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Parallel Dimensions and Fundamental Things – The Future of ICT in Education

Margaret Lloyd
Faculty of Education, QUT

Education is a futures business. The statement *I touch the future – I teach* is more than an aphorism for practising teachers, it is an anthem, an embodiment of who they are and what affirms them in good times and sustains them through difficult ones. Educational policy is always oriented to the future with promises and predictions of what will be.

Information and communications technology (ICT) is also a futures business. The next product, the next process, the next killer app is just waiting to be developed, released and distributed. It is an industry epitomised by a constant questing for faster processing and heightened functionality. It is a competitive but potentially profitable business and there is little room for stagnation.

The noted author, Ursula Franklin said that “to understand the real world of technology and cope with it, we need to have some knowledge of the past, as well as ... thought to the future” (Franklin, 1990, p. 13). Education and the ICT industry have links with the past as well as having their eyes on the future. It is through Education that societies safeguard cultural knowledge and transmit it through the generations. The ICT industry always looks to its past to see which successful “old” technologies can be converged into new hybrid forms. The past and the future could be represented as sitting at opposite ends of a straight sequential timeline as separate but interconnected entities. That the past and present should inform the future remains true in an educational computing environment despite the transience of the technology itself.

As new information and communications technologies are introduced into schools, it is important to recall past policies and initiatives and use this informed recollection to make some objective and rational decisions about the future. The results of this reflective exercise, however, may well make you wonder about the past-future continuum being a straight line - what Hawking (1988) called an “arrow of time” (p. 153) – and you may alternately begin to see time as a series of discontinuous and asynchronous events, decisions or accidents (Foucault, 1971/1991) or agree with the Dwarf in Nietzsche’s (1946) *Thus Spake Zarathustra* who was given to say that, “all straightness is a lie ... all truth is crooked and time itself is a circle” (p. 142).

This paper is about the future of ICT in education and suggests that it will uncannily resemble the past and present. It will draw examples from Australia, New Zealand and other countries to support its discussion of the parallel experiences of both countries as each comes to terms with planning for a predicted but unknown future. It will also cautiously suggest that we have already seen and lived the future in the recursion of policies and initiatives which are promulgated as if the past had never existed.

In a personal and somewhat irreverent way, it will draw on the author’s experience and evidence from the literature to show that we do not need fear or worry about the future because we have been there before – we are operating inside interconnecting parallel dimensions of place (between nations) and time (between the past and the future). These dimensions manifest themselves through (a) the national urgency with which we view anything and everything technological, (b) what teachers, students, parents and politicians

say, think and do; and, (c) our concerns about the curriculum implementation of ICT. This paper will consider these manifestations in turn in order to show, just as in the sentimental song, *As Time Goes By* (Herman Hupfeld, 1931) suggested that “no matter what the future brings” the “fundamental things” relating to ICT in education will still apply.

National Urgency

Information and communications technology is a matter of national urgency and there is a pressing need to be proactive in dealing with technological change. Consider the following statements:

1. We live in a time of rapid and unparalleled technological change (Ministry of Economic Development (New Zealand), 2004).
2. The world is changing rapidly: our work and daily life require skills not even imagined just a few decades ago. This rate of change is likely to continue in coming decades (State of Queensland, 2005)
3. Today’s children face an uncertain future in a rapidly changing world. The speed and uncertainty of the change makes it impossible to predict with any precision the skills students will need to function as adults (Sherwood, 1989, p. 236).
4. In future persons with no understandings of computers are likely to be disadvantaged both socially and economically (Queensland Legislative Assembly, 1980, p. 13)

The first and second statements are contemporaneous with the time of writing and show marked similarities between Australia and New Zealand - the first of the parallel dimensions of this paper. It could be confidently conjectured that similar statements could be found in government releases throughout all industrialised nations. A sense of change, however, is not new and this is characterised by the third statement which comes from 198, and the fourth from 1980 (thus establishing the second parallel dimension of this paper). Lem (1990) offered that “the present day consciousness of change, a change promoted by the acceleration of the rate of change ... does not show any tendency to stand still nor is it apparently amenable to social restraint – is now a common possession” (p. 28).

There is something of a sense of ambivalence in the four statements presented at the beginning of this section. Change is acknowledged in voices which convey both admiration and fear and there is palpable urgency in the third and fourth statements. A solution to the inherent dangers lie in education.

Computers in schools have always been symbols of a society acting to protect the future, to educate and employ its children, to equip them for the society we have created or one we imagine. There is a sociological belief in the power of computers in schools. Nelson (1985), writing of a small school in New Zealand, commented that this kind of simplistic belief “perpetuate[s] a myth, an untruth, one in which the future is lost if we don’t make just about everyone computer literate” (p. 63). Computers in schools are physical artefacts which governments can deliver, can point to as evidence of action and commitment. It has been contended that computers “were not introduced [into schools] in ways our children could handle as proper learning experiences. ... [but] were instead promoted as objects that would inevitably be met in the outside world, so come to terms with them they must” (Williams, 1987, p. 123).

In a recent OECD report, the purpose of integrating ICT was said to be “to improve and increase the quality, accessibility and cost-efficiency of the delivery of education, while

taking advantage of the benefits of networking learning communities together to equip them to face the challenges of global competition” (Bruniges, 2003, paragraph 6). The economic driver of the “national urgency” for ICT in education in the 1980s appears to have retained its potency into the 21st Century. It seems, however, to have escalated from national to global importance.

There are some indications that the rhetoric is changing a little or is beginning to encompass pedagogical concerns. In the initial release of Education Queensland’s *ICTs for Learning Strategy*, the then Director General of Education offered that:

ICTs are at the core of teaching and learning in the 21st Century. Queensland’s future depends on how successfully we integrate ICTs in the curriculum and daily learning and teaching. ... Many teachers already use computers to enliven teaching and inspire students. In order to build a 21st Century schooling system ..., we need teachers to understand how ICTs promote higher order thinking skills and deepen understanding in all key learning areas.

(State of Queensland, 2002)

The whole future (here of the state of Queensland) is dependent on our integrating ICTs into the curriculum but concern is here expressed for the learning and cognitive growth of our students. But this is a recycling rather than something novel. Bigum (1995) contended that the basic claims made on behalf of ICT in schools have always been concerned with either future employment or enhanced learning. The 1983 *Computers in the Curriculum Policy* (Department of Education, Queensland, 1983) presented claims about enhancing learning through typically moderated motherhood statements, namely (a) “may have considerable potential for enhancing ... learning opportunities” (p. 2), (b) “the interactive features ... may usefully complement ... more traditional teaching/learning interactions” (p. 2); (c) “may increase the effectiveness of existing teaching strategies” (p. 2); and, (d) “they may also promote the use of a wider range of teaching strategies” (p. 2).

The claim that “computer education in Australian schools was of fundamental importance to Australia’s future” (Commonwealth Schools Commission, 1983, p. 1) has not lessened. The concern – the national urgency – is, in fact, so great that Australian children (in Years 6 and 10) are about to undergo national ICT literacy benchmarking tests to reassure us that they will not be left behind. National literacy and numeracy tests currently exist and the ICT tests will begin their trials in late 2005 (ACER, 2005). In a joint press conference with the Prime Minister (March 11, 2004), the Hon. Brendan Nelson (Minister for Education) said that:

We’re also seeking national consistency, not the mediocrity of a national curriculum, but we want common tests to be delivered for our children in reading and writing, in science, in ICT and in civics and democracy.

(Office of the Prime Minister, 2004, paragraph 8)

The “fundamental thing” of the national urgency of ICT in education has seen it elevated to become one of the 3Rs, a basic of education. The reasons for this urgency are never quite fully explicated but are always couched in the rhetoric of future prosperity. It is unlikely that this will change and the future will be replete with its concerns of national and global urgency and an anxiety over the readiness of our children to adjust to change.

Teachers’ perspective

In the future, teachers will continue to be “the rank and file implementers of change” (Bailey, 2000). They will continue to think that there is an increasingly-yawning generation gap

between themselves and their students particularly in regard to ICT. They will think that “kids” know more than they do and have an innate digital fluency simply because they have been born in the 21st Century. They will feel under pressure to implement state or national policies whether or not it fits into their own pedagogical beliefs and practices.

Building on the emergence of various ICT standards for teachers in differing systems across the world, the use or non-use of ICT will become a watershed marker of a teacher’s proficiency and competence. In Australia, the federal Department of Education, Science and Training (DEST), in its 2004 review of teaching and teacher education included the action that: *All teacher education programs prepare prospective teachers for the digital age where ICT is an important tool in information and knowledge management and integral to student learning* (DEST, 2004, Action 31).

The influential longitudinal ACOT research project (1985-1995) spoke of teachers moving through iterative stages of development in their use and integration of ICT in their practice. These are:

1. *Entry* – where teachers learn the basics of using the new technology.
2. *Adoption* – where teachers use the new technology to support traditional instruction.
3. *Adaptation* – where teachers integrate the new technology into traditional classroom practice.
4. *Appropriation* – where teachers focus on cooperative, project-based and interdisciplinary work incorporating the technology as and when it is necessary.
5. *Invention* – where teachers discover new ways to implement the technology tools.

This five-stage schema is widely used and has been repeatedly validated in research studies over time. There are a number of variants and revisions within the literature but the sequence remains remarkably unchanged between studies. There is no reason to doubt that, irrespective of the technologies being used, teachers will move through these stages as they encounter new ICT applications, processes and products. The “fundamental thing” here will be the ongoing need for teachers to learn about “new” technologies.

Our working descriptors of these stages will undoubtedly change. I have been involved in this field since the mid 1980s and have noted a significant change over time in what are benchmarks of ICT knowledge. In a recent conversation in a primary school, a teacher confided to me that, “I don’t know anything about computers. I just do a bit of word processing, a bit of graphics, some Internet searching and email just about every day. But I don’t know much.” Arguably this would have made this teacher an expert only a few years ago and possibly have seen her promoted to be the school’s ICT Co-ordinator! What we call “entry” has been redefined without our realising it – and similarly – so too is what we define as “invention.” The terms and sequence of the stages remain valid but the descriptors and our expectations have moved on.

Students’ perspective

Students of the future will be late, untidy, impolite, illiterate, and possibly un-employable. This can be said with certainty, as this is what every generation from time immemorial has thought of the following generation. There are ancient quotes – including one from Socrates – which bemoan the uselessness of contemporary youth.

Students will think that school is boring and disconnected from life. I used to think this when I was at school in the 1950s and 1960s. My children thought this when they were at school in

the 1980s and 1990s. My mother told me how she used to watch the clock in primary school in the 1920s and pray for the release of 3 o'clock. I am quite sure that my grandchildren (her great-grandchildren) will feel the same way. It is a noble tradition designed to engender stoicism.

What we do know is that students have increasingly open access to sophisticated technologies at home. The first PISA (Programme for International Student Assessment) survey was carried out in 2000 across 32 countries involving 265,000 students with 5,000 students in 231 schools participating in Australia (Bruniges, 2003). From this study, we know that nearly 85% of Australian students have access to computers at home almost every day compared to 63% of their counterparts in other OECD countries. Only 9% of Australian students are reported to never have access to computers at home (cf. 23% of the OECD population). The Australian Bureau of Statistics' publication, *Household Use of Information Technology* (May, 2001) conducted four quarterly surveys in 2000 revealing that the proportion of Australian households with access to a home computer has increased steadily from 45% in 1998, to 48% in 1999 and 53% in 2000. The increase in the number of households with access to the Internet also continues to rise strongly. In 2000, 33% of Australian households had access to the Internet at home, a rise from 16% in 1998. The growth in home Internet access is much higher than the growth in home computer access. For households with a home computer, the proportion which also had home Internet access was 63% in 2000, up from 47% in 1999 and 37% in 1998 (Bruniges, 2003).

The ramifications of home access for ICT in the school setting are significant but, to date, have not been widely surveyed. There is less need, arguably, to teach "about" computers and more of a need to model meaningful uses (as opposed to game playing), to teach critical literacy (to contend with more but less reliable information) and to use ICT as a medium for thinking (akin to Jonassen's (1996) mindtools and Papert's (1980) mindstorms) where the technology becomes an amplifier and conduit rather than the means to produce an artefact. ICT in education, to complement ICT in private homes and public places, needs to be more about thinking and learning than doing or making. It needs to be about communicating and collaborating and using the medium in ways which create genuinely new learning environments.

Parents' perspective

In a study conducted in New South Wales, Downes (1998) found that parents believed that (a) computers were essential for their children's future success; (b) schools were where children gained knowledge of computers and computing; (c) having a home computer allowed improved presentation work and more timely access to information; and, (d) a home computer was not a necessity for schooling but provided an advantage. The students in the study generally agreed with their parents with the exception that they did believe a home computer to be a necessity. The proffered reasons were that schoolwork became "easier" (alluding to access) and "better" (meaning improved presentation). The parents in the survey believed that information from CD-ROMs or the Internet was more current and more readily accessible than that in books (Downes, 1998). Parents wanted their children to have both print (traditional) and digital literacy.

A 1999 advertisement for Microsoft's *Encarta*, an electronic encyclopaedia, resonated with similar beliefs. The text of the advertisement suggested that *Encarta* was "an investment in your family's future." It intimated that contemporary children have high levels of ICT literacy and need access to sophisticated multimedia resources. The sentence, "no matter how

old the student, it makes learning not only more engaging ... but also more rewarding” (Encarta advertisement, 1999) is a direct appeal to parents. The final sentence consolidates and reinforces this message by asking “And won’t that enhance your children’s future?” (Encarta advertisement, 1999). The binary of this is that failing to purchase a CD-ROM encyclopaedia for home use (and by association, not having the required hardware) will disadvantage your children and their chances in life.

Parents want (and have always wanted) a better future for their children. That vision of a better future is currently predicated on access to and competence with ICT. There is little to suggest that this will succumb to change – and parents in the future will iteratively want a better future for their children. Time isn’t a straight line, it is a circle.

Politicians’ perspective

Politicians speak of the future as if there were no past or present. Political statements are usually written to “evoke the future, [and the promise of] the tomorrows that beckon” (Ellul, 1972, p. 41). Druick (1995) suggested that:

This narrative of future betterment - be it through metaphysical salvation or technological extension - is remarkable precisely because it remains expectant: it is perpetually anticipating a future that never arrives. (paragraph 8)

The slogan for Bill Clinton’s 1996 Presidential campaign was “a bridge to the future” based on promoting research and development into increasing the speed of the Internet, putting the infrastructure in place and making the technology available to schools. In a speech made in Knoxville, Tennessee, President Clinton said, “I want to see the day when computers are as much a part of classrooms as blackboards” (“Clinton pushing Internet,” 1996, p. 29). Such a day was not being promised – all that was being expressed was Clinton’s “wish” for this to happen.

The United States *State of the Union* address is delivered by the President in late January or early February. In the 1997 address, President Clinton offered that:

The new promise of the global economy, the Information Age, unimagined new work, life-enhancing technology – all these are ours to seize. That is our honour and our challenge. We must be shapers of events, not observers, for if we do not act, the moment will pass and we will lose the best possibilities of our future.

(Clinton, 1997, paragraph 7)

A similar sense of promise is evident in the recent Digital Strategy (New Zealand) which declared that:

Our government is committed to bringing the benefits of information and communications technology (ICT) to all New Zealanders - to create a society where ICT empowers everyone to create, access, utilise and share information and knowledge, enabling individuals and communities to achieve their full potential.

(Ministry of Economic Development (New Zealand), 2004, paragraph 2)

A push for comprehensive access was also noted in the 1996 election rhetoric of Paul Keating, then Prime Minister of Australia concerning the “information-rich” and “information-poor” and the role of the school system in ameliorating the divisions between them. Similarly, in the Digital Strategy (New Zealand), concern was expressed for those “people and communities [who] do not yet have the access, skills or confidence to get the

maximum benefits form ICT” (Ministry of Economic Development (New Zealand), 2004, paragraph 4).

Equipping and connecting schools has (politically) become a symbol of democracy and fair governance. The 1997 U.S. *State of the Union* address clearly declared by word and deed (in its live Internet streaming) that technology is a necessary good, “the modern birthright of every citizen” and by the perlocutionary power of the President of the United States, ICT was accorded a pervasive and profound role in American life.

Politicians also enter the discussion of how computers in schools are related to employment prospects, and here we again see the parallel dimensions of place (here the U.K. and Queensland (Australia)) and time (1981 and 200) being enacted. For example, in 1981, Kenneth Baker, then Minister for Information Technology in the United Kingdom said that:

I want to try and ensure that the kids of today are trained with the skills that gave their fathers and grandfathers jobs ... And that is the reason why we’ve pushed ahead with computers in schools. I want youngsters, boys and girls leaving school at sixteen, to actually be able to operate a computer.

(Wellington, 1990, p. 57)

While in a parallel dimension, in 2000, the Queensland Premier Hon. Peter Beattie, MLA supported the Budget allocation of funds into computers in classrooms with the rationale that this would “equip children for tomorrow’s workforce” (Franklin, 2000, p. 1). Concerning this expenditure, the State Treasurer, Hon. David Hamill, MLA added that “tomorrow’s jobs will depend on our students having access to high-quality technology today” (Franklin, 2000, p. 1).

The archetypal political line relating to ICT in education came from the then Prime Minister, Hon. Paul Keating MHR in the 1996 federal election. He said that “if voters were not sure that the Coalition was equipped to handle the information revolution ‘that is as good a reason as any other not to vote for them’” (Maher, 1996, p. 13)

Curriculum

The conditions for successful ICT integration emerging from the previously cited ACOT research studies included administrative support, physical configuration of learning spaces, and teacher collegiality (see Apple Computers, 2003; Sandholtz, Ringstaff & Dwyer, 1989, 1997). One of the ACOT reports (Haymore-Sandholtz, Ringstaff, & Dwyer, 1992) concluded that there are four conditions for the effective integration of ICT in education. These may be summarised as being:

- the adoption of innovation and the creation of a collaborative environment are complementary conditions for change;
- innovations introduced at only one level of the system are not likely to succeed;
- the introduction of technology to schools can act as a catalyst for change, thereby enhancing restructuring efforts; and,
- teacher commitment to an innovation will not occur until they see a positive impact on their teaching.

As before, these conditions will remain true in the future – but our descriptors, particularly of innovation, will change. We are now accepting, for example, online curriculum projects as being routine or commonplace rather than extraordinary activities. The need for peer

collaboration and systemic support are almost universal truths in a teacher's life and are unlikely to change.

Trinidad, Clarkson and Newhouse (2004) have developed a planning and analytical framework for schools in Western Australia. The five layers of their framework are inaction, investigation, application, integration and transformation. A "critical use border" was identified within the first layer (Layer One) between application and integration with integration deemed to be the stage where the use of ICT becomes critical to the support of the learning environment. Transformation is the stage where the teacher is able to take on leadership roles (formal or informal) in the use of ICT and be knowledgeably reflective on its integration by themselves and others. The second layer (Layer Two) is referred to as Integration and Use (I & U) and here speaks of integration as a component of the overall outcomes. Integration is therefore a process and an outcome. This curriculum framework (as with the previously cited ACOT framework describing teacher's actions) has the potential to remain current allowing us to change descriptors and expectations into the future. The "critical use border" is what we will most radically redescribe and re-align to new technologies and processes.

But what of those classrooms and schools where little seems to have changed. Ward (2003) investigated the seeming reluctance of secondary teachers in New Zealand to make fuller use of the ICT infrastructure available to them. Similar studies can be found all over the world as researchers look for the factors inhibiting teacher uptake. There is, however, a subtler problem emerging and that is of the teacher who may have replaced the blackboard for the electronic whiteboard but retains fundamental views about teaching and learning. Hayes, Schuck, Segal, Dwyer, & McEwen (2001) noted in their study of ICT use in NSW schools that where "teachers generally integrate computer-based technology into their existing teaching strategies. ... they were using technology as a replacement tool to provide tasks similar to those not mediated by technology" (p. 12).

The role of ICT as a potential catalyst for change has been contended in the literature for some time (see for example Fullan, 1993) and can be said to be in line with current (and potentially future) systemic approaches. It is a process which would require the four previously cited conditions for success in integration (as suggested by Haymore-Sandholtz, Ringstaff, & Dwyer, 1992) to be evident. Toomey (2001) noted a trend to "whole school reform" through the use of ICT by suggesting that:

Many schools are now experimenting with new approaches to teaching and learning. They are doing so because they consider it a valuable way to encourage the development in young people of higher order thinking skills such as synthesising, analysing and evaluating, problem solving abilities, working in groups and other lifelong learning skills. They also recognise the relevance of these skills for life in the information economy. (paragraph 23)

There is no uniform implementation or integration of ICT in the curriculum in either Australia or New Zealand. This patchiness has been a concurrent feature of ICT education since its inception with some teachers displaying extraordinary enthusiasm while others have displayed extraordinary gifts in avoidance (Lloyd & Yelland, 2004). This is a perennial problem and one which will be with us into the future. Using ICT in education has much to do with teacher beliefs, and until some way is developed of making beliefs uniform, then multiple approaches and experiences for students will be common.

Play it again, Sam

The opening sentence of the rationale of the *Application of New Technologies to Enhance Learning Outcomes for Students* (Education Queensland, 1999) offered that “the pervasive use of computers in society and the concurrent explosion of information has had a *significant impact* on education” (p. 13) (emphasis added). The very same sentence appeared in the Introduction to the 1995 *Guidelines for the Use of Computers in Learning* (Department of Education, 1995b, p. 1). The notion of “significant impact” recurs in the 1983 *Computers in the Curriculum* (State of Queensland, 1995) policy document with its first sentence being, “Computers and computer-related technologies have made a *significant impact* on our society” (p. 2) (emphasis added). We are left to wonder if the “significant impact” of 1995 (or of 1999) is the same “significant impact” of 1983, or is it a new or more significant impact? The more things change, the more they stay the same - literally.

Bill Hayden, then Governor-General of Australia, opened the WCCE/90 Conference in Sydney offering the view that “the computer is a powerful and promising tool for education,” and that “every child must become confident and competent with computers and so must their teachers” (“Educators and policy,” 1990, p. 1). It does not stretch the imagination too far to envision a current governor-general or other dignitary making the exact same speech at a contemporary function. The parallel dimensions in which we operate would absorb this kind of rhetoric without any anachronism or cultural clash.

The theme of *As Time Goes By* is the recursive nature of life itself, seemingly oblivious to the changes of time and negating the notion of time as a straight line. The song is a perennial and sentimental favourite alluding to déjà vu and how, “no matter what the future brings” the “fundamental things” will still apply. We can be assured, with ICT in education, that some things will fall into familiar patterns and some old ideas will be dusted off and tried again. This cycle has already been observed in both Australia and New Zealand with uncannily comparable experiences and events occurring in both countries. Lankshear (cited in Armitage, 1998, p. 4) said that the 1997 *Digital Rhetorics* project found “exactly the same problems as there were 15 years ago ... lots of funny practices, odd practices, things that look counterproductive.” This paper has suggested that we do not need to wonder about the future, we might not know what the new widgets will be called or what the Windows 2500 or open-source interfaces will look like, but this is of little consequence. We know that the future will iteratively be full of concerns for the future, that computer education will be of national importance, and that parents, kids, teachers and politicians will behave exactly as they had always done. The future is tomorrow, the future is the next millennium. Tomorrow never comes – it doesn’t have to, it’s already here.

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