The Impact of Technology on Primary Schools

Submitted in partial fulfilment of the requirements for the degree of Master of Communications, Victoria University of Wellington

Grant Warren Sherson August 1999

Abstract

This paper attempts to look at the impact some technology has had on primary school teaching in New Zealand and propose future threats and opportunities that technology might bring

Introduction

Technology comes in a range of forms in Primary Schools. Included in this range are the tools teachers use to deliver courses, develop course materials and manage classroom administration. Add to that list the office tools used to handle finances, maintain communication, keep records and process documents and you have the main technology components used in schools. This paper attempts to look at the impact some of this technology has had on primary school teaching and propose future threats and opportunities that technology might bring.

According to a New Zealand Education Review Office report (1997), change driven by information technology is having a significant impact on every aspect of life and is an increasingly critical issue for education. Nearly twenty years ago Papert, (1980, p21) claimed that the computer is "not just another powerful educational tool. It is unique in providing us with the means for addressing what Piaget and many others see as the obstacle which is overcome in the passage from child to adult." Papert goes on to say "I am essentially optimistic-some might say utopian - about the effect of computers on society" (Papert, 1980, p26).

Enormous amounts of technology, specifically computers, have been installed in schools based on a belief in this effect. Not all agree with this belief. A British report says that the impact of technology "can only be described as disappointing" (McCormick, 1999). It also suggests that although a large amount of money has been poured into technology, there has been little benefit and little change.

Has technology, and in particular computer technology, had any impact on primary schools other than costing them money?

The Last Ten Years with Computer Technology

Ten years ago was about the point in time when office typewriters were being replaced by office computers and the banda machines replaced by photocopiers. The number of computers in schools was growing quickly. Most schools were scrambling to buy computers, teachers were taking in-service courses and parents in affluent areas were donating computers to schools (Ginsburg & Zelman, 1988, p152).

The focus for many schools seemed to be to get the computers in and then decide what to do with them, a sort of, 'fire – ready – aim' philosophy. It was also the a time when teachers had confirmed the role of the Logo programming language, had grappled with numerous adventure games and had begun the concept of classroom desktop publishing But still the most frequent use of computer technology involved drill and practice. (Ginsburg & Zelman, 1988, p153).

At that time more than three quarters of New Zealand primary schools were using computers in their teaching programmes and there was one computer for every 14 students (Lai, 1992, Marsh, 1999). There were computers of all shapes and sizes; IBM, Apple II, Commodore, Atari, Amstrad Acorn, BBC, Apple Macintosh plus numerous clones.

It was past the pioneering stage but still just the beginning of the use of computers in schools and there were few written policies and objectives for computer-integrated teaching and learning. Schools relied heavily on the one or two teachers in the schools who knew about computers. In some cases the computers had begun to gather dust in cupboards as schools that had made hasty decisions about them found they had chosen badly or the person who had organised the computers into the school had moved on.

Teachers were trying to tack computers on to what they were already doing and when the computers didn't fit they were left as games machines or not used at all. Rather than having an important role to play in children's education computers were used primarily as auxiliary tools to reinforce basic skills and knowledge already introduced using other methods and tools (Caffee, 1998). Without national or even local plans and policies, the methods employed in each class were chosen by the teacher and varied widely. The content of computer use was generally related to the teacher's comfort level with computers and level of computer skills and experience. (Caffee, 1998).

Since then there have been numerous advanced in technology including computer functionality and telecommunications. The commercial interest has been a powerful force. Schools have been caught up in collecting supermarket vouchers, bread packets and several competitions in the drive to get computer technology into their schools. The effect of this

pressure has been to trim down the range of computer technology to IBM compatibles, Apple II Macintosh and Acorn/BBC models (Marsh, 1999). The other effect of the commercial and societal pressure is that schools still have the philosophy to get the technology in without really knowing what to do with it.

By 1998 nearly all New Zealand primary schools had a computer somewhere. At least half of New Zealand primary schools now even provide access to the internet, in a minimum of one classroom and roughly 23% of all primary classrooms have internet connections (Marsh, 1999, Sullivan, 1998). There are even more than 10% of primary schools with their own web pages (Sullivan, 1998).

There was considerable promise from the amount of technology put into schools but the effect has not been as dramatic as expected. Teachers still often lack the knowledge and confidence to utilise the growing technology to its full educational potential. (Adams 1992). According to one American report computers are still used for skill development drill and practice (Rand, 1999). Other results suggest that:

Research has found that students at the elementary level used computers overwhelmingly in an exercise mode, doing drills and playing various educational games, rather than in a productivity mode (Berg, 1998, p120).

It appears that the investment in technology over the last ten years has not made much difference at all. The schools that were busy collecting supermarket vouchers in order to gain more computers certainly resulted in computers being increasingly used in most New Zealand primary schools. The difficulty is that it seems to have been assumed by many principals, teachers, parents, and groups with commercial interests that the use of sophisticated computer technologies will automatically equate to conditions for better learning (Brown, 1995). This assumption has not borne fruit.

But what about all the glowing reports about how successful computers are in schools? What about the following comment from an American department of education forum?

"We know now - based on decades of use in schools, on findings of hundreds of research studies, and on the everyday experiences of educators, students, and their families - that, properly used, technology can enhance the achievement of all students, increase families' involvement in their children's schooling, improve teachers' skills and knowledge, and improve school administration and management." (Department of Education Forum, 1995).

The key words here are "properly used". The way the technology is applied is the significant factor not the technology itself. For students in an environment of good teaching practice, along with the technology, there is improved academic opportunity and success.

Page 3 of 11

Writing is probably the most obvious example. Several studies have demonstrated that technology is particularly valuable in improving student writing. (Coley, 1997) The ease with which students can edit their written work on word processors keeps them motivated, which in turn improves the quality of their writing. Teachers have begun to realise the value of technology for this application and more recently the word processor has taken over the spot of the most frequently used piece of software (Drenoyianni & Selwood, 1998, p93). Even with the success of computers in writing, experimental results have been mixed and tend to confirm that the type of learning environment provided is rather more important than the type of hardware and software employed (Ryba, 1991).

The most significant impact of technology has not been the technology in the classrooms but the way it has been a catalyst for reform in classrooms. Ken Ryba (1991) puts it this way.

The truly remarkable thing about technology is that it has caused us to think a great deal more about who we are and how we relate to others. It has helped to change our awareness of ourselves, our awareness of one another and our awareness of the educational process.

There have been recorded changes in the behavior of teachers and students in technology rich schools. The students have started taking more responsibility for their own learning, and the teachers are working more as mentors and less as presenters of information (Department of Education Forum, 1995).

There is reason to believe that the technology in itself has not directly caused the improvement in education. The technology has more indirectly caused the change in teaching practice; and the teaching practice, along with good implementation, caused the technology to be successful in education (Rand, 1999). As Lai (1992) puts it, the issue is not whether we have enough computers but the way they are used in the classroom"

Threats and opportunities

There are a number of threats to the future of technology use, in primary schools. There has been a huge investment in technology in the mid and late 1980s which suggests that many school computers are relatively old. The combination of steady acquisition and accumulation of equipment by schools means that much of the school computer equipment is technologically obsolete. At the beginning of school year 1993-94, nearly half of the computers in American schools were early model Apple computers (Rand, 1999). To bring schools through to the next level of technology use, will require further investment based on a belief that this time the investment will provide some return. This is where the difficulty arises. There is a significant reaction to continuing to pour money into technology when there is little or no measurable return. Samuel Sava, the head of the National Association of Elementary School Principals questions the way America is attempting to fill schools with computers. "I have not the slightest doubt about the value of computers in our society. But I question whether we have learned to apply this technology to K-8 instruction." (Institute for Academic Technology's Information Resources Group, 1997). The value of computers as a definitive aid to learning has not matched the investment and that issue will continue to provide a barrier to adoption in the minds of some educators. Skeptics of the computer revolution say that microcomputers will fall prey to the same forces that relegated previous technological innovations such as radio and education television to storage rooms and closets (Mehan 1989).

Where there has been considerable investment there is also the threat that the technology will drive the learning, rather than the other way around. As the technology becomes the focus, the real role of the education system is forgotten. Ken Ryba (1991) says "A real concern that nags me is the possibility that sophisticated computer effects may be diverting attention away from important elements of academic learning."

A blind adoption of technology for its own sake may do more harm than good for education. Fundamentalist educators would say this is already clear in the results of a 1996 poll in America in which teachers ranked

"Computer skills and media technology as more 'essential' than the study of European history, biology, chemistry, and physics; than dealing with social problems such as drugs and family breakdown; than learning practical job skills; and than reading modern American writers such as Steinbeck and Hemingway or classic ones such as Plato and Shakespeare." (Oppenheimer, 1997).

The arguments given for putting computer technology into schools is to make tomorrow's work force competitive in an increasingly high-tech world. To achieve this, learning computer skills are claimed to be a priority. This is seen by some as not matching the reality. In a recent article in the Scientific American, Wayt Gibbs suggests that productivity in fact has decreased as a result of technology.

"What puzzles economists is that productivity growth measured in the seven richest nations has instead fallen precipitously in the past 30 years, from an average of 4.5 percent a year during the 1960s to a rate of 1.5 percent in recent years. The slowdown has hit the biggest IT spenders--service-sector industries, especially in the U.S.--hardest. Most of the economic growth of the 1990s can be explained by increased employment, trade and production capacity. Computers' contributions, in contrast, nearly vanish in the noise." Another threat to primary schools is the continued implementation of technology without sufficient support and training. Caffee (1988) states that "for technology to be a vehicle of change within the educational process three things must happen. First, sufficient hardware resources must be available to facilitate the change. Second, the teachers who lead this change must be trained in the use of the hardware. And finally, methods of using these technologies in a symbiotic fashion with traditional teaching methods must be developed and implemented". Without all of these in place technology will remain an add-on to the teaching process and the real potential for technology in education will not be realised. Historically the opportunities for education do not lie in what technology does but in what can be done with the it. If we take what the technology does and add innovative creative educators, able to keep education as the focus, educational opportunity abounds. At a Silicon Valley expo, convened by the Association for Computing Machinery, a handful of chief technologists forecast how computers would evolve. They suggested that there would be:

Computers exchanging video calls as commonly as e-mail. Three-dimensional windows that open into virtual worlds instead of virtual scrolls. Machines that speak and respond to human languages as well as their own. Personal "agent" programs that haggle for concert tickets, arrange blind dates and winnow useful information from the chaff of daily news. And everything, from our medical records to our office files to the contents of our refrigerators, hypertextually linked via the great global network. (Gibbs 1997).

Put these innovations in a school context and virtual classrooms will become reality, language difficulties will be a thing of the past. Writing will become a recreation rather than a chore and teaching QWERTY typing will disappear from the curriculum. Once computer technology stops getting in the way and becomes as transparent as the telephone, then it will impact enormously on all aspects of education.

"Compared with the big economic bangs delivered by water-, steam- and electricity-powered machines, productivity growth in the information age has been a mere whimper." (Gibbs 1997). What we can expect in the next few years is an explosion of technology that doesn't take it into the forefront of what we do, but like the telephone, becomes a normal part of everyday life in the background of everything we do.

Technological Determinism

Technological determinism has had a significant role in the introduction of computers into primary schools. In spite of the many reports stating that advanced technology does not

equal advanced teaching and learning, there is still a belief that technology is vital for learning. (Ryba, 1991).

Computers have been installed with fervor that is not seen with other resources. The figures speak for themselves. The density, measured by the number of students per computer, has fallen dramatically in the past 12 years. This growth has been encouraged by lower costs of computers, improvements in the quality of productivity software, and the belief of increasing numbers of parents that a capability to use technology constitutes another basic skill that schools should provide their students (Rand 1999).

There is a strong belief that the technology is going to somehow save children from impending doom like the laptop in the movie 'Independence Day'. There is a belief that a modern citizen has to have an understanding of technology to be able to function, and to be collectively in control of the development of society that is increasingly driven by technology (McCormick, 1999).

Schools have responded to the call for technology but the teachers largely use computers according to their pre-existing conceptions of teaching.

The actual flow on effect of technological determinism to the students is happening in spite of what is happening in schools rather than because of school adoption. In most cases, the sophisticated features of the hardware and software hide what are still traditional approaches to teaching. D'Ignazio (1990) makes the point that there are many schools using advanced technologies in accordance with out-dated models of learning, whereas, there are many schools experimenting with innovative teaching approaches with out-dated technologies.

Concluding Comments

When we try to determine the effectiveness of educational technologies, we are confronted by a number of methodological and practical issues. First, we need to remember that technology is only one component of an instructional activity. Assessments of the impact of technology are really assessments of instruction enabled by technology, and the outcomes are highly dependent on the quality of the implementation of the instructional design. (Coley, 1999).

In some cases, technology is just one of a number of strategies for achieving an educational purpose--for example, teaching and learning introductory algebra. In others, it may be the only way to achieve some goal such as distance learning or to provide foreign language instruction to small, remote schools.(Rand, 1999).

Computer technology was expected to reform education in the same way that radio, motion pictures, and television were expected to. Apart from isolated instances, all of these technologies have failed to have the expected impact.

Perhaps it is early days yet. Too much of the implementation of technology in schools relies heavily on the teachers. To get any educational innovation into existing practices is highly dependent on the personal and individual meanings that teachers give to it. (Drenoyianni & Selwood, 1998, p89). Maybe when more technology is in place the teachers will use its potential to make a significant difference in what, how and why students learn. And there is going to be more ...

"We stand today on the threshold of an explosion in information technology, the social and economic consequences of which will make everything that came before look like slow motion." (Gibbs 1997).

References

- Adams, J., Adams. P., Cheng, F., & Sutherland, J. (1992). Teacher's attitudes and perceptions of computer needs. <u>Computers in New Zealand Schools 4</u> (3), 10-17
- Berg, S., (1998). Exemplary technology use in elementary classrooms. <u>Journal of research on</u> <u>computing in education 31</u> (2), 111-122
- Brown, M., (1995). Learning with computers: After the supermarket vouchers. [On-Line] Available URL: <u>http://www.massey.ac.nz/~wwedpsy/t%26sres/mark2.htm</u>
- Caffee, J., (March 1998). Assessment of the effectiveness of computer resource allocations in elementary education. [On-Line] Available URL: http://www.avana.net/~jcaffee/ElemResAlloc.htm
- Coley, J., (1997). A new study shows the effectiveness -- and the limitations -- of school technology. [On-Line] Available URL: <u>http://www.electronic-school.com/0997f3.html</u>
- D'Ignazio, F. (1990). An inquiry-centered classroom of the future. <u>The computing teacher, 17</u>, 16-19
- Davies, J. (1997). Research on Technology Use in Education. [On-Line] Available URL: <u>http://www.quasar.ualberta.ca/edpy485/edtech/research.htm</u>
- Drenoyianni, H. & Selwood, I., (1998). Conceptions or misconceptions? Primary teachers' perceptions and use of computers in the classroom. <u>Education and Information</u> <u>Technologies 3 (2)</u> 87-99

- Education Review Office Report (Oct 1997). The Use of Information Technology in Schools. [On-Line] Available URL: <u>http://www.ero.govt.nz/Publications/eers1997/itsch.htm</u>
- Gibbs, W. (July 1997) Taking computers to task <u>Scientific American 277,(1)</u> 82 [On-Line] Available URL: http://www.sciam.com/0797issue/0797trends.html
- Ginsburg H. & Zelman S. (1988) <u>Understanding idividual differences in the computer age</u> in Constructivism in the computer age, Foreman, G & Pufalls, P. (Eds), Lawrence Erlbaum Hillsdale New Jersey
- Hunt, T. (1988) (ed.) Computers in Education New Zealand. <u>New Zealand Computer</u> <u>Education Society Magazine 2</u>. (1), 1988
- Lai, K (1992) <u>Learning with computers: issues and applications in New Zealand education</u>. Dunmore Palmerston North
- McCormick, R., (Accessed 1999). Curriculum development and new information technology. Centre for Technology Education, The Open University, United Kingdom. [On-Line] Available URL: <u>http://rice.edn.deakin.edu.au/Archives/JITTE/j113.htm</u>
- Marsh, F., (April 1999). <u>IT Use in New Zealand Schools: Computers in Schools</u>. This is a chapter in a report on "Statistics on Information Technology in New Zealand", written by Frank Marsh of the Ministry of Commerce. [On-Line] Available URL: <u>http://www.moc.govt.nz/pbt/infotech/it1999/it99-07.html</u>
- Mehan, H (1989). Microcomputers in classrooms: educational technology or social practice? <u>Anthropology and Education Quarterly 20</u>
- Oppenheimer, T, (July 1997) The computer delusion. <u>The Atlantic Monthly 280</u> (1) 45-62 [On-Line] Available URL: <u>http://www.theatlantic.com/issues/97jul/computer.htm</u>

Papert, S (1980). Mindstorms: Children, computers and powerful ideas. Brighton Harvester

- Rand. (Accessed 1999). The use and effectiveness of educational technology today. [On-Line] Available URL: <u>www.rand.org/publications/MR/MR682/ed_ch2.html</u>
- Ryba, K. (1991) <u>Kids, classrooms and computers in the 1990's. What we've got is it right?</u> Keynote address New Zealand Computer Education Society Conference, Wellington New Zealand September 1991

- Institute for Academic Technology's Information Resources Group. (July 1997). Computers and Classrooms: The Status of Technology in U.S. Schools. Views of technology in schools/workplace: backlash or reality check? ISSN 1071-5223 <u>IAT infobits 49</u> [On-Line] Available URL: <u>http://www.iat.unc.edu/infobits/bitjul97.html</u>
- Sullivan, C., (November 1998) <u>IT in Schools</u>, A report prepared for ITAG by Charles Sullivan of BRC Marketing & Social Research (Sponsored by Microsoft, Apple, Hewlett Packard and the Ministry of Education).. [On-Line] Available URL: <u>http://www.moc.qovt.nz/pbt/infotech/it_in_schools_98-03.htm</u>
- Department of Education Forum, (1995) <u>Technology's impact on learning</u>. [On-Line] Available URL: <u>http://www.nsba.org/sbot/toolkit/tiol.html</u>

Further Reading

- Chamberlain, M. (1992) A study of the use for teaching and learning in two New Zealand secondary schools. <u>Computers in New Zealand Schools 4</u> (3), 6-9
- Harris, D., (Accessed 1999) Information and communication technology in the New Zealand educational context. [On-Line] Available URL: <u>http://www.minedu.govt.nz/Schools/ITinSchools/</u>
- Hunter. W., (1996) Computers in education: wild speculation and sober thoughts. Keynote presentation to New Zealand Computers in Education Society 6th biennial conference Hamilton New Zealand Jan 1996, 25-36
- Information Technology Advisory Group. (November 1998) IT in Schools: Use of telecommunications [On-Line] Available URL: http://www.moc.govt.nz/pbt/infotech/it_in_schools_1998/it_in_schools_98-05.html
- Information Technology Advisory Group. (November 1998) IT in Schools: Barriers to Schools Getting Value from IT. [On-Line] Available URL: <u>http://www.moc.govt.nz/pbt/infotech/it_in_schools_1998/it_in_schools_98-08.html</u>
- Lane, C., (Accessed 1999). <u>The Role of Technology in the Systemic Reform of Education and</u> <u>Training Part 1</u>. This study was conducted under a Star Schools Dissemination Grant to The Distance Learning Resource Network (DLRN) through OERI, U.S. Department of Education. . [On-Line] Available URL: <u>http://www.wested.org/tie/dlrn/reformtechpart1.html</u>

- Learning By Design, Research on Instructional Technology. [On-Line] Available URL: <u>http://207.201.187.139/research.htm</u>
- Leiberman, D & Linn, M.(1991). Learning to learn revisited: Computers and the development of self directed learning skills. <u>Journal of research on computing in eduction 23</u> 373-395
- Perkins, D. (1985). The fingertip effect: How information processing technology shapes thinking. <u>Educational Researcher</u> 14.
- Wellburn, E., (1996). <u>The Status of Technology in the Education System</u>: A Literature Review.
 Ministry of Education, Skills and Training, British Columbia, Canada. [On-Line] Available
 URL: <u>http://www.cln.org/lists/nuggets/EdTech_report.html</u>