INTRODUCTION

Computer technologies offer powerful teaching and learning tools that can reshape the educational process in classrooms, and provide a scaffolded environment with multisensory orientation, interactive and motivational qualities, and facility for reinforcement of concepts (Bruner, 1985; in Elliott, 1995; King, 1997). However, researchers (Maddux, LaMont Johnson & Willis, 1997) claim that literacy in most classrooms today is still defined exclusively in terms of paper-based texts. In classrooms such as these, little or no teacher interaction or direct instruction takes place during computer activities, and computer use becomes an isolated and solitary drill-and-practice activity or a reward. Maddux et al. (1997) even go so far as to suggest that the information revolution has transformed almost every segment of society except education, while Mann (2000) remarks that although there are computers in classrooms, they remain ancillary to the pedagogy of traditional instruction, a position supported by Newhouse (1998) who concluded in a study that there was very little change at the classroom level that could be attributed to computers.

SCAFFOLDING IN EDUCATION

Effective learning is about making cognitive connections. Effective teaching is about ensuring that those connections create an environment where learning is active, is scaffolded and makes sense (Lloyd, 1999). Computer technologies offer powerful teaching and learning tools that can reshape the educational process in classrooms, and provide a scaffolded environment with multisensory orientation, interactive and motivational qualities, and facility for reinforcement of concepts (Bruner, 1985; in Elliott, 1995; King, 1997).

Scaffolding, in an educational context, describes supported or mediated learning and occurs through guided participation when a mentor or teacher shares some of the cognitive workload with a child, and is intended to reduce the processing burden involved in bringing cognitive and metacognitive mechanisms into use during problem solving. Berk (1997) defines scaffolding as a changing quality of support over a teaching session in which adults adjust their assistance to fit the child's current level of performance, providing direct instruction when a task is new and less help as competence increases.

While scaffolding is usually envisaged as mediated by more knowledgeable peers or adults, computer environments can also provide scaffolding through pre-structured content and in-built cognitive supports such as feedback, sequencing, multiple representations of materials and the predictable flow of an activity (Elliott, 1995). Scaffolding interactions in computer-based contexts could serve to generate what Pea (1987; in Elliott, 1995) refers to as ‘intellectual partnerships’ in which the cognitive supports within the computer context assume a role similar to that of a mentor.
Intellectual partnerships have the potential to allow learners to function at a level that transcends existing limitations of their cognitive system and may serve to change the balance between simply accessing prior knowledge or constructing new knowledge in favour of the latter. An extension of these intellectual partnerships occurs in a situation in which a small group of students and a teacher, working with a computer-based activity, becomes the setting for the establishment of an 'intellectual cooperative'. This notion of 'cooperative', with an emphasis on a mutually supportive interactive and social context, is reflective of Vygotsky's (1978, in Elliott, 1995) zone of proximal development, described as the distance between abilities displayed with social support and those used independently. It is possible for computers to be used by construction of shared resolutions to problematic experience.

In the context of those intellectual partnerships, carefully selected technology-based tools and activities can provide content and structure thus enabling the teacher to concentrate on facilitating interactive processes. The intellectual cooperative thus provides a situation that elicits the cognitive processes required to attain intended enducational objectives through multisensory orientation, interactive and motivational qualities, facility for reinforcement of concepts and the ability to simplify tasks into manageable steps.

THE POTENTIAL OF NEW TECHNOLOGIES

Software and telecommunications tools such as the internet and electronic networks, and multimedia tools that facilitate sophisticated visual and audio representations enable the manipulation of environments and events to afford multiple perspectives on complex phenomena (King, 1997). Such representations are important for building flexible knowledge assembly and construction processes in complex learning domains (Mann, 2000; Ritchie, 1999). Downes & Fatouros (1995) propose that computer technology processes can be used to provide strategies for achieving curriculum goals within one area or across several areas simultaneously. Those enhanced opportunities include:

- Communication through the combination of images and sounds with written texts to convey meaning
- Instantaneous interaction over long distances as writing becomes interactive and instantaneous through electronic ‘chat’ networks
- Recorded and delayed communication as voice mail allows recorded speech to be held until needed. (Fatouros, Downes & Blackwell, 1994).

Within this age of interactive television, voice recognition, video conferencing, multimedia and virtual reality, Dowling (1999) remarks that writing will become more important than at any other time in history. A word processing package can support a range of writing strategies and styles through its editing capabilities, making writing a pleasurable and satisfying activity, and enabling students to communicate in extremely powerful and flexible ways. The Internet can provide a range of opportunities for new genres and new purposes for writing through the combination of hypertext (the structural basis of the WWW) and multimedia, integrating text with other modes of expression in new ways.

POSITIVES

When used appropriately computers can be integrated into powerful frameworks of instruction, inspired by each of the major psychological approaches: Behaviourist, Cognitivist, Constructivist, and Social-Psychological approaches (Heinic, Molendo, Russell & Smaldino, 1999). Furthermore, computers afford flexibility, making it possible for teachers to adapt the tool to their particular approach, incorporating a number of supporting pedagogical features into instruction such as:

- Practice in varying contexts
- Practice in realistic contexts
- Active participation through interaction with the material
- Addressing individual differences, thus enabling students to progress at different rates, use different materials, and participate in different activities
- Reinforcement and feedback through electronic messages or a scoring system
- Provision for cooperative learning, serving as a means to provide a number of pedagogical and social supports.

NEGATIVES

Teaching with technology is effectively new to those of us currently teaching because it is part of a learning environment very different to the one in which we ourselves were educated. In NSW for example, the average teacher age is 47. Other difficulties commonly identified by teachers include:

- The time and effort required to learn to use technology
- The enormity and variety of changes associated with computer technology
- The need to change teaching strategies and constantly upgrade skills to keep up with change
- Lack of relevant professional development on computer integration into curriculum
- Inadequate resources, resulting in fragmented access
- Lack of technical support
- Class disruption when things go wrong

CONCLUSION

Although the advantages of computer technologies are limitless, teacher resistance is high (Maddux, LaMont Johnson & Willis, 1997; Mann, 2000). Therefore teachers need to know that, used effectively, computer environments can provide scaffolds through pre-structured content and in-built cognitive supports such as feedback, sequencing, multiple representations of materials and the predictable flow of an activity (Elliott, 1995).

Computer technologies enable the manipulation of environments and events to afford multiple perspectives on complex phenomena. Such representations are
important for building flexible knowledge assembly and construction processes in complex learning domains (Elliott, 1995; Mann, 2000; Ritchie, 1999). Furthermore, computers afford flexibility, making it possible for teachers to adapt the tool to their particular approach, incorporate a number of supporting pedagogical features into instruction, and cater for individual differences (Heinich et al., 1999).

The task of assimilating technological innovations ultimately rests with teachers’ understanding and acceptance of the need to change current pedagogy, and willingness to forego their power base in the classroom. As teachers we must therefore reflect on our current practice and pedagogical beliefs with a view to realising preferred aims and strategies that are likely to convert these new technologies into tools that can maximise the benefits for all our students.

REFERENCES