Investigating the place of the 'T' in ICT in Early Childhood Education

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Abstract

In this paper I suggest that teachers perceptions of Information Communication Technology (ICT) ***as*** *technology are common, and investigate whether this is leading to confusion and acting as a barrier to children's technology learning in early childhood education (ECE). These differences arise in part from confusion surrounding terminology used around ICT and technology education, and in part from the ad-hoc way that both ICT and technology education have been introduced to ECE because of the lack of precise guidelines for teaching and learning with ICT in ECE in this age of multiliteracies. Some of the tensions around the use of ICT in ECE are explored in the following article.*

Introduction

Technological experiences are included in the everyday programmes of early childhood centres in New Zealand (Mawson, 1999). However, much technological learning is going unnoticed, undocumented and unextended (Mawson, 1999; Patterson, 2005). In early childhood education in New Zealand the use of ICT, particularly digital photography, computers and the Internet have become routine. The role and potential for ICT to enhance children's learning is well documented (Bolstad, 2004; Brown, 1995; O'Hara, 2004). Research cited in Ministry of Education documents indicate that used well, "ICT can enhance children's learning and encourage purposeful and exploratory play, collaboration, cooperation, discussion, creativity, problem-solving, risk-taking and flexible thinking" (Ministry of Education, 2005a, p.3). However in the analyses of ICT use in ECE, there is little acknowledgement of the nature of ICT in relation to how it fits with technology teaching and learning. There is also little acknowledgement of teachers' perceptions and attitudes of the place of ICT in technology teaching and learning (O'Hara, 2004).

For teaching and learning experiences to be successful, it would be advantageous for teachers' perceptions of ICT and technology to be congruent with the approach advocated by the Ministry of Education (Ministry of Education, 2005b). In this paper I suggest that teachers perceptions of ICT **as** technology are common, and investigate whether this is leading to confusion and acting as a barrier to children's technology learning in ECE. I suggest that ICT is a rapidly evolving tool for use throughout all curriculum areas, and agree with Petrina who questions the purist approach to technology teaching and learning (Petrina, 2003). I start by defining technology education, ICT, and the place of both in early childhood education. Then explore the need for research to inform and guide teachers.

What is technology education?

It is important for teachers to have, as a starting point, an agreement of what constitutes technology education (Brown, 1995). The teaching of technology as a school subject began early last century with the intent of providing working class children with knowledge, skills and values necessary to survive the effects of industrialization (Brown, 2000; Petrina, 2003). In New Zealand it was variously known as 'Industrial Education', 'Instructional Technology', 'Manual' and colloquially as 'Tech' (Brown, 1995; Petrina, 2003).

Technology education became a distinct compulsory curriculum area in the New Zealand school sector only in 1999 with the publication of '*Technology in the New Zealand Curriculum'* (Ministry of Education, 1995). It has been included in teacher training courses for many years and has matured as a separate curriculum subject to become more than imparting knowledge about craft, sewing, cooking, metalwork and woodwork (Petrina, 2003).

Technology education is defined by Brown (1995), as *"a process by which society identifies human problems and seeks solutions to solve them"* (p.2). Brown describes technology education as having a number of inter-linked phases, beginning with the identification of a problem or need. Next comes an investigation and the conceptualization of a solution to the problem. This is followed by the design and construction of an object, system or environment to overcome the problem. This

solution is applied and followed finally by an evaluation of its success (which may lead to further refining and design). Brown's description is in accord with the design process outlined in '*Technology in the New Zealand Curriculum'* (Ministry of Education, 1995), with the addition of a strand of learning considering technology in the social context.

At the same time as this new Technology Curriculum was being developed, the early childhood curriculum, *'Te Whaariki: He whaariki Maatauranga mo nga Mokopuna o Aotearoa: Early childhood curriculum'* (Ministry of Education, 1996) was written and became the framework for teaching and learning in ECE in New Zealand. As a holistic, experiential, socio-cultural curriculum, it describes aspects of technology education throughout its strands of learning. Table 1 outlines examples of how technology education is woven throughout the strands in *Te Whaariki*:

Table 1: Some aspects of technology within Te Whaariki Strands:

Strand	**Examples**
Exploration – Mana Aoturoa	Representing ideas in two dimensional form, planning, exploring materials
Communication – Mana Reo	Developing understanding of process skills, materials, discussion
Well-being – Mana Atua	Risk taking, being responsible, understanding rules
Contribution – Mana Tangata	Developing strengths, interests, problem-solving, group work
Belonging – Mana Whenua	Developing understandings of the wider world, taking an active role, expressing ideas

However, as a non-prescriptive, and holistic curriculum where learning areas are integrated, many teachers have struggled to notice and therefore extend children's technological education (Mawson, 2002). While teacher education institutions have included 'Technology' as a department for many years, and student teachers in training have learnt about skills, knowledge and technological processes, the focus has been on the curriculum of the compulsory sector rather than developing guidelines for appropriate technological practices for children in early childhood education.

There is little research investigating the facilitation of technological capability of young children (Fleer, 2000).

Technological practices of children in ECE

Mawson, (2002), writes about the technological practices of young children, which teachers can apply to their practice in ECE. Napper (1991) cited in Mawson (2002), identifies two stages in the development of young children's technological capability. The first stage is an exploratory stage, during which the children experiment with materials. For example, they manipulate, cut, join and paint to discover the properties of materials, and how to use the properties in the making of an artifact. The second stage involves problem solving, during which the children use the knowledge and skills learned about materials to solve problems that are important to them.

The recent emergence of the widely described pedagogy of Reggio Emilia, an innovative Italian education pedagogy, have also informed technology teaching and learning in ECE in New Zealand, through the 'Project Approach' (Edwards, Gandini & Forman, 1998). Mawson (2002) highlights useful aspects of the Reggio Emilia approach for teachers wanting to develop technology learning at their ECE centre:

- The role of the environment, especially having a wide range of flexible resources, in stimulating children's learning
- The emphasis on child-centred projects, in-depth investigations of topics that interest them
- The development of new forms of documenting learning
- Taking a collaborative approach, involving communication within the wider community

Mawson (2002) suggests that ensuring that teachers look at children's experiences through a 'technology lens' is one way of fostering technology education. He suggests that teachers acknowledge and document technology experiences, assess learning and plan for further learning within the context of the child's interests.

These messages about technology education practice in ECE appear clear, and are congruent with both the earlier general definitions of technology education that

Brown describes (1995) and with the tenets of best practice outlined in *Te Whaariki* (Ministry of Education, 1996).

However, a literature search for the word '*technology*' on the Internet yields many hits, which have a much narrower view of *'technology'* as gadgets such as computers and televisions. Terms such as *'educational technology (ET)', 'technology in education', 'e-learning', 'information technology (IT)'* and *'learning technologies', 'new educational technologies'* are bandied about and interchanged in the literature (Brown, 1995; Hunt, 1996; Patterson, 2005) and while some refer to technology the curriculum subject, others refer to electronic or digital devices.

At the same time that the development of technological education has been happening in New Zealand, there has been immense development in technology of an electronic and digital nature (Bolstad, 2004). In ECE in New Zealand, these technologies are commonly known as information communication technologies (ICT). It is no wonder that there are confusions about terminology (Brown & Vossler, 2000). In the past ten years, since the publication of *Te Whaariki,* ICT has featured more and more in ECE practice, and in literature, and authors often use the word technology when referring to ICT. To clarify these terms and specifically their meaning in ECE, the following review of New Zealand literature seeks to establish a common meaning for ICT and technology in education.

What is ICT in ECE?

A review of New Zealand literature finds that definitions are often given to clarify the meaning of terms. In investigating the literature to clarify the definition of ICT further a number of confusions in the common terminology have emerged, because of the way that understandings have changed over time.

In the context of information and communication, the Ministry of Education defines 'technology' as including "systems that enable the collection, structuring, manipulation, retrieval, and communication of information in various forms" (1995, p.12). Also in 1995, Brown defined ICT as "The design (and evaluation) of an artifact, environment or system as a solution to a human problem with either the structure or function of information and/or communication" (p.3). Neither of these

definitions refer explicitly to the use of electronic devices rather they focus on the information and communication.

In 2004, Bolstad defined ICT as "anything which allows us to get information, to communicate with each other, or to have an effect on the environment using electronic or digital equipment" (2004, p.vii). Over time, there has been a shift when describing ICT, from being any device that facilitates communication, to a focus on electronic devices. This seems to be a common understanding of information and communication technology from recent literature, which regards ICT as electronic tools including computers, the Internet, faxes, phones, televisions, video, CD and DVD players (Lee, Hatherley & Ramsey, 2002; Bolstad, 2004; O'Hara, 2004). Old understandings are being replaced by new in the literature, as popular perceptions change, and ICT becomes more commonplace in ECE.

The introduction of ICT into ECE has occurred with incredible pace. Without "guidance, examples, and support for their own professional learning, early childhood teachers and centres have made their own decisions about the nature and extent of ICT use in children's learning" (Bolstad, 2004, p.ix). After consultation within the early childhood sector, in 2005 the Government introduced a framework to support centres to provide some guidance for teachers and managers of ECE centres, and to ensure that every child attending ECE has access to ICT to enhance their learning experiences (Ministry of Education, 2005b).

The framework is outlined in one main Ministry of Education document that refers to the role of ICT in teaching and learning, to guide the practice of teachers in ECE in New Zealand/Aotearoa - '*Foundations for discovery: Supporting learning in Early Childhood Education through information and communication technologies: a framework for development'* (Ministry of Education, 2005b). The document is "intended to provide guidance to inform effective ICT development, use and investment in the ECE sector" (Ministry of Education, 2005b, p.2). It describes ICT **use** to support teaching and learning practice, the **integration** of ICT into children's experiences to enhance their learning, and introduces ICT as a **resource** to support practice (Ministry of Education, 2005b).

This suggests that the ICT is the infrastructure that supports teaching and learning, rather than the topic being taught. Brown (1995) suggests that there is a "tripartite relationship between: learning with information and communication technology across the curriculum; learning specific technological knowledge and capability in this domain; and learning about the relationship between this area of technology and society" (p.1).

The ECE sector is diverse in philosophy and delivery of its curriculum, *Te Whaariki* (Ministry of Education, 1996). Although it underpins the practice of ECE teachers, *Te Whaariki* as an aging document and makes no mention of using ICT in teaching and learning experiences. In searching the literature for a way forward through the jargon contained in definitions, what has emerged is that there is no precise set of guidelines for teaching and learning with ICT in ECE in the New Zealand context. While the development of ICT policy, integration in curriculum and practice has been a focus in the compulsory education sector, and the ECE sector may find guidance from some of the compulsory school sector ICT literature, there are differences between the two sectors that should be recognized (Bolstad, 2004; Brown, 2006). Brown and Vossler (2000) agree there is a problem with using definitions to clarify meaning, because ICT has different meanings in different contexts.

The place of ICT in ECE

This lack of precise guidelines for teaching and learning with ICT in ECE in New Zealand is a tension that has emerged (Brown & Vossler, 2000). Another is that the various meanings attributed to the words '*technology*' or '*technologies*' may lead some teachers to believe that use of ICT in teaching and learning is the same as teaching technology. This confusion highlights the need for teachers to have a clear understanding of developing technological practices in ECE, the distinction between ICT and technology, and the place of ICT in teaching and learning technology (Brown & Vossler, 2000).

Patterson (2005) considers the place or role of ICT in technology education. She seeks to clarify a position that **use** of ICT is not technology education. She puts forward a purist view, distinguishing between the ICT and Technology as separate

entities, with ICT a subset of technology education. She distinguishes between teaching and learning about, with and through technology, as a way to ensure that technology teaching and learning continues to be at the forefront.

Perhaps the answer lies in a more basic definition of technology as something that helps us to do things better and faster (Petrina, 2003). This view of technology includes a product, a tool, the process for using the tool, but also must include learning about the tool and the process while encompassing all of the phases of technological learning described earlier. Using this definition of technology, ICT teaching and learning becomes technology education in certain contexts, but is not at the expense of technology experiences (Petrina, 2003).

Petrina (2003) suggests that ICT and technology education have been converging, just as ICT has been integrated into other subject areas. This doesn't mean that technology education is redundant by any means, rather ICT can "add to, rather than replace, a teachers' complement of tools and activities" (Bolstad, 2004, p.26). Perhaps it is time to get over the focus on definitions of terms, and to just get on with good teaching practice in all aspects of teaching and learning (Brown & Vossler, 2000). Perhaps we can just agree that given the rapid pace of development in ICT, and in the global world of multiliteracies, teachers need to understand that both ICT and the associated terminology and definitions, are evolving at a similar pace.

Roder, a senior lecturer in education at the University of Auckland suggests that in this context, this is the "new norm in language" (personal communication). He deems it good enough to have our definitions fuzzy. He believes that concentrating on definitions and clarifying meaning can create more confusions because it is always going to be difficult to keep pace with the rapid change and development in new technologies in education, especially ICT. To go a step further, with ICT being such a rapidly evolving branch of learning is it even possible in reality for teachers to teach about ICT, in ECE, apart from in the moment?

It must also be realised that *Te Whaariki* does not align itself with traditional subject boundaries as occurs in the compulsory school sector. *Te Whaariki* emphasises integrated learning strands, and assessment of children's learning is holistic "viewing

the child's learning as complex and contextual' (Ministry of Education,1996, p.4). This means that research from the compulsory sector, and views such as Patterson's (2005) that advocate the separation of curriculum areas are not necessarily transferable or relevant to the early childhood context (Bolstad, 2004; Brown, 2006). Perhaps rather than focusing on where in the curriculum ICT is being taught, it is more relevant to centre on how and what is being taught, and its relevance for the children's learning?

ECE Pedagogy, Teacher Attitudes and Understandings

The rapid growth in integration of ICT into ECE has occurred alongside a growth in accountability of teachers for the children's learning since *Te Whaariki* was implemented, and through the chartering and licensing process in ECE. It is now commonplace in ECE for children's learning experiences to be assessed and documented using ICT in the form of 'learning stories', and for these assessments to be collected in portfolios. Teachers using *Te Whaariki* take a socio-cultural approach and involve their community in their teaching, learning and assessment, and ICT plays a big part in this (Lee et al., 2002).

ICT used as a tool to facilitate the documentation of children's learning experiences, and to support daily learning activities, is dependant on teachers integrating the ICT as practical and useful tools in an educationally meaningful way (Brown & Vossler, 2000; Lee et al., 2002; Bolstad, 2004). This is across all curriculum areas, all strands and goals of Te Whaariki. The recently published documents *Enabling 21st century learners: An e-learning action plan* (Ministry of Education, 2006a), and *The New Zealand Curriculum: Draft for consultation* (Ministry of Education, 2006b) also advocate an interdisciplinary approach to education.

These innovations in teaching and documentation demonstrate some teachers' adaptability, and willingness to embrace new technologies and new pedagogy. Emerging in the literature over the past five years are many examples of innovative ways to integrate ICT into the ECE curriculum (Carr & Lee, 2002; Hatherley & Sands, 2002; Lee et al., 2002; Ministry of Education, 2003). This integration has not been at the expense of technology education experiences for children.

A community of learners has built around innovations in ICT use and integration in ECE centres throughout New Zealand (Hatherley et al., 2002). These innovations have been well publicized through the early childhood assessment exemplars, *Kei tua o te Pae* (Ministry of Education, 2005a), which are a showcase of ICT use, and integration throughout all aspects of the programme, and all curriculum areas including technology education.

Much of the literature around ICT pedagogy follows along the same lines as the new MOE documents, advocating an integrated approach to teaching and learning with ICT (Ministry of Education, 2006a; Ministry of Education, 2006b; Sulla, 1999) and an interdisciplinary approach to education (Sherman & Kursham, 2005). While this may be a relatively new pedagogical approach in the compulsory sector, this holistic view of education has been advocated for many years in ECE, and is the basis of *Te Whaariki,* so it is natural for ICT to be included throughout the curriculum.

While celebrating the way that the ECE sector has responded to the challenges of integrating ICT to their teaching practice, there are always challenges, and Brown and Murray agree, with a cautionary voice to ensure that policies and practices that are problematic are publicly debated (2006).

What is missing in ECE, is a model of professional development for teachers based around pedagogical approaches to integrate ICT throughout the curriculum, in the New Zealand context (Brown & Vossler, 2000). Many teachers have had little guidance in strategies to implement technology education and ICT (Mawson, 1999). It is not surprising therefore that there is some confusion over terminology, understandings and pedagogical knowledge (Brown & Vossler, 2000). Bolstad in her review of the role and potential of ICT in ECE (2004) agrees that

> "*without good guidance, examples, and support for their own professional learning, staff will make their own decisions about the nature and extent of ICT use in children's learning. These decisions are influenced by such factors as teachers' own level of confidence with ICT, and their beliefs about learning and teaching in the early childhood years"* (p.73).

While there have been models of successful professional development in ECE, in 2003 a New Zealand Council for Educational Research (NZCER) survey described in

Bolstad (2004) highlighted tensions around variable access to ICT, a need for technical and advisory support for ECE centres, and access to "research evidence about workable approaches to using ICT for teaching and learning" (Bolstad, 2004, p.75). Brown and Vossler (2000) suggest that it is a responsibility of the teacher training institutes to ensure that teachers have clear understandings of terminology around ICT and technology education, and are explicitly taught to integrate ICT throughout all curriculum areas.

Implications

As ICT continues to be more established in ECE, there will be an increasing need for research to identify pedagogical and integration issues in the New Zealand ECE context. There will be a need to more fully explore teacher constructs of the place of ICT in ECE, including the place of ICT in technology education. There is an urgent need for the research outlined by the MOE in *Foundations for Discovery*, to be funded by the government in teacher-led services. This will give a baseline to ensure the guidelines are relevant to practice in ECE, and should give a direction for professional development in ECE around ICT integration, with all curriculum areas including technology education. There is also a need to research the ICT resources and infrastructure needed to ensure equity across the whole ECE sector (Ministry of Education, 2005b).

The emergence of a new term, which describes the pedagogical use of ICT to enhance teaching and learning, is timely. In the latest Ministry of Education documents, the term '*e-Learning*'; '*learning and teaching that is facilitated by or supported through the smart use of information and communication technologies*' (Ministry of Education, 2006a, p.2) is being used. The adoption of this term in ECE could see the focus shift from the technologies, back to the teaching and learning.

Perhaps it is also timely for *Te Whaariki*, the early childhood curriculum to be reviewed in line with the curriculum reviews happening in the compulsory, school sector, and to incorporate ICT into learning outcomes.

Conclusion

As one of the newest curriculum subjects, technology education has developed considerably in the past ten years. At the same time innovations in ICT have blurred the lines between teaching and learning **with, use of**, and **around** ICT in technology education. There have been inevitable confusions around the terminology, in part because of the newness of these disciplines, and in part because the advent of ICTs have facilitated communication to the extent that we have access to information from around the world. In this age of multiliteracies, choosing to continue to refine and define meanings to avoid confusion can have just the opposite effect. It is better to be discerning and discriminating users of the ICT available to us, focusing on pedagogical best practice is a way forward. While definitions play a part in building understandings, we need to move beyond a focus on terms. What is the place of the 'T' in 'ICT'? What we can be sure of is that our understandings today will tomorrow be as obsolete as my OS X 10.4.7!

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