprise) involving the community and an essential component for developing a connected integrated curriculum, then primary teachers will need to develop a robust personal construct of what the subject entails to ensure a successful enactment (O'Sullivan, 2008). The diagram (figure 1.) places technology at the centre of this integrative model to maintain a clear focus on technology education, being the central theme of this undertaking.

## The connected curriculum: some theoretical assumptions

Saunders (2000) argues that there are four 'significant underlying or tacit theoretical assumptions' used to debate education and wider community enterprise links:

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1. Functionalist
2. Marxist
3. Liberal
4. Progressive/emancipatory.

The first two can be described as 'structural' frameworks. They are modernist theories that look at operations from a macro or big picture perspective, invoking notions of the whole society. They imply strong causal frameworks and according to Saunders tend to be reductive, looking for explanations from meta-theories.

In contrast the liberal and progressive/emancipatory perspectives look at the relationship between community and school from an education standpoint. Their focus is not on the direct link between education and future opportunities, i.e. one leading to the other but more about educational practices and their relationships with expectations.

Understandings of these four perspectives are rarely debated; however they form the backbone of many assumptions made about school and its connections with wider society.

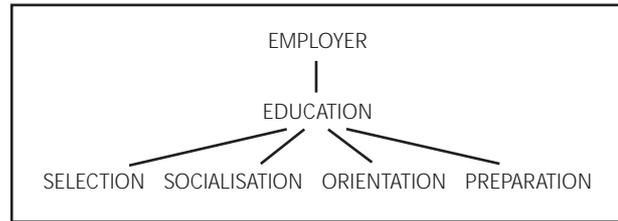
## 1. Functionalist perspectives.

The functionalist perspective views society as a whole, almost like a living organism. In this perspective, each aspect of society has responsibilities for the next and all are mutually dependent. For schools, this perspective has created an increasing pressure to respond to the needs of society particularly economic concerns.

*Put crudely, if labour market requirements are not being met, we should be looking for policy which brings them in to line. Critically, this view presupposes that requirements can be 'known', that they are of a 'technical' nature and the 'norm' is that they can be met through the choice of appropriate policies.* (Saunders, 2000, p. 686)

Saunders elaborates to say that in this perspective it is seen as logical that education should 'co-ordinate with the requirements of work because that is how societies function'. Watts (1983) identifies this notion as 'human capital'. These bonds or 'functions' are the ways in which education can service wider community needs.

The process of selection matches closely the employment strategies of the industrial era. It relies heavily on industrial practices of division of labour. Educationally it includes systems that regularly test students and separates them by the results. This separation normally includes splitting into



## *Human Capital: a restrictive view of how education can service society's needs*

academic and vocational type courses with those that fail being filtered off into lower level employment. This leads to misunderstandings from every party: student, employers and society in general. Historical accounts of technology education, both internationally and in New Zealand, clearly reflect this use of a selection policy (O'Sullivan, 2001). Recently the Minister for Education in New Zealand announced the government's commitment to establish trade academies.

*"Trades Academies are about relevance – they will provide those students who prefer to opt for practical hands-on education experiences with exactly that, and provide them with more opportunities to gain the practical skills they need to enter the 21st century workforce."* (Tolley, 2009)

So far five trade academies have been announced one of which is an area school which provides education for students from years 1 to 13.

The second function identified by Watts is the socialisation process. This is embedded in the pupils' experience of schools. These experiences can involve explicit or implicit procedures, whereby the pupils begin to associate themselves with a particular type of endeavour. This is often done by reinforcing stereotypes (e.g. gender, class and racial associations with particular types of courses). Historical forms of technology education are often associated with this function (e.g. craft for boys and food for girls). In terms of school-community links, care should be taken to ensure that socialisation does not occur.

The third function of orientation moves from the slightly more subtle socialisation process to deliberate curricular intervention or steering. Most notably this can be seen through career guidance, work experience or placement programmes. Additionally, one could readily associate school-community links with this function if they are carried out without a critical or questioning premise. Typically, the words 'enterprise' or 'entrepreneurial' are used in such orientation practices.

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The fourth of Watts' functions is that of preparation. This refers to the role of schools in preparing pupils with specific skills and knowledge required in the workforce. According to Watts at the general level, this may mean numeracy and literacy. However, Saunders (2000) argues that it is this preparation aspect which underpins 'new vocationalism' and the introduction of education as training.

This functionalist perspective views people as 'human capital' and society would be making an investment in people – a term used in both New Zealand and in the English education policy directives in recent times. Lee and Hill (1996) state that this was exactly the rationale for the introduction of the New Zealand curriculum. Proponents of this perspective argue that investment in technology education will no doubt bring returns in the technological fields of both higher education and employment. According to Saunders, this human capital theory has proved to be incorrect, citing the English example of higher numbers of students going on to University but studying in "esoteric courses" rather than science and technology (Saunders, 2000).

## 2. Marxist perspectives

Marxist perspectives would encourage the study of relationships that exist between people as they go about their endeavours and how that fits with their family life. Saunders argues that at present we are in a capitalist mode in which classes of people buy and sell labour; this is not an equal relationship. There are many cases of labour exploitation, and Saunders argues that these Marxist perspectives are reflected in the existing education system.

Education, according to Saunders (2000), if studied from a Marxist perspective, is there to maintain the status quo, thus enabling the capitalist mode of production to continue. This is achieved in education following much the same bonds as described earlier in the functionalist perspective. Functionalists identify socialisation as a means of creating order, Marxists as a means of maintaining social control. Functionalists identify selection as distributing recruits into a division of labour, Marxists as a means of sustaining inequalities in the education system and later life. These are often found in work habits and attitudes and Saunders describes this as the "hidden curriculum". Young (1998) refers to a divided system, which has a divided curriculum and divided qualifications and ultimately has a selective function.

## 3. Liberal perspectives

The liberal perspective, through the delivery of liberal

education, has come to signify the opposite view of education from functionalist or instrumentalist. The liberal perspective sees education as important for its own sake not just to fulfil some extrinsic factor such as employment. Saunders (2000) contends that this view of education was historically associated with the aristocratic classes, but in the modern era is free from the divisive aspects of class etc.

The liberal perspective would advocate that explicit vocational preparation is best undertaken either at work or just prior to beginning it. Instead of vocational education, advocates of this perspective believe the best preparation for life is a general education, which is broad, deep and informed by the whole culture not just one aspect of it. This may include interactions with the world of work but not as direct preparation for a particular occupation but as a pedagogical process. Effectiveness within this perspective should not be analysed in a narrow sense related to a particular employment or national economy.

*What is important for this perspective is the democratic imperative that no child should be denied access to these forms of knowledge and experience in the mistaken belief that they are not 'relevant' either to them or an extrinsic need like that of employers.* (Saunders, 2000 p. 692).

The liberal perspective advocates that this 'general education' preparation is suitable for future life including work. Saunders describes the main problem for this perspective is finding ways for all pupils to get the opportunity and access. Generally, in education the knowledge is imparted and learned in disembodied chunks and then tested through exam at a later stage where only those who have the cultural means to accommodate this method succeed. According to Bereiter (2002) liberal education gives learners access to a culture that transcends the particularities of their social and ethnic background. The liberal perspective can support technology education but it would be technology education as general education not vocational.

## 4. Progressive, emancipatory perspectives

This perspective is associated with individual growth and learning styles, which accommodate these. This, according to Saunders (2000), will lead to social goals of civic participation and democratic emancipation. Saunders identifies two sub-themes in this perspective. The first surrounds 'learner centeredness' and personal growth, whereas the second is 'social reconstruction' through empowerment. This perspective positions education centrally in social and personal reconstruction and is

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optimistic in nature. This perspective brings these two sub-themes together in the style of learning.

Unlike functionalist and Marxist perspectives, the progressive perspective underplays the social and political context. It also under-emphasises the nature of knowledge and skill that the liberal perspectives see as the starting point. It emphasises the power of the educational process to allow the learner to transform the above, to allow the individual to re-orientate him or herself.

## Research objectives

The research component of the E4E project investigated what promotes the development of enterprise attributes in students and what school wide practices can be introduced to support these. The research was not undertaken using a vocational perspective or an economic imperative but from a connected curriculum standpoint. The research also evaluated the professional development undertaken by teachers working in schools with facilitators focused specifically on E4E outcomes within technology education. This was a significant undertaking and analysis of data is still ongoing.

The author's objectives for this paper include firstly to illuminate the role technology education can play in developing innovative, enterprising and creative attributes in children (see Ministry of Education 2009a); and secondly to highlight how current practices school wide, and community partnerships impact on this development. This illumination may lead to an effective model of curriculum delivery which could be significant in the development of technology education as a discipline and offer a way forward as part of a connected creative curriculum in the primary school setting. One may hold the view that E4E has little place in a primary classroom. However policymakers in New Zealand are increasingly forcing their agendas into this sector. It should be noted particularly when considering Technology Education that political ideology and the latest fads have a significant influence on the directions proposed. Others have also raised some concerns:

*Decision making in education continues to be driven by political agenda, by models adopted from other countries and industries, and philosophical beliefs about what 'should' work. (Masters, 1999, p.1)*

An article by Clark (2004) highlights the differing views about the word enterprise when used in association with education. This article also highlights some of the main issues surrounding interpretation particularly those associated with the economic imperative.

## Research method

The selection of any research design involves a number of interconnected stages (Crotty, 1998; Denzin & Lincoln, 2000). These stages can be summarised as: firstly, locating the study within a research paradigm; secondly, the selection of an appropriate methodology; and thirdly, using the selected research paradigm and methodology to identify the methods used to collect and analyse the data.

A paradigm consists of ontological, epistemological and methodological beliefs which help to decipher the complexity of qualitative research. Researchers are guided by particular paradigms, and the associated ontological and epistemological beliefs influence their research questions, their choice of research methodology, and their methods of data collection and analysis (Guba & Lincoln, 1994; Kember, 2000). This study uses an interpretivist paradigm (Denzin & Lincoln, 2000) which is supportive of constructivist philosophical approaches. Such approaches share the notion that reality is a social construction, created between the observer and the observed, and that lived experiences need to be understood from the perspective of the observed.

According to this interpretative, constructivist paradigm interactions between all stakeholders including the researchers are deemed equally important. These interactions combined with an exploration of values held by all the stakeholders help shape the information which becomes a major focus of the study. The interpretative constructivist paradigm can be characterised by its use of primarily qualitative data gathering techniques in a hermeneutical and dialectical manner. Interpretative constructivist researchers focus on the multiplicity of viewpoints held and illuminate how these interact to shape the study. It is the interpretative constructivist researcher's belief that these mutual interactions between those studied and those doing the studying guides the research outcome. The interpretative constructivist paradigm supports the view that the observed reality exposed as part of a research study is a social construction process with no one truth discoverable (Tashakkori & Teddlie, 2003).

In the case of this specific research, defining and making sense of the impact of a professional development programme needs to be co-constructed from the perspectives of all the participants. Interpretivist methodology is thus a participative and collaborative endeavour concerned with constructing new understandings *"that get inside the ways others see the world"* (Neuman & Kreuger, 2003, p. 75). Fourth generation evaluation was used as an effective method to

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critique the E4E professional development programme for teachers. It was selected because this method focuses on interpretation and renegotiation (the hermeneutic/dialectic). The tensions and conflicts associated with this type of methodology were considered including theory and practice issues, the role of active participants and ownership of evaluation studies.

## Significance

With the new curriculum implementation underway and also the E4E professional development contract concluding, it is timely and important for academic research in this area to be introduced. Connecting school activity with out of school experience is not a new concept it relies heavily on the work of Dewey and reflective thinking as described by Marshall.

*This was not to make the schools an adjunct of industry and commerce and to acquiesce in the 'untransformed, unrationalised and unsocialised phases of our defective industrial regime'; but of utilising the intellectual problem-solving potential inherent in modern technology; 'to make school life more active, more full of meaning, more connected with out of school experience'. (Marshall, 1997, p 309)*

Young (1998), when talking about flexible specialisation and its relevance to education, introduced a notion of 'connective specialisation'. This contrasts with the insularity of the traditional subjects specialists and ultimately with the divided curriculum which dominates in the secondary sector. Divisive specialists see the curriculum from the point of view of their subjects, whereas connective specialists see their subjects from the point of view of the overall curriculum. Young argues for a shift from teacher centredness to learner centredness.

A connective curriculum acknowledges that education takes place in a community of practice and that learning is purposive and a social process (Lave & Wenger, 1994 cited in Young, 1998). It exposes the need to relate educational activities to developments in the wider society including but not exclusively linked to industry. So connectivity is more than just a curriculum model; it is the purpose of school itself.

The Education for Enterprise (E4E) project team was made up of two experienced facilitators and a senior university researcher. The project included a number of scheduled group meetings during the two year contract. These 'workshop' meetings were used to inform and shape the research. The meetings were conducted as a partnership between the 'local' experts (the teachers) and

'non local' experts (the facilitators and researcher). The facilitators were involved heavily with planning sessions as well as being in the classroom whilst projects were being undertaken. The focus was 'mutual aid' to improve teaching and learning with an emphasis on 'Enterprise for Education' through the learning area of technology.

At each of the meetings the groups were introduced to the research stages via an address from the researcher which included PowerPoint presentations and question and answer sessions. These meetings helped to clarify the role of both the researcher and the research, to explain the methodology, and to highlight the participatory nature of this form of research. It was decided that where appropriate the project would focus on existing planned units of technology education and that the teachers and facilitators would work together to enhance these offerings to further develop E4E activity.

According to Kuemmerle (2005), entrepreneurs can be distinguished from others by their ability to accumulate and manage skills and knowledge as well as mobilise resources to achieve specific goals. They steward resources whilst remaining open minded, learning as they find a way forward to develop responses with some merit or value (Saravathy, 2004). For this research transcribed participant interviews were mapped against three focus areas and the sixteen enterprising attributes identified to ascertain coverage. These were discussed with all parties so the different realities of what was occurring could be negotiated.

The constructivist view as described by Hipps (1993), that reality is changing whether the observer wishes it to or not, is an indication of multiple constructions of reality. Constructivism values the individual multiple realities that stakeholders have in their minds. Therefore, to acquire reliable multiple and diverse realities, multiple methods of searching for or generating data are in order.

For this project a number of methods were employed to generate and collect data:

- baseline data from workshops and questionnaires;
- observational field notes;
- audio and video recordings of activities and discussions;
- interviews.

In constructivist research it is important that the study is thorough, coherent and comprehensive. It should be trustworthy and useful; the interpretation should be provocative and generative of further inquiry. An open-ended perspective in constructivism adheres with the notion of data triangulation by allowing participants to

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assist the researcher in forming the research question as well as with the data collection. An example of how this was achieved by the project was the 'daily snoop' where the team facilitated participants to interview each other in a role play situation. This interview was included as an informant of what was actually taking place. Research has shown that aspects of self-understanding through construct developments play an important role in the way in which teachers ultimately teach (see Day et al, 2006; Boote, 2006). These views were supported by this research.

An example of this can be seen when many of the primary schools struggled with identifying the early stages of their technology projects. The facilitators reacted to this need utilising the hermeneutic/dialectic opportunities of fourth generation evaluation by providing a workshop on the 'fuzzy front end' which derived from New Product Development (NPD) research. This included developmental work around:

1. Opportunity Identification
  2. Opportunity Analysis
  3. Idea Genesis
  4. Idea Selection
  5. Concept and Technology Development
- (Koen et al, 2001, pp. 47-51)

These Personal Development sessions proved to be both popular and invaluable to the project team as it helped foster a 'win-win' situation for the teaching staff, facilitators and researcher alike. Some key success themes have begun to emerge from the research:

- An emphasis on a real need while designing the unit.
- Making the need transparent to the students so they see what their new found skills and knowledge will be used for.
- Expecting more than just presentations at the using and doing stage, i.e. trying to develop a tangible outcome.

School	Community enterprise
Increased personal motivation working in partnership with people outside the classroom.	Increased motivation for individuals and employees able to participate in a social good, i.e. education.
Purposeful action working with others in the community and an increased awareness of the role enterprises plays.	Increased awareness for community enterprises of how schools work; a chance to develop some connectedness.
Improved individualised careers information.	Opportunities for employees to develop communication skills, liaising with a different social grouping.
Accurate up to date information about specific enterprises and industries.	Accurate information about school technology education programmes.
Access to experts in the community/enterprise.	Access to experts, e.g. language teachers.
Access to facilities beyond the scope of the school.	Access to educational facilities beyond the scope of the enterprise for training etc.
Possibilities for sponsorship to support the curriculum.	Improved employer/employee relationships allowing staff to have contact with children in their community. Giving the employee personal satisfaction.
An increased understanding of the world outside of the classroom. Including expectations of possible employers and how this relates to their personal growth.	An increased understanding of the world of education including the expectations of schools and individuals leaving school.
Increased understanding for teachers of how communities and enterprise work, ultimately improving teaching and learning for individuals in their class.	Fulfilment of a possible personal altruistic desire to help improve the quality of teaching and learning.

Table 1. Possible benefits of school community partnerships

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- Keeping E4E attributes in mind when designing the whole unit rather than as an add on. Curriculum integration can create more time and reflect real life as integration is the way we get things done.
- Making sure the students see, reflect on, and revisit the timeframe, deadlines and expectations continuously.
- Success requires teacher scaffolding that will help students move beyond the fuzzy front end. Building up the background knowledge required by getting students to ask relevant enquiry questions.
- Maintaining a focus and continuity in terms of timetabling and commitment.
- Student involvement in planning, goal setting, and identifying targets.
- Student ideas are actually considered and used.

## Research Findings

Technology education as a connected integrative curriculum is an interesting notion. There are many definitions of curriculum integration, for example, Shoemaker defines an integrated curriculum as:

*...education that is organised in such a way that it cuts across subject-matter lines, bringing together various aspects of the curriculum into meaningful association to focus upon broad areas of study. It views learning and teaching in a holistic way and reflects the real world, which is interactive.* (1989, p. 5)

Others such as Drake & Burns (2004) have moved beyond a single definition and suggested a continuum involving multiple levels. There are many interpretations of curriculum integration expressed. However, they share a general philosophy which proposes a movement away from teaching isolated facts towards a more constructivist holistic view of learning based on the principles of philosophers such as Bruner, Dewey and Piaget. This was an important issue identified by the teachers and facilitators during this research.

Table 1 adapted from earlier research carried out by O'Sullivan (2001) was utilised to promote community involvement. In reality community involvement in technology education is often from enterprise experts.

Although more commonly found in the secondary sector, this research highlighted that these partnerships can also have a significant role to play in primary technology education. There were of course some frustrations experienced during community participation in this research project. These included:

- Enterprise mentors taking too much control over the direction of work.

- A lack of response from community experts and also difficulty in matching a mentor's/expert's timeline and school timelines.
- Experts' work commitments during school time took precedence. There was a willingness expressed but commitment issues came to the fore.

It was extremely worthwhile spending time developing primary technology teachers' understandings of the 'fuzzy front end'. This notion initially presented itself during the early facilitation stages of the E4E research. Once the participants were made aware of its importance they responded favourably. The efforts made to increase their personal constructs of technology through gaining a deeper understanding of the fuzzy front end proved to be worthwhile. There is certainly early indication that further research in this area would be helpful and warranted. This paper has introduced technology education in New Zealand as the connected curriculum by being the centre of a tripartite relationship. This can be achieved when policy directives bring E4E, community partnerships and a belief in a connected curriculum together through technology education activity. Further evaluation is underway to assess the success of these endeavours.

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