The new Great Expectations

CHU SHIU-KEE looks at Asia's computer education scenario and discovers . . .

"Some people have actually asked the fundamental question: is computer education really for all?"

Education has been an equalising factor. But technology by nature is inequitable. How to deal with this in-built contradiction and to spread the use of new information technology in education in a way that it may even promote the democratisation process is therefore a major issue facing most countries of Asia and the Pacific. Government intervention in the supply of computers with "generators to rural schools as well as mobile computer classes in vehicles are some of the innovative measures being taken in some countries. Central or local governments are providing hard-ware and software as well as trained teachers for computer education to the less well equipped schools.

In the process of attempting to democratisre computer education, there have been suggestions that the local community surrounding each school should be mobilised to play a leading role in supporting its school to develop computer education. This has unfortunately resulted in a situation where schools in richer communities have been able to develop rapidly their computer education programmes, while those in poorer environments lag further behind in the race. This points to the importance of intervention from the government and also the involvement of the non-governmental sector.

Computer education for all

Some people have actually asked the fundamental question: "Is computer education really for all?"

This is related to the current regional drive for "Education for All", which aims at universalising primary education and eradicating illiteracy by the end of the century.

There is in this regard the common perception that if the Asian countries are

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"Information literacy . . . is likely to become the baseline life skill for the future"

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striving at attaining universal literacy by instilling in everyone the ability to handle books and the written words, then computer literacy which represents the ability to handle computers and computerised information should be the next step in preparing the people for the information age.

It is therefore only natural that the concept of computer literacy as the mainstream of computer education dominates current thinking, and even policy, in most countries of the region. It is not surprising for one to find the computer education curriculum in many of our neighbouring countries to be focussed on getting to know the computer and programming.

Bloated by public opinion that future generations should all be equipped with basic computer skills and be prepared for the information age, there is a growing national political drive to introduce computer education in terms of the type of computer literacy mentioned above. But in most countries computer education remains a luxury and resource constraints limit its spread.

Information literacy

While many progressive computer educators may consider this present policy bias in many Asian countries- namely in emphasising computer literacy - simplistic and lacking in both educational breadth and depth, there is unmistakably considerable potential educational impact in this approach.

Manual skills in information search, retrieval, processing, analysis, synthesis, storage, aid to assimilation, and dissemination have existed over the ages. But it is with the advent of computers that these skills have been pushed to new heights. Computerised data processing has brought speed, precision and many other sophistciations to the information process. This has resulted in subtle changes in the fabric of modern society and its workings, particularly in the scale and intensity of the use of information as a vehicle for societal actions and even renewal.

In line with the analogy above, "information literacy" of individual beings as the built-in systematic ability to search, identify, select, process, analyse, synthesise, store, assimilate and communicate information is likely to become the baseline life skill for the future. Com-
"Little attention has been paid to the country’s need for trained computer personnel..."

that are available, some of which reflect very original and effective educational designs.

The use of the computer as a tutor is still constrained by the limited application of new technical and technological break-throughs in artificial intelligence, although the education sector may be the best arena for testing these innovations. Very limited use has been made, only in some more advanced countries, of available authoring and expert systems. With the help of computer specialists, some small scale and uncoordinated research studies are being carried out in applications of expert systems in education. The question was raised as to how nations should get together in jointly pushing forward this new frontier which offers great educational promise.

In the process of expanding the scope of computer education, many developing countries are interested in knowing whether there are short cuts to this development process by skipping some of the above stages. Some third world computer educators have been asking questions such as whether computer literacy will be readily achieved with CAI, or if programming skills will come naturally with increased use of software packages.

Another frequently asked question is: In the face of resource constraints and lack of expertise, should the developing countries embark on the development of an all-pervasive use of computers across the curriculum and in all learning situations?

**Computer education and the learning process**

Many of the doubts about the value of computer education stem from the lack of clear understanding of the effectiveness and possible impact of computer education on the learning process.

This shortcoming is further complicated by the fact that computer education approaches vary according to formal, non-formal and informal educational settings. While school-based computing remains the mainstream in computer education, there is increasing evidence showing that it should be accompanied by community-based and home-based computing in order to achieve better educational impact. The use of community resource centres for extending computer education is a major trend in some Asian countries, such as India.

Currently in the process of learning about, from, with and through computers, particularly within the formal educational setting, there is continuous need for attaining the optimal combination between learners, computers and teachers in order to achieve maximum educational impact. A great deal of research is required in this area.

What is apparent these days is that by combining graphics, sound and words, as well as rapid and never tiring interactive capabilities, computers are opening new vistas to the learning process. In most developing countries, computer-assisted drill and practice remain the major features of computer use in education. There have been comments that computerised page-turning is not all that bad if it can facilitate search and retrieval of knowledge and information, enhance assimilation and even facilitate creativity.

Interactive fiction that combines reading, logical thinking, problem solving, path-finding, writing and possibly group interaction can become valuable educational tools. There have been proposals of open-ended fiction that may stimulate creativity. Some preliminary empirical findings have shown that word-processing can improve children's writing ability.

Studies regarding the impact of computer education on reducing learning gaps and improving achievement of low-achievers are still inconclusive. There is evidence showing that while computer education may heighten pupils' self-esteem, it may also have a devastating effect on the morale of certain among them who cannot adapt quickly to computerised operations, as computers do not always make concessions for repeated failures in the interactive environment.

There have been signs showing that by teaching the younger generation to make use of and rely upon the vast and rapid information storage and retrieval capacities of computers, their memorizing patterns and power can be affected. To this is added many interesting research results on the reaction to computer education between the sexes, as typified by the findings of the research initiated in Australia.

Another important concern of educators is related to the effects of shifting from group learning to individualised computer assisted learning environments. Many are worried about adverse effects upon the attitudinal attributes of the children, their approach to problem solving and its effectiveness, as well as ability for multi-faceted learning within the group environment. Experiences have shown that the effectiveness of self-paced interactive learning through computers depends to a large extent on the type of learner. For one thing, it certainly diminishes abilities for group learning and team-work, except for software designed for group work such as the Dirigible developed in Australia.

**Policies on computer education**

Most countries in Asia and the Pacific still lack a well defined national policy for computer education. Such a lack has resulted in the continuation of the elitist approach to computer education, whereby better endowed schools and population groups are becoming even more advanced by being able to afford computer education.

As mentioned earlier, many current national policies are "technology-based" rather than "need-oriented". Computer education programmes are launched mainly because the new information technology is here to stay. Little attention has been paid to the country’s need for trained computer personnel and to the realities of lack of resources or simply of electricity supply in certain rural zones.

A priority requirement for the future will be the development of better computer education policies in countries of this region. Such policies should be defined taking into consideration at least the following dimensions or aspects:

- Pedagogy and learning
- Material - hardware and software
- Curriculum: contents, methods and structure
- Teachers and their training
- Finance
- Administration of computer education programmes
- Social impact
- Cultural impact
- Economic impact
- Technological impact

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As mentioned earlier, education policies invariably work towards equity and the full democratisation of educational opportunities. In the long-term perspective, computer education policies will also have to aim at attaining this goal. Measures to reduce disparities between urban and rural zones and among different population groups may be devised, which could include special provision of hardware, software, materials and trained teachers to disadvantaged schools. To achieve this, resources should not only be drawn from the government sector, but more important to be mobilised from non-governmental sources such as productive and service enterprises, professional associations and community members.

In view of the wide range of computer educational hardware, software, contents and methods available these days and the variability of their relevance and quality, it is the prerogative of the government to set norms and policy on the choice and use of these components for different levels and types of computer education. This could avoid large wastage due to the wrong choice of material which a number of countries have experienced in the recent past.

If possible, the determination of norms may involve educators, computer hardware and software specialists, teachers, administrators and learners. The organisation of computer education task forces or advisory committees bringing together these people to periodically produce policy recommendations and white papers is a commendable practice.

Under the policy framework, there is a need to set up guidelines and criteria for the continuous evaluation of hard- and software materials for computer education. The same applies to computer education policies and programmes, which may be subjected to periodical review and revision.

The hardware scene

To most people, the expression "computer education" still places more weight on "computer" than on "education". Their vision of computer education is usually overshadowed by the mighty and enigmatic "black-box": the computer hardware. It is interesting to mention at this point the idea raised in some countries for "developing computer education without the computer". This idea originated from serious hardware resource constraints in these countries. By taking a second look at it, one finds that there is more to it.

Computer hardware is therefore still considered the foremost component in computer education. The attitude prevails that the main investment in computer education is the hardware. A gradually decreasing but still commonplace belief is that by putting a computer in a school and letting people play with it, computer education will grow naturally.

There is the need to spread the knowledge that hardware only accounts for barely one tenth of the total cost of computer education; that a great deal more has to be spent on software, courseware, teachers and their training.

The above costing, of course, is based on the cost structure in the developed countries. In the developing countries, the hardware may actually account for a higher share of the total budget due to relatively lower labour and other costs. The need to import whole computers or components, coupled with the absence of advantages of economy of scale in local manufacturing, also contributes to the high cost of hardware. Furthermore, computer imports are sometimes restricted and heavy duties are usually levied on them, although more and more countries are lifting these barriers.

Similarly, it is not uncommon to find restrictions within the education system imposed on the acquisition of computer hardware. Such restrictions very often apply to schools under government control. The private schools thus enjoy decisive advantages in starting computer education. More stringent budgets of the government schools and tighter control have also been factors unfavourable to the development of formal school computing.

Except in the small least developed countries, most countries in Asia have acquired the technical know-how and have begun assembling microcomputers. Some may have the capacity to manufacture them on the industrial scale for both the national and foreign markets. The types of microcomputers made are mainly the clones of the IBM series and, to a lesser extent, Apple clones. The Commodore and BBC types are also being manufactured under license in some countries; and they occupy non-negligible market positions as far as the

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educational and home computer markets are concerned.

Is it a wise policy to maintain a variety of hardware for computer education, or should there be only one national standard? This has been the primary concern of most countries in Asia and the Pacific in developing computer education. There have been concrete examples of singular national standards such as the Sinclair Spectrum in Sri Lanka, BBC in India, and Apple IIe and Commodore 64 in some other countries.

Taking into consideration the very strong cultural and linguistic traditions in countries of Asia and the Pacific, and also widespread dissatisfaction with the educational capacity of existing brands of microcomputers in the market, the question was raised as to whether there could be a new generation of computers designed specifically for educational purposes. With increasing technological capabilities and a huge market potential, the Asian countries can collaborate in a major project in this direction.

Educational software
There has been a growing awareness that the availability of quality software is more important than hardware in computer education. Countries of the region are looking keenly into the building of endogenous capacities to select, adapt, develop, evaluate, and disseminate educational software.

Among the various attributes of educational software such as quality, compatibility, portability, network possibility, language, and cultural bias, it should be noted that the countries of Asia and the Pacific are particularly sensitive to the last two aspects, namely the adaptability of individual education software to different languages. In the written form these may not necessarily follow the Latin alphabets. There is also the issue of cultural bias underlying the content and design of certain software, encompassing attitudes, value systems and sex roles.

Countries embarking on developing educational software have been alarmed at the finding in the developed countries that to use teachers to develop software may result in bad quality software. Being short of specialised educational software developers, the developing countries are relying on interested teachers with computer knowledge to design software.

The limited experience accumulated so far has shown that one should not underestimate the resourcefulness and creativity of these teachers as well as other non-professionals in educational software design, which have resulted in many first rate products. With proper technical guidance and assistance, plus appropriate motivation, the large teaching force can contribute a great deal to the pool of quality educational software. Some countries have been organising open competitions in educational software design, by level, subject matter, type of software, and category of designers.

Admittedly, educational software development is becoming a very specialised field which requires the formation of highly professional teams consisting on the one side of computer specialists and educators on the other. Throughout every process of educational software development, close and frequent interactions between the teachers and software specialists will have to be maintained.

More and more, the trend has been moving towards making available user-oriented and user-friendly software development tools. Program shells that allow teachers to insert content suitable to specific learning needs have been developed. Authoring systems such as Hypercard and others have been successfully used by computer lay-people to design very effective educational software. There are great prospects for new advances in artificial intelligence to be applied in the teaching/learning process.

With increased availability of educational software, there is a need to build up the ability of potential users to search, select, use and evaluate software. Mechanisms will have to be established to register and catalogue educational software and to facilitate users' access to them. Such mechanisms may exist at the international, regional, national and sub-national levels, in the form of software centres and clearinghouses. Software may be disseminated by these centres through ordinary or electronic mail, or via mass communication channels such as the satellite.

Recently, there is the proposal to establish a Regional Educational Software Network in Asia and the Pacific, which will link together major software centres for the exchange of quality software and experiences in software development, use, evaluation and dissemination. The network may also provide assistance to countries in developing computer education.

Curriculum reform
Until recently, computer education in schools has been mainly relegated to after-class self-study, electives or extracurricular activities. In the current education reform that is pressing for basic changes in the organisation and content of education, it is time to gradually integrate computer education within the formal curriculum, as part of a new multimedia delivery system.

Resources shortages in the near future, namely in hardware, software and trained teachers will however continue to prevent the rapid generalisation of computer education in schools. Other formal, non-formal and informal channels will have to be found to widen the access of learners to computer education.

Training of teachers
The success of computer education programmes depends to a large extent on trained teachers. Unfortunately, insufficient attention has been paid to this aspect and most countries are not giving enough time and resources for teachers to learn about computers. In the developing countries, most teachers involved in computer education have had little systematic training for the job. The quality of teaching consequently leaves much to be desired.

There are mainly two categories of computer education teachers to be trained: teachers specialising in computer education and teachers able to teach effectively with computers. For the former, it has been generally agreed that a systematic training should cover the following areas:

- Computer literacy
- Systems applications
- Material production techniques
- Computer education management skills
- Hardware and software maintenance
- Use and adaptation of program shells

While these areas may form the core of...
TIME TO BREAK THE MOULD?

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Rewards beginning to flow

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...tailored to its unique situation. When using the system it is possible for a teacher in the ACT to access a range of information including details about resources needed in the classroom and their availability in the library, as well as look up a description or review of a particular software package and its use as part of a curriculum project in another state. The synergy of the components of the ASCIS database also has enabled access to reviews of various educational resources, education policy documents and projects in progress throughout the country.

The ACT Schools Authority has been part of ASCIS since it was first mooted as a shared cataloguing and information system for schools some fourteen years ago. The choice of software and the need to have a low cost, efficient information service for Australian education has meant that small systems like the ACT can maximise the benefits of belonging to a large scale organisation and further develop the principle of 'one-stop-shopping' for education information for its schools.

Further information about ASCIS and the ACT Schools Authority's use of its products and services can be obtained from: Executive Officer, Library and Information Services, ACT Schools Authority, PO Box 20 Civic Square, ACT 2608 or Executive Director, ASCIS, 325 Camberwell Road, Camberwell, Vic 3124.