Twenty Years of Australian Educational Computing: A Call for Modern Traditionalism

ABSTRACT

This article reflects on twenty or more years of development and research in educational computing. It argues that the emphasis on exploiting the technology in the service of contemporary ideas about learning held by many of the early workers has been lost to a focus on the technology itself and its capabilities. In schools this has led to an artificially "vocational" emphasis on the learning of skills in using applications designed not for learning but for use in business and industry. Using the term "modern traditionalism" (Robertson 2003), the article advocates the use of information and communications technologies in education for the enhancement of students' broader learning, and draws attention to the need to re-visit and build on some of the earlier work to avoid re-inventing ineffective wheels and to benefit from the valuable pioneering work in the relatively short history of our discipline.

Warning: This article contains references to work published earlier than the year 2000. Readers confident that nothing worthwhile could have been said about computers in education before that time should read no further.

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INTRODUCTION

I shall argue that practice, development and research on information and communications technologies (ICT) in schools should focus above all on educational purposes. To this end I outline early work in educational computing, which emphasised educational and broader learning goals far more than is generally the case in schools today. I contend that this perspective has been lost in the constant commercial and related pressures associated with the fast and enormous development of computing, information and communications technologies, a loss detrimental to our discipline.

Was It Only Twenty Years Ago?

Constructivism in learning has its origins in the pioneering work of the philosopher and developmental psychologist, Jean Piaget (see for example Piaget 1952, 1977). In contrast with the previously dominant view of learning as relatively passive absorption by learners of knowledge transmitted by external sources, Piaget argued that learners actively build their cognitive structures as a result of their day to day experiences and activities. Seymour Papert, now widely acknowledged as the fundamental theorist of educational computing, spent time working in Switzerland with Piaget and was strongly influenced by Piaget's work on learning.

Papert's subsequent work at the Massachusetts Institute of Technology resulted in the publication in 1980 of the seminal text *Mindstorms: Computers, Children and Powerful Ideas*. In this book he described ways in which controlling the power of the computer – programming - might empower learners, enabling them to build and investigate an enormous variety of computer-based artifacts. With colleagues he developed the powerful *Logo* programming language to enable this; *Logo* is now embedded in its multimedia descendent *MicroWorlds*. Papert discussed ways in which programming activities can enable the "concretization" for learners of otherwise abstract ideas. His views were supported by the work of others. Abelson and DiSessa's *Turtle Geometry: The Computer as a Medium for Exploring Mathematics* (1980) suggested mathematical activities through which learners might actively investigate topics ranging from elementary geometry to general relativity. Sylvia Weir's Cultivating Minds (1987) and Sherry Turkle's *The Second Self* (1984) described how the computer's facility for visualization of shapes and animation of processes could enable learners of a range of intellectual styles and working preferences to undertake learning activities that would otherwise not be available to them.

Other early work in the USA explored the design of educational software of many different types and investigated the potential of computers for individualizing learning and increasing the efficiency and effectiveness of learning; a concise summary of much of this work is provided in the early sections of Johnstone's book Never Mind the *Laptops: Kids, Computers and the Transformation of Learning* (2003).

BIOGRAPHY

Anne McDougall is Associate Professor of Computer Education and Head of the Department of Science & Mathematics Education at The University of Melbourne. She has held teaching positions in secondary schools in Victoria and computer programming positions at Melbourne University and Duke University in the U.S.A., and has under-taken consultancies for the Education Department of Victoria and for schools and industry clients. She is a Member of the Australian Computer Society and holds leadership positions in educational computing both nationally and inter-nationally. In a career spanning more than 30 years she has written or co-authored 16 books on various aspects of educational computing, including translations into French, German, Spanish and Chinese, and published over a hundred research reports, journal articles and conference papers.

In the UK during the 1980s major government projects supported work in universities and other centres to collaborate with teachers in the design and development of software specifically for schools, and to provide teacher professional development in the curriculum integration and use of these materials. Software developed by groups such as those at King's College Chelsea, the Shell Centre at Nottingham University, and the Advisory Unit for Computer Based Education at Hatfield, and by individuals such as Mike Matson incorporated ingenious ways of exploiting the technology to offer students learning experiences that would be difficult or impossible otherwise. Some examples are simulation programs designed to enable students to actively investigate dangerous or complex scientific, mathematical or social processes, computer based games of many kinds that provided bases for class discussion and role play, and data bases used to focus students' development of investigative skills in history and social studies. Many of these were supplemented with sophisticated print materials stimulating valuable on- and off-computer activities.

Early work in Australia was of course influenced by developments overseas, and articles by a number of the important early writers have appeared in earlier issues of *Australian Educational Computing*. Innovative and powerful educational software was also developed here, such as the suite of genetics programs developed by Judith Kinnear, and Sandra Wills's *First Fleet*.

I do not wish to argue that all the early writing about computers and their roles in education is of value to us today. On the contrary, some of the early articles appeared to ignore contemporary understanding of learning processes, advocating computerised drill and practice and rote learning tutorial programs liberally sprinkled with multiple choice quizzes, to increase learning "efficiency" and decrease the time taken for learners to "cover" set material. This period also saw the development of so-called author languages, computer environments into which teachers with no knowledge of programming were to be able to enter lesson materials; some writers claimed rather surprising success for these author languages, despite the constraints and restrictions in teaching approaches widely reported by teachers attempting to use them.

Where is the History Now?

Papert made a strong case for the enhancement of learning through students developing programs and building and investigating computer-based artifacts and ideas. His argument has subsequently been substantiated over and over again by researchers in many countries. But today how many students are taught to program, to control the power of the technology to build and investigate for themselves interesting and complex artifacts or abstract and challenging ideas?

The educational software described in the previous section was developed for machines with vastly smaller memories and screen resolution far inferior to those of today. Because of the developments in the technology this software has in most cases been discarded. With it has gone much of the knowledge about educational software design and the computer's potential to support and strengthen learning. Many of these programs were designed in collaboration with teachers, specifically for use in schools; readers will note that most of the software used in schools today was not designed for education at all. Further, much of the teaching skill and educational wisdom in the design of these old programs would still be relevant for learners of today if the software, and in many cases extensive associated off-computer support materials, were to be "versioned up" to exploit the current superior technology. Why has this not happened? Is it the expense? Or have we perhaps been convinced by forces outside education that what the newest technology can do should drive what we *should* do in schools?

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The Internet and associated developments in the technology have caused a revival in the development of technology-based environments into which teachers (and university lecturers) might enter learning materials – whole courses – for students to work on. This *is* a revival, despite the making of claims such as one I heard from a senior educational administrator not long ago, that e-learning is "a new kind of learning". I wish we could be confident that the designers of modern Learning Management Systems have studied and eliminated the educational limitations of the author languages that proved so constraining to teachers and lecturers in the 1970s and early 1980s. Or must we assume that all of the problems then were due simply to a need for larger memories, better screen resolution, and the ability to have material delivered instantly to anywhere in the world?

Curriculum, Competencies and Standards

More and more of what is done in schools is determined by curriculum guidelines and documents listing competencies and standards desired of students and teachers. Regarding the use of information and communications technologies in schools, these documents generally, and sometimes exclusively, specify skills in the use of various computer applications and the Internet.

School use of information and communications technologies should be for educational purposes, for the support and enhancement of learning. Most of the information technology skills that students are currently expected to "learn" in school would be picked up incidentally by them as they use the technology for learning purposes – how many of our students need formal teaching and competency tests of the skills of using mobile telephones? Many of these skills, while currently used in business and industry, will be out of date by the time the current Year 10 students are in the workforce – not to mention current Year 2 students. Further, these skills may well be taught inappropriately if contexts or uses for them have to be contrived for the purpose of satisfying competency requirements; I occasionally receive lists of names, room numbers and telephone numbers presented in spreadsheet format, and cannot but wonder about the purveyor's understanding of the purpose and potential power of a spreadsheet.

CONCLUSION

I would argue that in disdaining the history of our discipline because early computers were inferior to our present technologies we lose much valuable experience and knowledge about the educational uses of information and communications technologies.

I propose a new approach in educational computing. I take the name of this approach from the writing of John Robertson, a Professor of Law who works on the ethical and policy implications associated with technological developments in artificial reproduction. Robertson argues for an approach he calls modern traditionalism.

> *Modern traditionalism … is modern* in its acceptance of new technologies, but *traditional* in demanding that those techniques ordinarily serve traditional reproductive goals … (Robertson 2003: 446).

I suggest that replacing the word "reproductive" with "educational" in Robertson's quotation gives us a valuable guide in our approach to practice, development and research in educational computing. Of course we would be foolish not to utilise and exploit the enormous power of current technologies. But let us not assume that new technologies require us to repudiate the knowledge gained by earlier workers in our discipline or the essentially educational purposes of our use of these technologies.

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