Selecting and organising worthwhile computer based learning experiences

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INTRODUCTION
Like any educational resource, computers can be used effectively or misused. Different uses have quite different implications for the curriculum. Simply providing students with access to computers does not ensure beneficial learning outcomes.

The process of selecting and organising worthwhile activities needs to be based on an understanding of what is possible, what is desirable and what is feasible in a particular school or classroom setting. The nature and location of computer resources, the previous experiences of students with computers and the experience, skills and strategies of teachers will affect what is possible.

SELECTING WORTHWHILE ACTIVITIES
Worthwhile computer-based activities:
• are linked to other contexts;
• have a clear focus or purpose; and
• are efficient in terms of time and learning outcomes.

Links to other contexts
Skills and processes developed by students when using particular software programs are of limited value unless they can be transferred effectively to other contexts (in the classroom, school, home and society). Consequently, meaningful computer-based activities need to be supported by a scaffolding of related activities - before, during and after computer use. For example, the use of drill and practice programs to develop spelling or punctuation skills needs to be related to students’ writing and reading.

Software programs such as adventure games can be used as a vehicle for integrating learning across a number of curriculum areas. In this way the computer-based activities represent one part of a complex web of interrelated tasks. When the software used is content-specific, a worthwhile activity can be related to activities which draw on other resources e.g. print, audio-visual and human resources.

As students develop skills in the use of content-free software such as databases, spreadsheets and wordprocessors, they can apply them to all curriculum areas. For example, students can use wordprocessing software to prepare reports and essays in all curriculum areas. Thus an activity which develops computer skills can be related to a range of curriculum areas.

Worthwhile activities will act as springboards to the investigation of the effects, consequences and implications of computer use in society. Students need to reflect on their computer experiences to make the relationships with other contexts explicit. Worthwhile activities will include time for reflection by individuals, small groups and the whole class. Strategies could include keeping diaries of computer activities, in which successes, frustrations, discoveries and strategies are noted or whole class debriefing sessions where experiences are shared. Debriefing sessions are ideal forums for exploring the links between particular software programs and the curriculum, and for raising issues relating to the use of computers in the wider community.

When computers are located away from the usual classroom, particular care needs to be taken to relate computer-based activities to other classroom activities.

Focus and purpose
The versatility of computers and many software programs mean that they can be used in many different ways for many purposes. In order for students to direct their attention to the salient features of a program (while still allowing incidental learning to occur in other areas), the activity must have a clear purpose or focus. If an activity is negotiated, students should be encouraged to articulate their goals in using computers.

The focus of an activity might be:
• the development of computer skills (e.g. exploring one, some or all of the functions of a particular software program);
• the application of computer skills to the curriculum (e.g. creating a database of information gathered on a field trip and preparing reports of selected categories);
• a combination of these (e.g. experimenting with a graphing program to discover the most effective way of presenting the results of a survey of television viewing habits).

The role of the software program is intended to play in an activity should be specific and clear. Just as ‘watching a video’ has limited meaning as an educational objective, so has ‘playing and adventure game’. Teachers and students need to understand why they are using a particular program. Possibilities include:
• to stimulate interest
• to reinforce concepts
• to apply concepts
• to create a context
• to elucidate questions or problems
• to provide raw data for analysis
• to practise skills
• to present information to others.

Efficiency
Computer-based activities are worthwhile when the learning outcomes justify the time spent on the activity. Some software programs have a steep learning curve which means students need to spend considerable time developing skills.

The ideas presented here are drawn from the Department of Education, Queensland's Policy and Guidelines for the Use of Computers in Learning which will be released later this year.
in the use of the program before they are able to use the program for meaningful purposes or to achieve curriculum goals.

If learning can be accomplished more efficiently using alternative resources, or if a complex software program has applications in only one topic of an entire course, this particular use of computers must be questioned. However, if skills in the operation of a specific program can be utilised in a variety of circumstances and curriculum areas over time, activities related to the development of these skills will be justified. Similarly, if the learning outcomes are extensive, considerable time may be spent on computer-based activities. It is imperative that the use of computers in classrooms be appropriate, as classroom computer use constitutes a powerful model for students.

ORGANISING WORTHWHILE ACTIVITIES

Only on rare occasions does a single computer-based activity result in significant learning. The effective use of computers in the curriculum is dependent on:

- balance;
- cumulative learning;
- structure and sequence; and
- variety.

Balance

When developing computer-based activities, it is important that balance is maintained in the following areas:

- development of computer skills and the application of those skills to curriculum purposes;
- the range of purposes for which computers are used;
- computer-based activities and other contexts; and
- the exploration of new functions and software programs and the application of familiar programs;
- using computers to present information and critically evaluating computer-mediated information;
- activities which require critical thinking and those which require creative thinking;
- independent and collaborative learning;
- the types of software programs used (wordprocessor, database, spreadsheet, graphics etc.);
- activities common to the whole class and activities for individuals or small groups;
- guided and self-directed activities.

Cumulative learning and continuity

Learning with and about computers is cumulative and spiral in nature, reinforcing, building upon and amplifying previous learning. In planning activities, sufficient time must be provided throughout the year for all students to develop their understanding and skills in the use of computers. The understandings, attitudes and skills need to be revisited over time so learners can apply them in different contexts. The organisation of activities and allocation of time throughout the year, month or year/s should ensure continuity of learning.

A school computer policy may be required to ensure that progress is developmental across year levels. Within a developmental program, schools designate year levels or curriculum areas where students are expected to have mastered certain types of software programs or to have used computers for particular purposes. Such an approach allows teachers of higher year levels to confidently plan for computer use which is focused on curriculum applications. For example, if the English department in a secondary school allocates time in the year 8 program for all students to master basic word processing skills, English teachers in years 9-12 can organise access to computers confident that time spent will be focused on the writing process rather than the development of basic wordprocessing skills.

Structure and sequence

Learning activities can be structured and sequenced to integrate the development of computer skills with their application to curriculum tasks. Strategies such as demonstration, exploration, application and reflection can be used to structure and sequence activities.

In developing skills, a balance of guided and self-directed activities is necessary. Too little guidance can mean that students are so overwhelmed by options that they fail to identify key features of a program. Too much guidance may reduce the narrative suspense of some programs or inhibit students opportunities to apply problem solving strategies and take responsibility for their own learning.

The process of demonstration, exploration, application and reflection can be sequenced in a variety of ways according to the focus of the activities and the nature of the software. The process described below is an interactive, rather than a linear one.

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Example 1
- **Demonstration:** Teacher demonstrates features of a software program to the whole class. (Wall charts summarising key steps may be displayed beside the computer.)
- **Application:** Students (individually or in small groups) use the software and reinforce the understanding of its features by using it to complete a task (set by teacher or negotiated with students).
- **Reflection:** Students reflect on their experiences, and discuss successes, problems and strategies.

Example 2
- **Exploration:** Students (individually or in small groups) explore the capabilities of a software program through experimentation and play. The time allocated may be brief (one half hour session) or may extend over a whole term.
- **Reflection:** Students reflect on their discoveries and report to the whole class. The class may create wall charts or booklets of their collective understanding.

- **Application:** Students use the program to complete a task (set by the teacher or initiated by students) or use the program when it is appropriate.

Example 3
- **Exploration:** An individual student or small group of students explore a software program.
- **Demonstration/application:** ‘Expert’ students tutor other class members in the use of program while working collaboratively on a task provided by the teacher.
- **Reflection:** Students reflect on their experiences and discuss achievements, problems and strategies.

Example 4
- **Exploration:** Students work on a task individually or in small groups.
- **Demonstration:** The teacher introduces the class to a software program which throws new light on the task or allows the task to be completed in a different way.
- **Applications:** The students continue, extend or repeat the task incorporating their skills in the use of the software program.

**Computer-assisted knowledge acquisition:**
Let’s have theory-based instruction

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This paper argues that computer use in classrooms should be based on pedagogical aims and principles rather than on trial and error, and that it should aim to facilitate the acquisition of knowledge as well as skills. To accomplish this, methods of teaching must focus primarily on the characteristics of the student and his/her individual needs with respect to the knowledge and understanding to be acquired, and only subsequently on the technology.

**SOME PROBLEMS WITH COMPUTER-ASSISTED INSTRUCTION**

Until recently, the way in which computers were utilised in learning and teaching was based totally on the teacher’s expertise in the subject content, supplemented by common sense ideas about computing. Many recommendations have been made as to how computers can be utilised more effectively in schools. Most of these recommendations can be summarised into four broad areas: the school culture and organisational structures should encourage the serious use of computers; sufficient numbers of computers need to be available to assure regular access for teachers and students; ample support for teachers in learning and planning how to use the technology is required; and ongoing technical support is essential. These are important conditions, but in such a complex and multifaceted endeavour of instructional innovation, I believe that there is at least one other factor to be considered: the pedagogical implications of a computer-supported learning environment.

In many classrooms technological issues are considered first and hence command most of the available resources. Currently, the main pedagogical activity in computer-assisted learning is to monitor practice, and the acquisition of some basic skills in the operation of computer hardware and software. To be sure, these are important activities, but it is even more important that teachers facilitate the use of activities which lead to the attainment of the basic educational goals for their students.

Much of the theoretical knowledge concerning the principles underlying human cognition, which has emerged over the past three decades, has been influential in the design of methods of learning and teaching throughout the curriculum. What appears to have been overlooked is that theory-based design of instruction is equally important in the hi-tech classroom. The use of computers in classrooms has largely been a matter of trial and error, supplemented by the teacher’s common sense ideas about how