The Australian Centre For Computer Enhanced Learning

NEIL HOOLEY AND RON TOOMEY
Department of Education, Victoria University of Technology

INTRODUCTION
The term 'Computer Enhanced Learning' (CEL) refers to the utilisation of computers to deepen intellectual understanding of significant ideas by their being used as 'cognitive tools' (Rowe 1993). By cognitive tools, Rowe means that computing 'can provide users with a box of reconstructible tools which can change the characteristics of problems and learning tasks.'

To reinforce the notion of student control over the box of reconstructible tools and the assumption that technology will provide new avenues to human perception and insight, CEL is clearly demarcated from Computer Assisted Instruction (CAI) and the loosely defined generic term of Computer Assisted Learning (CAL).

Computer Enhanced Learning is predicated on the view that the introduction of computing technology into a classroom changes the context of that classroom and enables young people to develop their learning and thinking skills in different ways from the approaches they use in the absence of the computer. Importantly, as Papert (1985) reminds us, 'If you want to understand (or influence) the change, you have to centre your attention on the culture — not on the computer.'

THE AUSTRALIAN CENTRE FOR COMPUTER ENHANCED LEARNING
Whilst there is considerable evidence that the introduction of computers to classrooms does effect young people's approaches to learning, it is less certain as to precisely why these changes occur and how they might be made more widespread. Accordingly, a research development and dissemination centre, known as the Australian Centre for Computer Enhanced Learning (ACCEL) has been established within Victoria University of Technology, Melbourne, Australia, to pursue research in this field. Significant support for the establishment of ACCEL has been provided by IBM Australia and the Victorian Education Foundation.

The work of the centre will primarily concentrate on projects within two main domains:
- teacher research into Computer Enhanced Learning and
- investigation of approaches to having Computer Enhanced Learning adopted more widely.

Initially, ACCEL's research and development program has concentrated on investigating and promoting classroom uses of multimedia technology. However, this has been considerably influenced by what Rowe (1993) calls 'computer literacy' and Papert (1985) denotes 'computer criticism'. This has been done by mounting projects which are applied in nature and conducted in ways which have students and teachers not only explore the uses of computers as cognitive tools, but also have them critique social and educational aspects of computing as well.

The centre has been established to serve primarily the local western region schools of Melbourne, its higher education providers, local industry and the Science and Technology Division of the Museum of Victoria at Spotswood. Traditional research techniques have been combined with those of applied and action research. The term 'action research' refers to practitioners identifying issues for investigation, the establishment of project teams and an ongoing process of observation, reflection and changed practice.

Functions
Throughout 1992-1995, work has proceeded on the following functions of the centre:
- Investigate multimedia application in schools. Eight local primary schools have incorporated the Linkway Live! multimedia program into their curriculum at the Grade III level. Students have investigated and compiled their own multimedia projects such as the Olympic Games and material gathered from excursions to the Zoo.
- Investigate multimedia application as a
form of distance education or primary schools and as a means of overcoming educational disadvantage. A computer video link has been established between the Royal Children’s Hospital and the schools of patients within the hospital. This enables children in hospital to maintain contact with their school classrooms by having face to face contact with their teachers and friends. Utilising a similar link with the science and technology museum at Spotswood, is being investigated.

- Conduct coordinated applied action research in schools on techniques for computer enhancement of learning in mathematics, science, computing and language. Primary school use of multimedia applications have been designed to promote cross-curriculum student writing and discussion with other children related to their reading program, such as exploration of the solar system via compact disk.

- Provide professional development programs for local teachers on computer enhanced learning, enabling a local network of schools to share and refine the outcomes of their action research projects. Studies within a fourth year Bachelor of Education program have been established which enable practising teachers to upgrade their qualifications by conducting an extended classroom investigation on computer enhanced learning. Different schools thereby provide mutual support and networking by sharing experience of teaching and learning for improvement in learning outcomes.

- Work with teacher educators to utilise technology for teaching purposes and in the development of units and courses on technology and education. Computer based activity is being introduced into courses to assist with the preparation of beginning teachers.

- Develop the technique of action research, particularly in regard to journal writing, reflection and conjecture on teaching and learning practice. Initiatives in action research involve investigation of reflection on the part of teachers by closely describing in journals the impact of the computer on student learning, as distinct from a more general description of teacher behaviour. Attempts have been made in drawing together research group speculation on learning outcomes to provide a basis for more refined ongoing work and guidance for other teachers interested in the change process. This work is being developed in booklet form for professional development activity.

EMERGING PROJECTS
In the longer term, the examples shown below illustrate the variety of projects which it is hoped, will be instigated:
- Teaching and Learning: Investigation by a group of primary school students of the use of computer in musical composition. Experimentation with synthesisers and composition packages. Description of how technology can extend or inhibit human creativity. Experience at a recording studio and with a professional band.

- Professional Development: Long-term professional development programs with primary school teachers related to improving student understanding of mathematical ideas. Use of graphics software. Teachers note observations, contribute to collective journal entries and suggest new software features.

- Teacher Education: University staff develop a new course for school level co-ordinators and holders of responsibility positions, which highlight the use of computer based technology for learning purposes across the curriculum. Education students will be required to undertake a small research study to evaluate the manner in which computers can support enquirv learning.

- Computer Based Training: Development by a group of local teachers, students and university personnel, of a training module for resource management and action research projects meeting the needs of 'Schools of the Future'.

- School-Industry Interaction: A program of visits by students to local industrial plants to observe the production of in-house newsletters and publications by desktop publishing. The techniques and means of organisation observed to be incorporated in a school setting for a range of student and school publications. Graphics, text and colour to be utilised for communication of ideas to the targeted audience.

- Technoethics: Project group of staff, local industry and teachers to investigate the impact of technology and automation or organisation within the workplace (including schools), deskillng and reskilling the culture of work and the ethics of teaching and learning. Development
of a 'stack' of hypertext presentation, or multimedia presentation for real audiences, for example, attendees at the Science Museum. Implications of ethical considerations for the school use of computers and hardware and software design.

**CRITERIA FOR ACCEPTANCE OF PROJECTS**

Projects can be proposed from local schools, local industry, higher education providers and local community groups and are negotiated with the centre in accordance with the proposed following criteria:

- Emphasise issues related to learning, language development, mathematics, science and technology.
- Incorporate techniques designed to promote collaboration, enquiry and research and dissemination strategies.
- Adopt a practical, applied focus.
- Raise the potential of organisations to explore ways of extending the use of their computing facilities for computer enhanced learning.
- Explore ways of encouraging local schools, higher education institutions and local industry to cooperate on improving interest in, and ability with, computing technology.

**PROJECT BRIEFS**

As an example of the general approach to be adopted, all projects negotiated with ACCEL should be based on a project brief, such as this suggestion from the teacher research domain noted below:

**Major idea:** Machines and Human Intelligence

**Technology area:** Robotics

**Year level:** Upper primary, secondary

To assist students to:

- work in small groups to investigate how computer based machines can promote development of human intelligence, add to learning and working environments in an intelligent manner and exhibit intelligent behaviour
- explore the links between the area of study and work situations
- contribute to a class journal on technology and society.

To assist teachers to:

- improve learning outcomes of students by introducing new teaching techniques
- to a research newsletter.

**Outcomes:**

Students to demonstrate in a satisfactory manner, their capacity to:

- gather and organise information
- clarify and describe issues
- make informed judgments
- indicate further areas of research.

**Product:**

Research report from each group, to be presented to the class and be made available to the school community.

**Resources:**

Logo, Lego/Logo, robots, CAD/CAM, games.

**Computers:**

Each small group to have access to one computer at school for one session three times per week and one half-day session at ACCEL per week for five weeks.

**COMPUTING IN ITS CULTURAL CONTEXT: ACCEL’S RATIONALE**

All of the current and proposed research and development projects outlined above, have been fashioned by ACCEL and its collaborating schools, industries and other colleagues, to fit with the notion of 'techno-choice' (Sachs, Russell & Chataway, 1990). For use, 'techno-choice' is a frame of mind, perhaps even an ideology, which locates the investigation of the uses of technology in schools, within a 'critical curriculum research' orientation (Kemmis & McTaggart, 1993).

This orientation suggests that those people who seek to influence what our schools do and how they do it, need to find ways to challenge and critique current social and organisational arrangements within schools and between schools and the wider society; in ways that encourage schools to work towards making the world a better place in which to live.

In particular, this involves developing a critical orientation to the use of computing technology in schools and in the wider community. Such a critical orientation involves not only developing an understanding of computing technology and how it works, but also an appreciation of the social impact of the technology. That is, not only should the technology itself be the object of critical review, but its potential effects on society should also be considered.

Different communities will approach the use of computer-based technology from a different experience, situation and standpoint. A collaborative process of working with and through these different perspectives will enable mutual understandings to emerge which inform practice and help explain the significance of broader contextual matters. For example, an investigation of the way in which computing might extend co-operative learning in the classroom, may raise issues of democratic practice in social life outside the classroom. We are optimistic that such an approach will encourage the development of a 'critical computing literacy' for users generally.

At a low level of application, computing technology might make an organisation more efficient, in much the way that the insertion of a washing machine into a household can benefit each member. In such a case, the technology might cause a transformation of instrumental time into creative time. At a higher level of conceptualisation, development of a critical computing literacy may suggest fundamental rearrangements in how an organisation operates, including the classroom, thereby prompting new work arrangements and new relationships between the human players involved by establishing teacher research projects which set out to investigate ways of learning with computers within a framework of 'techno-choice', the Australian Centre for Computer Enhanced Learning therefore intends to develop an understanding of computing technology and generate debate about how computing might enhance learning and about our choices for using it in a way which makes a better and more just world.

**References**


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