Using ICT for Quality Teaching, Learning and Effective Management

Report of the Seventh UNESCO-ACEID International Conference on Education
Bangkok, Thailand, 11-14 December 2001

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Foreword

Today, real borders do not lie between nations but lie between those who can access ICT and those who cannot. As a response to this divide, the Seventh UNESCO-ACEID International Conference on Education was organized for facilitating the effective use of ICT for quality teaching, learning and effective management.

The Conference aimed at helping the providers to look into the ongoing provisions of ICT, educators to look into educational processes, and to improve quality of learning by students as end-users of ICT. The Conference aimed at realigning the roles of these partners so as to improve their competencies required for smooth integration of ICT into education.

During the Conference, some of the presenters have cautioned the participants against the overuse, under-use and misuse of ICT, while at the same time, they gave a very clear message that ICT has provided us a great opportunity that has to be harnessed. Some of them have foresaken many a new promises of ICT that are lying ahead of us.

Likewise, the participants have also deliberated upon the ill-effects of digital divide and also glimpsed the future potentialities of emerging developments like speech recognition, handwriting recognition, gesture recognition, face recognition, emotion recognition, identity recognition, and location recognition.

The new developments of technologies will create dramatic influence upon the structure, functions, and processes of educational institutions. The new development of ICT will create unimaginable changes in systems of schooling, sources of knowledge, curriculum framing, sources of data, learning styles, managements of learning environments, and interfacing all these elements with the larger economic and cultural systems that are functioning around education.

Sheldon Shaffer, Director
UNESCO Asia and Pacific Regional Bureau for Education, Bangkok.
Preface

This report is the outcome of the Seventh UNESCO-ACEID International Conference on Education: Using ICT for Quality Teaching, Learning and Effective Management held on 11-14 December 2001, in Bangkok.

The purpose of this Conference was to explore how the powerful potential of information communication technologies is being utilised to address concerns as to quality in the content and process of education, to consider how a wide diversity of education provisions could be more effectively managed through appropriate use of ICT; and to demonstrate/share 'best practices' in using ICT as an instrument of facilitating educational innovations for development.

The major theme of the Conference was sub-divided into three sub-themes: (i) Using ICT for Quality in the Curriculum and in the Classroom, (ii) Using ICT for Development of Teachers and Educational Personnel, and (iii) Using ICT for Effective Management, Innovative Approaches and Practices. We are sure that this publication will help to understand the issues that are central to the appropriate uses of ICT for the improvement of the structures and functions of education.

We are grateful to the authors for their academic contributions, to those who have worked hard to bring participants together on a common platform, and to the supporting staff that have given shape to this report.

We are particularly thankful to our partners like: UNESCO Institute for Information Technologies in Education, The Office of the National Education Commission, Thailand, UNEVOC, Bonn, and to our associates and co-sponsors including for Learning and Teaching Styles, the Commonwealth of Learning, for Research and International Collaboration, International Baccalaureate Organization, Department of Education, Training and Employment, SA, Shanghai High School, UNESCO of Macau, University of Macau, New Media, Educational Testing Service, and Australian Council for Educational Research, for their multiple roles and contributions.

Zhou Nanzhao
Co-ordinator, APEID
UNESCO Asia and Pacific Regional Bureau for Education
Introduction

Welcome Remarks
By Mr Zhou Nanzhao, Co-ordinator of APEID

Director's Address
By Mr Sheldon Shaeffer, Director
UNESCO Asia and Pacific Regional Bureau for Education

Opening Address
By H E Pongpol Adireksan, Deputy Prime Minister
of the Kingdom of Thailand

Using ICT for Quality Teaching, Learning and Effective Management (Raja Roy Singh Lecture)
By Sir John Daniel, Assistant Director-General for Education
UNESCO, Paris, France
Welcome Remarks
By Mr Zhou Nanzhao, Co-ordinator of APEID

Your Excellency Mr Pongpol Adireksam
Sir John Daniel, Assistant Director-General of UNESCO
Distinguished Participants and Guests
Ladies and Gentlemen

It is indeed a great pleasure and honor for me as Coordinator APEID to welcome all of you to the 7th UNESCO-ACEID International Conference on Education.

We are especially honored to be able to welcome His Excellency Deputy Prime Minister of the Kingdom of Thailand, H E Mr Pongpol Adireksam, and to Sir John Daniel, the Assistant Director-General for Education, UNESCO. We thank them for honoring our Conference with their presence and we look forward receiving their intellectual guidance. Our sincere thanks go to our partners: the Office of the National Education Commission of Thailand, UNESCO Institute for Information Technologies in Education, UNESCO-UNEVOC Bonn and all the co-sponsors for their professional as well as financial support to the organization of this Conference.

We are very pleased to greet more than 400 participants from nearly 40 countries around the world. Your diversified experiences and perspectives as policy-makers, teachers, researchers, and managers of education will no doubt help in broadening perspectives on education and your interactions will provide opportunities for creating synergy in action.

The series of UNESCO-ACEID Conferences have attempted to serve the mission of APEID, Asia-Pacific Programme of Educational Innovations for Development, which is a UNESCO regional inter-country cooperative programme. Launched twenty-nine years ago and involving more than thirty participating countries, APEID aims at strengthening capacity-building at national, sub-regional and regional levels in facilitating educational innovations to achieve socio-economic and human development goals. APEID has been served by a secretariat and coordinator, formerly ‘ACEID’, and hereafter ‘APEID’, as an integral part of formerly ‘PROAP’ and recently restructured UNESCO Asia and Pacific Regional Bureau for Education, directed by Mr Sheldon Shaeffer.

In view of the profound impacts of information-communication technology on education and in light of UNESCO Medium Term Strategy approved by Member States, the purpose of this conference is to explore how the powerful potential of ICT is being utilized to address worldwide concerns over quality in the content and process of education; to consider how a
wide diversity of educational provisions could be more effectively manage through appropriate use of ICT; and to demonstrate/share best practices in using ICT as an instrument of educational innovations for quality teaching, learning and effective management.

We hope to achieve the objectives through intellectual guidance by Raja Roy Singh Lecture, valuable inputs from distinguished plenary speakers on sub-themes, Demonstrations/Workshops, Roundtables, Special Interest Groups, and Concurrent Paper/Discussion Sessions. We are sure the deliberations and demonstrations at this Conference will contribute in meaningful ways to worldwide efforts in harnessing the advantages of technology while reducing digital divide and avoiding the misdeeds in education.

Jointly we look forward to a most stimulating and fruitful Conference and I wish you all a pleasant stay in the 'City of Angels' on this most hospitable 'Land of Smiles'. Thank you.
Director’s Address
By Mr Sheldon Shaeffer, Director
UNESCO Asia and Pacific Regional Bureau for Education

H.E Mr Pongpol Adireksam
Deputy Prime Minister of the Kingdom of Thailand
Sir John Daniel, Assistant Director-General for Education
UNESCO, Paris

Dr Rung Kaewdang and Dr Chinnapat Bhumirat
Office of the National Education Commission, Thailand

Distinguished Guests
Ladies and Gentlemen

In my capacity as Director of UNESCO’s Asia and Pacific Bureau for Education, I am honoured to welcome you here today to share in the official opening of the seventh APEID conference. I would like to particularly thank H.E. the Deputy Prime Minister for the high honour of his attendance and for opening the conference and Sir John Daniel for his major contribution of the Raja Roy Singh lecture.

Before I came to Bangkok, I was advised by my predecessor, Victor Ordonez, to contact the former UNESCO Director, Mr Raja Roy Singh, and seek his advice on how to manage the Bangkok office. The days of Mr. Roy Singh’s tenure here are legendary – a time of UNESCO’s ascendancy in the world of education – and despite his age and advancing disabilities, he was willing to speak to me at length. He did give me good advice – some of which I have been able to follow. I am therefore especially pleased that UNESCO is able to organise this important annual lecture in honour of Mr Raja Roy Singh.

I would also like to say how much we continue to enjoy the valuable support of our friends at the Office of the National Education Commission in Thailand and the Thai National Commission for UNESCO, and express our gratitude for the enduring and fruitful nature of these relationships. And I wish to thank as well the plenary speakers, UN partners, and government, non-government, and civil society organizations for your participation. This Conference has generated a spirit of collaboration and partnership among countries, governments, industry, business groups, universities, institutions, educators, and many others across the world. I acknowledge the assistance of these partners and co-sponsors for the way in which they have supported APEID as it organised the Conference.

Although some sections of the Conference are identified as being sponsored by specific organizations, the overall responsibility for arranging the Conference has been UNESCO’s, and as Director I am grateful to the sterling work of the Bureau personnel to bring this conference together –
especially, I might add, the secretaries, printers, and binders who have
toiled late into the night to produce the excellent conference materials.
May I also especially thank Mr. Zhou Nanzhao, now officially the Co-
ordinator of APEID, the Asia-Pacific Programme on Educational Innovation
for Development of APEID.

I am pleased by the broad range of participation at this conference, with
over 400 people from nearly 40 countries — pleased because I think the
Conference theme — the growing concern over the quality of teaching and
learning and the effectiveness of educational management and the great
potential of information and communication technologies (ICTs) in
promoting greater quality as well as expanded access — is such an
important one. We all have much to learn from each other about the
issues and challenges which dominate this area of work.

For UNESCO Bangkok — which includes staff from the culture, social
sciences, and communications sectors of UNESCO — the underlying
principle is clear: we will work in the area of ICT use in education in order
to ensure that ICTs serve not to increase disparities in educational access
and quality, as they often do, but rather to reduce these disparities,
especially for the most disadvantaged groups of our societies. The
contribution of ICTs to the achievement of the goals of the Dakar
Framework for Action towards Education For All is another important
purpose of our work.

In this regard and with the support from Japanese Funds in Trust, we are
about to launch a programme on promoting the effective use of ICTs in
education. In addition to regional activities on surveying current ICT use,
developing indicators to assess their future use, and creating a
clearinghouse for ICT-related materials, this programme has three
components:

- The development of national policy environments — including
  enlightened decision makers, ICT friendly policies, and adequate ICT
  accessibility and connectivity — which promote effective, affordable,
  and sustainable use of ICTs in education;

- Successful models which demonstrate the appropriate use of ICTs
  and of relevant ICT-based curricula and teaching-learning materials in
  both formal and non-formal educational settings;

- The development of policies and programmes which promote the
  training and professional development of teachers and other
  educators in the use of ICTs in education.

UNESCO itself is also changing in its structure, functions, and
perspectives, with a renewed focus on promoting education as a
fundamental right; improving the quality of education; and promoting
experimentation, innovation, and the diffusion and sharing of information
and best practices in education. The contribution of ICTs to education,
science, culture and information for all society — and, I might add, to the
promotion of the increasingly important concept and practice of a culture
of peace – is a critical cross-cutting theme in the upcoming medium-term strategy of the organization. The mandate of the UNESCO Bangkok office to function as the principle advisory body in education to UNESCO field offices and to Member States in Asia and the Pacific – a mandate reconfirmed in the ongoing reform of UNESCO – will, I hope, make our work in this area of special significance to this region.

I therefore look forward to learn more about the wide range of innovations made in UNESCO member countries in this region and beyond, many of which will be described and demonstrated at this Conference. In this regard, I am pleased to be told of the high quality of presentations to which you can look forward. It is my hope that the presentations, deliberations and activities of this conference will be such as to make a real difference – to influence educators to change and improve their practices in the field, thus being of direct benefit to learners of all ages and cultures.

Let me close by asking for your help. Conferences such as these take much time and many resources to organise. They are exhausting for the organisers – and perhaps for the participants as well. And they are only successful if participants return to their countries and to their places of work and act in a clearly different way. As Director of the Regional Bureau for Education, I need to be convinced that this Conference is a good investment of the Bureau’s energies. Before confirming that this Conference will be followed by another, therefore, I invite those of you who have attended past conferences to indicate on your Conference evaluation forms – or directly to me – how past APEID conferences have made a difference in your professional lives – what you do and how you do it.

With thanks again to all of you, I give my good wishes for a very successful Conference.
His Excellency Mr Pongpol Adireksam, Deputy Prime Minister of the Kingdom of Thailand highlighted the importance of using ICT in education, and other areas of development in the Asia-Pacific countries. While welcoming the resource persons and the participants from different parts of the world, His Excellency officially blessed the Seventh UNESCO-ACEID International Conference on Education in Bangkok. He hoped that the participants will have fruitful deliberations during the Conference.
I am honoured to have been invited to give the Raja Roy Singh lecture. In so doing I pay tribute to Raja Roy Singh and to all the directors and staff who have established the reputation of the Bangkok office as a powerhouse within UNESCO. Its role as the Regional Bureau for Education will be enhanced as a result of the emphasis that the Director-General is placing on strategic planning and decentralization.

The most effective strategic planning combines top-down and bottom-up elements. The vision and strategy developed for UNESCO as a whole must be informed by the aspirations and experience of staff in the field who are in daily contact with local realities. As Assistant Director-General for Education I shall consider our four regional bureaux for education in Bangkok, Beirut, Dakar and Santiago as the points where these two strands of planning are wound together. For the Asia-Pacific region this is where top-down and bottom-up planning merge in effective action.

I have already demonstrated my commitment to the role of UNESCO’s regional bureaux in both symbolic and substantial ways. As a symbol of my commitment to our regional work I am visiting all the regional bureaux early in my tenure as ADG. I shall have finished a first tour of the four bureaux by the end of January and this is already my second visit to the Bangkok Bureau. More substantively, I have expressed my confidence in the work of the Bureau and my commitment to decentralisation through the budgeting process by breaking with the previous practice whereby each field office received a small allocation of funds for every activity listed in the biennial plan for the education sector as a whole.

This approach had two weaknesses. First, it resulted in the earmarking of trivial amounts of money. Second, it assumed that Daddy, i.e. UNESCO Headquarters, knew best what was needed in Viet Nam or the Cook Islands. To remedy both weaknesses I am now allocating significant blocks of money to each region for each main line of action in the biennial plan. The main line of action is a broad programming thrust so the funds are at a high level of aggregation.

The Asia-Pacific region was the first off the starting blocks in taking advantage of this decentralization of authority and responsibility. I thank our Regional Director, Sheldon Schaeffer and the heads of our cluster and...
national offices in this region for deciding how to allocate these funds between regional and country levels and developing work plans to match. This work provoked discussions about both the nature and the content of UNESCO's work in the region of a type we have not seen previously.

Those of you who do not work for UNESCO will be wondering why I have started this lecture with these internal issues that appear to have little to do with my subject, which is *Using ICT for Quality Teaching, Learning and Effective Management*. But I do so to make a point. We spend too much time talking about the extraordinary potential of information and communication technology and too little about what we want to achieve by using it. This gung-ho attitude is expressed in the phrase 'technology is the answer'.

My first piece of advice to you is that we must always complete the sentence. 'Technology is the answer but what was the question?' What is the question we are trying to answer or the problem we are trying to solve? Asking questions should be a UNESCO habit. As the great Brazilian Paulo Carneiro used to say, 'It is UNESCO's vocation to be a perpetual question mark'.

My aim today is to help you ask those questions. I shall suggest four principles that you should apply to thought or action that involves information and communications technology. For the rest of this lecture I shall usually abbreviate that long expression by using the one word 'technology'. This is partly because I dislike acronyms in general and ICT in particular and partly for a reason that I shall come to in a minute. My four themes or principles all begin with the letter 'b' which may help you remember them. Two of them are ways of thinking you should avoid and two are good principles that you should adopt. I shall go through them one by one spending progressively longer on each.

**Avoid bias**

My first 'b' stands for bias, which is bad. There are, of course, good ways to be biased, like having a bias in favour of the disadvantaged. Here I shall focus on the bad biases—those assumptions that can misdirect our efforts in using technology. The most prevalent of these biases is the vendor bias, which says that technology must be good for what you want to do because I can make money by selling it to you. Of course, none of you would fall for a vendor bias expressed as crudely as that. However, we must remember that the vendor bias has still got a firm grip on much of the public discourse about information and communications technology.

Fortunately this bias has become somewhat less prevalent since the end of the dot.com frenzy but you must still be on the alert. Do you remember the dot.com frenzy that lasted from autumn 1999 to the spring of 2000? I was the head of the UK Open University at the time and the dot.com frenzy rattled me. Had it not been for the calming influence of my former colleague Diana Laurillard, who is one of the world's clearest thinkers about learning technologies, I might have been panicked into believing...
that the Open University was about to become, as some dot.com critics put it, 'legacy distance education'. The word legacy carried the implication that, just like software that was due to catch the millennium bug, the Open University needed to be replaced with a brand new system.

The dot.com fanatics argued that the Internet was going to replace everything in education that had gone before and that attempts to graft the new onto the old were doomed to failure. It would be like the older man who asked his doctor for a prescription for Viagra and was told that he shouldn't try to put up a new flagpole on a condemned building.

Today, with the information technology industry shrouded in misery, the dot.com frenzy seems long, long ago. The Open University continues to successful by taking an evolutionary rather than a revolutionary approach to technology and I shall refer to its experience later. Here I simply wish to urge you to be sceptical about assertions of the value of technology coming either from those who want to sell it to you or from their surrogates in political life. The information technology vendor community has done a remarkable job in convincing political leaders that technology is the answer to every educational problem. Sometimes our task is to be unpopular by bringing our politicians down to earth.

There is also a more insidious manifestation of vendor bias of which we must be aware. That is the suppression research reports or evaluative studies if they undermine the thesis that technology improves everything. You have read of the row about pharmaceutical companies that prevent publication of research that they have funded if it casts doubt on the safety of their product. Vendors have funded much of the research and evaluation on the application of information technology in teaching and learning in schools. They have tended to prevent or delay publication of results that suggested technology made no difference or made things worse. We need to remember this when we read the literature. Another form of bias you often encounter in relation to technology is a prejudice in favour of private sector provision over public sector provision.

My second 'b' is also related to bias. It is bullshit. I have tried to find a more polite word for this but have decided to use it anyway. Bullshit is a nicely expressive word because it combines all the energy and force of a stampede of bulls with the messiness and distasteful smell of what they leave behind. This describes exactly the situation we often face in making sense of technology in education. Once an idea has currency the press tend to stampede with it. When we see a concept everywhere it is easy to suspend our critical faculties and assume it must be right.

For example, I was surprised by this passage in a recent issue of The Economist magazine: The global great and good (which I suppose means people like ourselves at this conference) are obsessed with the 'digital divide'. Half the people of the world, they fret, have never made a telephone call. Africa has less bandwidth and Brazil's city of Sao Paolo. How, ask dozens of inter-governmental task forces, can the poor get connected. Amid
all the attention being paid to developing countries’ lack of internet access, some people feel that more fundamental problems are being ignored. Ted Turner, an American media boss, observed last year that there was no point in giving people computers when they had no electricity.

Such observations should make us ask ourselves questions. UNESCO too is officially committed to doing something about the digital divide. It is also interesting to note that here it is a technology mogul, Ted Turner, who is pointing up some loose thinking about technology. I don’t think that Ted Turner sells electricity generating stations so this is not a case of vendor bias, simply the observation of someone with his feet on the ground.

I need not argue at length that those of us who try to apply technology to education should have good antennae for detecting BS. UNESCO is an organization for intellectual co-operation. One of our tasks is to cooperate in the exposure of hollow thinking. We encourage our member governments to engage in ‘evidence-based policy making’. We ourselves should also look for the evidence when we make statements about technology. In the words of another great UNESCO figure, Jacques Maritain: The end-purpose of UNESCO is to be the last fortress where minds can meet.

Think broadly

Rather than continue about the dangers of the bad B’s let me move to the good B’s, which are their antidotes. My first good B is breadth. By this I mean that I encourage you to think broadly about technology in teaching, learning and management. Here are two examples of what I mean. They also explain why I prefer the term technology rather than ICTs. I found the first example just the other day in a new book written entirely by women—twenty-one female contributors—called Using Learning Technologies: International Perspectives on Practice. The book contains a very telling chapter by Edith Mhehe from Tanzania. She did research to find out why so few women were taking advantage of the opportunities offered by the Open University of Tanzania. Here is one of the replies she got:

When I asked about the possible use of alternative learning technologies one woman suggested that her most pressing need was not for learning technologies but for other technologies such as washing machines, cookers and vacuum cleaners, which could help shorten the time she spent on housework and increase the time she needed for studying. Mhehe (2001: 104).

My other example came from a seminar about education in situations of emergency, conflict and crisis that was held during UNESCO’s recent General Conference. The question was, how do you get children to school in a rural, mountainous region of Latin America when they live a good way away and you don’t want them to arrive at school already tired out? The answer was that you get hold of some donkeys. We then heard, from both UNICEF and UNHCR that it is actually very difficult to buy donkeys under the United Nations procurement guidelines. These require performance specifications, tendering and such like. In the end someone
had a flash of inspiration. The solution was to hire the donkeys as consultants, which was fine under the UN rules. In fact they the donkeys turned out to have one great advantage compared to human consultants—they did not write reports.

These are extreme examples of thinking broadly about the use of technology to help people learn. The most helpful technologies for helping Tanzanian women and the Latin American children to learn were technologies that we don't think of as learning technologies or, in the case of the donkeys, as technology at all.

So my first point is to urge you to think broadly about technology. My preferred definition of technology is simply this: Technology is the application of scientific and other organised knowledge to practical tasks by organizations consisting of people and machines.

Let's unpack that. First technology is more than applied science. Non-scientific knowledge, such as crafts, design, tacit knowledge and managerial skills are involved. Second, technology is about practical tasks, whereas science is about understanding. Third — very important — technology always involves people and their social systems. So when you use technology in education, remember that processes, approaches, rules and ways of organising things are just as important as the devices with coloured lights and screens that we call hardware.

With that as our definition of technology I do not need to stress that even when we talk in a more limited way about information and communications technology we should take the broad view. ICTs mean much more than the Internet. Even in the industrialized world, let alone the developing world, only internet fanatics and vendors claim that the Internet renders obsolete all preceding technologies: books, blackboard, film, radio, television, programmed learning and so on.

This was one of the mistakes made during the dot.com frenzy by start-up companies that assumed students wanted to do all their studying on the net. It turned out that they didn't and the start-ups either went broke or survived by adopting a broader view of what technology-assisted learning meant. Technology always involves people and their social systems. I shall come back in a minute to some of the evidence about what students want and like, but first let's identify my second good B.

This is balance, which should be a particularly congenial principle here in Asia where harmony and equilibrium between the yin and the yang are valued. We must strive for balance on a number of dimensions. Let's look at dimension number one. My title talks about quality teaching and learning. Teaching and learning are opposite sides of the same coin. However, it makes a difference which side of the coin you start on when using technology for instruction. Until recently there have been two distinct traditions in the application of technology in higher education.

Seek balance
First, there is the American tradition, which starts with teaching and attempts to use technology to expand the range and impact of the teacher. I call this the remote classroom approach to teaching. The idea is to set up a network of classrooms and to use technology, usually video by satellite or landline, to take teacher’s lesson live to students at the remote sites. The system is interactive, meaning that students can ask questions.

Until about five years ago this approach was what most Americans meant when they talked about distance learning. That created confusion, because most of the rest of the world, including Canada, had a different tradition. The rest of the world started on the other side of the coin, with learning, and used technology to create a good learning environment for the student wherever and whenever the student wanted to study. That approach had advantages both in effectiveness and economy. Effectiveness, because by adapting the technology to the student’s need, instead of the teacher’s needs, one can create a powerful learning environment. Economy because this approach can operate at scale, which the remote classroom approach cannot.

One of the great achievements of the Internet has been to end this dichotomy. The American tradition lost out because the Internet gave us a new tool to reach the student wherever and whenever. Those of you who work in this field will remember how, about four years ago, the word ‘asynchronous, which had not previously been a common word in the educational vocabulary, became as American as apple pie.

So much for dimension number one. When we use technology are we using it to enhance learning or to enhance teaching? I’ve made my bias clear. It is both more effective and more cost-effective to concentrate on improving access to learning, improving its quality and decreasing its cost. Re-engineering, if you like, the basic triangle that defines our challenge as educators with the vectors of access, quality and cost.

Dimension number two is also implicit in my title. ICT for Quality Teaching and Learning: yes, but for teaching and learning what? A useful distinction is between IT for teaching and learning about computers and IT for teaching and learning about everything else. It sounds like an obvious distinction when you make it. But it is not always made and can often be the source of some of the bias and bull**** that I warned against. We all agree that ICTs are useful for teaching about ICTs. Heroic attempts to teach computing without computers are the exceptions that prove the rule that IT is best taught with IT. But it is a logical fallacy to extrapolate from that and assume that IT is also best for teaching and learning about everything else.

Let me give an example. It is relevant to UNESCO’s key challenge of reaching the unreached and is called the Hole in the Wall. The project is the initiative of Sugata Mitra of the National Institute for Information Technology, who is one of the liveliest minds in the IT world. Mitra had observed his five-year-old son playing with a computer and concluded
that children could learn to use computers on their own with minimal help from adults. He was able to test his hypothesis by building a PC with a touch screen into the wall of a street in a Delhi slum where most children do not go to school. It quickly became known as the hole in the wall.

To quote Mitra: children from 8 to 13 years old came rushing to the hole in the wall. Within an hour they were browsing. In a week they could do most of the common functions on a PC, cut and paste, drag and drop, copy, paste, rename and save files and so on. In a month they were downloading and playing games from the Internet. Researchers watched with incredulity. The media exploded with stories. And I would add, James Wolfensohn of the World Bank came to visit.

As a result the experiment has expanded. Since August this year 30 computers have been installed by the government of India in the sprawling settlements of Madangir in the south of Delhi. To quote Mitra again: Hundreds of children flock around them all day long. Their understanding is instinctive and incredibly accurate. They want a keyboard but we don’t know how to build one that will survive in the open. Other computers were installed in a poor area of Uttarakhand where girls spend more time playing on them than boys. From these experiments Mitra draws two conclusions.

First, what he calls Minimally Invasive Education does exist. According to a school principal near the hole in the wall in Uttarakhand the children seem to be able to learn everything on their own. Mitra’s second conclusion is that because teachers are not necessary for kids to learn IT skills it may be possible to scale up from the half million students that his Institute trains every year to the hundreds of millions that must be trained to make the digital divide a thing of the past. The question I leave with you is what do Sugata Mitra’s experiments tell us about the use of ICT for teaching subjects other than IT skills to these children?

In this context you might like to read the interesting account in today’s Bangkok Post of the use of the web at Sriswitthayapuknam School here in Thailand. Students are perfecting their written English by maintaining a series of excellent websites about Thailand, some of which receive more hits than the website of the official tourist bureau.

Dimension number three from my title relates to ‘effective management’. Here I merely point out that management is not the same thing as administration. A simple way of describing the difference is to say that management means doing the right thing whereas administration means doing the thing right. Computers are fast, accurate and consistent so they are a tremendous asset in administration. Indeed, you simply could not operate large distance learning systems, such as the world’s open universities, without massive use of ICTs. I shall mention some applications in a minute, but let me simply note that you will hear about an outstanding application of IT in educational administration at this conference from Andrew Bollington of the International Baccalaureate Organization.
The use of IT in management is more limited because the cycle of planning, implementation and evaluation that is the essence of management requires repeated human inputs and cannot be automated. However, IT is clearly helpful in providing managers with accurate and up-to-date information so that their actions can be fact based. I have also found that meetings where all participants have networked laptops are much better than conventional meetings for identifying and reviewing priorities. Because everyone can input separately in their own time such meetings are quick and democratic.

That is all I shall say explicitly about IT and effective management. For the rest of this lecture I return to the phenomenon of learning, which is at the heart of our endeavour. I shall argue that getting the right balance or the right blend between different elements of learning is the key to both pedagogical and economic success when you use technology in teaching and learning.

I suggest that learning is a blend of two types of activity, independent learning and interactive learning. By independent learning I mean activities such as reading a book, working with software, listening to a lecture or an audiocassette, watching TV or writing an assignment. Such activities are a major part of any learning, especially in higher education. But most learners cannot succeed on independent activities alone. They also need interactive activities.

Interactive is one of the slippery words in the educational vocabulary. I use it to mean a situation where an action by the student evokes a response from another human being, who may be a teacher, a tutor or another student. The response is tailored specifically to the student’s action. Examples are a face-to-face or phone discussion with a teacher or fellow student, having a teacher comment in writing on your work, or getting an e-mail response to a query.

Good learning, in my view, requires an appropriate mix of independent and interactive activities. This distinction between these two types of activity also helps us understand how to use technology effectively from the points of view of both pedagogy and cost-effectiveness.

Concerning pedagogy I make the simple observation that the younger the learner the stronger the interactive component of learning needs to be. Not surprisingly online learning is most successful in graduate programmes and dropout rates at other levels can reach 80 per cent. Handing out laptops to each infant cannot be the total solution for early childhood education.

The key issue in cost-effectiveness is that independent activities lend themselves more readily to the use of technology and therefore to economies of scale. Print, audio and TV material and software cost relatively little to reproduce in volume once you have made the investment in the first copy. However, the interactive activities do not lend themselves
to economies of scale in the same way. Making twenty extra copies of a CD-ROM costs very little, but in learning systems like open universities another tutor is hired for every twenty additional students. This still applies if tutoring is done by e-mail or computer conference.

Put very simply we have cost curves for totally independent or totally interactive learning that look like this. The challenge is to minimise the cost per student in the system by operating at scale and making maximum use of independent activities.

I expect that you are asking yourselves about the exact nature of what I call interactive activities. After all, listening to me now is what I call an independent learning activity, yet all sorts of interactions are going on in your brains at this moment as your neurones fire and compare what I am saying to your own experience. Furthermore, we often refer to today's online technologies as interactive. After all, CD-ROMs and websites respond to actions by the student.

But to what extent is this response personalised? If you make the same series of clicks that I do, will we both get the same response or does the programme remember something about our previous interactions with it and respond to us differently? The fact is that most so-called interactive programmes are not very interactive in the sense of being personalised. That's because writing fully interactive tutorial programmes is labour intensive and therefore expensive.

In many applications, of course, full interactivity is not necessary. What counts is what the student finds useful. What do students find useful? How do they divide their time between independent and interactive activities and particularly between online and offline learning? Some of the most complete answers to those questions come from the UK Open University, which I had the great privilege of leading for the last eleven years until I joined UNESCO in July of this year.

With 150,000 students working with it online from their homes the open university must be the world's largest online university. It first offered courses with online components in the late 1980s so the novelty has worn off. We do not need to worry about Hawthorne effects. Open university students have an extensive range of online facilities available. Which ones do they use?

Online technology is also very successful where it opens up new opportunities. One is for communication between students. Each day over 250,000 e-mail and computer conference messages fly around the open university system. Most may not be of lasting academic significance, but they greatly increase the sense of academic community. A second new opportunity is the chance to consult libraries and museums online. The university selects and updates a collection of online documents for each course and usage of this facility jumped from 60,000 in 1999 to 176,000 in 2000. Students like to go straight to relevant documents instead of taking their chance with the hit-and-miss process of using search engines.
The main conclusion I draw from observing open university students online is that they use the technology more for activities associated with their studies rather than for the mainline work of studying course content. They make it clear, for instance, that they prefer to read books as books, not as downloaded computer files.

I am sure that online technology will gradually play a larger role in study. To make ICTs useful we need to design learning materials that play to their four strengths. The first is to be interactive at a sophisticated level – more than just page turning. Their second strength is as communicative media. Asynchronous group discussion is a powerful learning tool, although to be really effective it needs a human moderator. Third, ICTs can be adaptive. I’m thinking of applications where students manipulate a model, say of climate change. Having students test the impact of changing variables themselves is much more powerful than hearing a lecturer talk about it. Finally, ICTs can be productive, by which I mean that they allow us to operate at scale. The open university has developed a technology called Stadium that allows it to hold master classes over the net to an audience of many thousands.

My conclusion is that ICTs have two key virtues. First they support active learning experiences. Second, they support access to a wide range of media and learning opportunities. The challenge, of course, is that devising good active learning experiences is expensive because it requires lots of work by the teachers.

We need to invest more in the study of the productivity of online teaching and learning. The aim is to involve teachers in designing learning activities that actually increase the productivity of learning for the students. We all know how often enormous resources are devoted to designing a beautiful web application that adds little value for the student. This is another area we must strive for balance, between the effort invested by teachers and the benefit derived by students.

There it is. I trust that my four ‘B’s – two bad and two good – will help you think about the effective use of ICTs for quality teaching, learning and management. I have been fortunate to spend much of my career at the heart of the development of distance learning, which is the most important educational innovation of the last fifty years. In my work I have often found useful the distinction between independent and interactive learning activities and I hope you will too.

We all face the tremendous challenge of bringing education to all in the next fourteen years. Only by educating everyone can we achieve the individual fulfillment and social cohesion that will make September 11 a distant memory. To achieve education for all we must use every tool at our disposal. ICTs are a very important tool. Let us use them wisely and effectively for the benefit of all humankind.


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References
Presentations

1. **ICT and Systems of Education: Formal, Non-formal, and Lifelong**
   By Mr Madeleine Woolley, Director, Adelaid Institute of TAFE
   and Ms Di Booker, Executive International Manager, Australia

2. **Using ICT as a Subject, Tool for Curriculum, and Co-curricular Resource**
   By Dr Kar Tin Lee, Principal Lecturer IT in Education, China

   By Ms Jillian Dellit, Director, Learning Federation Secretariat, South Australia
ICT and Systems of Education: Formal, Non-formal, and Lifelong
By Madeleine Woolley, Director, Adelaide Institute of TAFE and Ms Di Booker, Executive International Manager
Adelaide Institute of TAFE, Australia

The impact of ICT on all sectors of education raises challenges for policy makers, administrators, teachers and students. Underpinning the realization of the potential of ICT to improve educational practices is a series of pedagogical and practical challenges. How these challenges are met will determine the effectiveness of the application of ICT as a means for improving systems of education.

This paper considers the issues commencing with the underlying purpose of education, the impact of the concept of 'educating the global village' and concludes by raising a series of challenges which educational institutions must face if they are to successfully integrate ICT into teaching and learning practices.

In the past 100 years we have experienced 'the greatest social and scientific advances since the industrial revolution started in the 18th century. We have learned to communicate by means never thought of or imagined before. The integration of technologies and systems have allowed for the creation of inventions that have carried us to the moon, brought the world's images into our homes by the flick of a switch and allowed the deaf to hear; all due to the vision and the knowledge of people using technology to control the 'human made world' and 'improve their surroundings' (Hall p1).

ICT is impacting on how education is delivered and how students learn. This paper examines some of the key issues surrounding the application of ICT in education and raises a key number of issues that are fundamental to the successful application of ICT across the whole education sector.

In essence the underlying purpose of education it is to prepare students for their life and role in society - for their role in their community, to ensure their ability for lifelong learning and to think critically, and for their profession/trade (Newman 2000:3).

Is ICT the key to better student outcomes, better teaching and learning?

If so, how can we take advantage of the opportunities that information and communications technology may provide educational systems to enhance access to education and hence move towards the reduction of poverty and generation of personal economic growth?

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What does ICT mean to those who are disadvantaged by the ‘digital divide’ – an issue so eloquently explored by Jacques Chirac, President of France in his opening address to the recent UNESCO General Conference? These inequalities are both between and within nations, and between the North and the South, giving rise to new inequalities in access to learning and work opportunities. As we are all aware, Internet use is much more common among younger rather than older people, men rather than women, urban rather than rural dwellers, and people with higher levels of education and income’ (ILO 2001 Chapter 4).

The OECD defines three ‘dimensions’ of the digital divide:

- differential access to computers and the Internet by socio-economic background, ethnic group, age and educational background;
- geographic differences (between cities, regions, countries); and
- variations in ICT use by industry (small vs. large; different sectors) (OECD 2001:85).

To reinforce this point, the same report comments that ‘those without access to ICTs and without ICT skills become less and less capable of participating in the knowledge-based society, which makes increasing use of technology and information. The resulting so-called digital divide represents a major challenge for policy-makers at all levels’ (OECD 2001:84).

The term “technologically disconnected” is one that crops up often in these reports. Certainly the one third of the world’s population which does not have access to the electricity, phone lines and other infrastructure necessary to enable them to adapt information communication technologies in production and consumption are “technologically disconnected”. A very telling statistic from the ILO is that while ‘at least 70 per cent of the EU labour force is engaged in technology intensive work, more than half the world’s population has yet to place a telephone call’ (ILO 2001 Chapter 2).

There is however some optimism with commitments by governments, and groups such as the Heads of State and Government for the Asia-Pacific Region, to initiatives which will enable their communities to have access to ICT which is slowly changing this scenario – but it is slow. These governments committed at their meeting Brunei in 2000 to working towards providing access for their communities to the Internet by 2010 (Jomtien 2001). Initiatives such as these will have a follow on effect into the education sector.

Working in favour of these initiatives are trends towards:

- Declining costs of telecommunications;
- Potential of wireless technologies to extend access across wide areas and remote rural communities, especially important in developing countries;
Leverage effect that telecommunications can have on other social and economic processes (ILO Chapter 2).

Information is basically data, which with the addition of learning becomes knowledge. In other words learning which is based on the capacity to find, access, apply and transform information into new knowledge. Important competencies which learners require to make this transformation are often called information literacy competencies and include awareness of the need for information, the ability to critically analyse information and evaluate its usefulness and ultimately to be able to apply the information, turning it into knowledge.

Communication is that simple act of dialogue between peoples and cultures that takes on a new dimension when combined with ‘information’ and ‘technology’.

Technology is not strictly limited to the Internet and includes simpler technology such as CD ROM, video, television etc although the term ‘information technology’ does imply the use of the Internet and telecommunication networks. Certainly in educational practices, information technology falls into two parts:

- computer technology which is computer based courses, computerized tests, word processors, graphulous software, spreadsheets, databases and presentation software;
- telecommunications software which offers distance courses, distributed educational resources, e-mail, videoconferencing, bulletin boards, whiteboards and chat (Serdikov 2001:5).

In brief, the application of ICT can take many forms and has the ability to ‘revolutionise the way teaching and learning occurs. The concurrent use of multimedia and computers permits the development of new pedagogical approaches involving active and interactive learning e.g. using computer based learning methods, problem based learning, project based learning, online, video conferencing, satellite links (Salmi 2001:116-7).

Dale Spender (2001), an Australian IT commentator, makes some useful comparisons between traditional teaching and learning indicating that ICT can lead to interactive, constantly changing, two way, customised or individualised teaching and learning which allows users to do things with information and make something new - ‘print is read, online is used; print is studied, online is making; print is knowing, online is doing’ (Educating the global village, Delors 1998:177).

a) Globalization of education. The issue of globalization is a critical factor in considering the concept of ‘the global village’ both in terms of students going abroad for further education and institutions offering courses internationally.

As Jacques Chirac stated in his speech to UNESCO, ‘globalization is often depicted as a new form of colonization’. He went on to say however, it...
will be 'good, if what is shared, what moves about and shapes our consciousness is information, knowledge, progress, understanding of others, the sharing of values and wealth alike. (It will be) bad, on the contrary, if it spells uniformity, reduction to a pre-established format or the lowest common denominator. The response to globalization as cultural steamroller is cultural diversity'. That is one challenge for us as educators.

With the increased use of ICT as a means of instruction, 'the decreased importance of physical distance means that the best (and the worst educational and corporate institutions) of any country can decide to open a branch anywhere in the world or to reach out across borders using the internet or satellite communication links, effectively competing with any national university on its own territory' (Salmi p111-2).

This has advantages and disadvantages which raises further challenges to us – advantages if a nation is not able to finance educational opportunities within its borders and can access appropriate educational systems in this way. The disadvantages however are very real - how do students determine which is the best course for them, and what are the challenges for governments to ensure appropriate accreditation and evaluation processes are in place to ensure these programmes and degrees meet acceptable academic and professional standards?

b) Sharing expertise is an important component of nations’ aid programmes and two interesting examples are the Virtual Colombo Plan and the African Virtual University.

- The Virtual Colombo Plan intends to make intensive use of ICT. This is a joint World Bank and Australian Government project which will inject A$200 million over 5 years into supporting a project to assist the development of basic education, educational infrastructure, information dissemination and higher education. This will take the form of:
  - scholarships each year to support distance education programmes (using the internet in many cases) for training and up skilling primary school teachers;
  - establishment of eight multi purpose teacher education learning o in Teachers Colleges in PNG (equipped with computers and communication equipment);
  - development of content for delivery through the African Virtual University;
  - assistance to developing countries in the development of policies and strategies which will maximize the benefits of the use of ICT;
  - extend the World Bank’s information technology network into developing countries.
The African Virtual University (AVU) is described as a "university without walls" that uses modern information and communications technologies to give the countries of Sub-Saharan Africa direct access to academic faculty and learning resources in Africa and throughout the world. In Australia we have a similar organization under the umbrella of the Open Learning Agency which calls on the faculties of selected universities throughout Australia to deliver distance learning programmes.  

The AVU however provides an interesting model of using ICT in developing countries. According to its website, the AVU is bridging the knowledge divide by training world-class scientists, engineers, technicians, business managers, and other professionals who will promote economic and social development and help Africa leapfrog into the Knowledge Age. Classes are delivered in a studio classroom and using satellite technology the course is then beamed to AVU's learning sites across Africa. Real-time interaction with the instructor using phone lines or email is available and at each AVU learning site, tutors guide the students through the materials and act as liaison with course instructors. All learning sites are equipped with Internet access and computers.  

Since the launch of its pilot phase in 1997, the figures are impressive. AVU has provided students and professionals in 15 African countries with more than 2,500 hours of interactive instruction in English and French. More than 12,000 students have completed semester-long courses in engineering and the sciences and more than 2,500 professionals have attended executive and professional management seminars. AVU also provides students access to an online digital library and free email accounts.  

Building on the success of its pilot phase, AVU has moved from being a World Bank-managed programme to greater African ownership and leadership. It is expected that during the next three years, AVU will expand to more countries in Africa and reach undergraduate students, faculty, and professionals through three main avenues: learning sites in universities, private franchises, and professional learning sites housed in corporations and non-governmental organizations (African Virtual University website).  

Changes in the environment in which education operates, particularly, the demands educational systems are receiving from both their students and the workplace.  

Positioning for the job market. The increasing diversity of use of ICT in industry is placing proportional demands for ICT to be integrated across the courses that we offer. Also, from the student's perspective, the desire to position oneself for the new types of jobs in the knowledge economy provides a strong incentive to mix study programme options and qualifications, often beyond the traditional institutional boundaries.
patterns of demand are emerging, whereby learners attend several institutions or programmes in parallel or sequentially, thus defining their own skill profiles on the labour market' (Salmi 2001:110).

For example:

- in Australia we are finding that more students who are graduates from universities are now taking vocational qualifications after they have completed their degrees than there are TAFE graduates going on to degree programme at university; and
- the emerging trend for TAFE institutions to offer applied degree programmes. Students are now looking increasingly for 'vocational degrees' which provide them with quicker access to jobs and success in the workplace.

Students are requesting and requiring qualifications that are recognized internationally.

For example:

- Tourism: The world's fastest growing industry. In Australia, tourism employs more than 12 per cent of the workforce and this figure will grow significantly over the next few years. Our education and training programmes at AIT (certificate through to degree, which is delivered online) aims to produce graduates with management level skills to fill key positions in the tourism and travel industry all over the world. Eighty five per cent of AIT graduates are employed in the industry in Australia and overseas within 12 months of graduation. Our graduate scholarship programme (sponsored by industry) offers employment in Japan, US, UK and industry placements occur in all comers of the world.

- Information Technology: We are about to offer, as a partnership with the Carnegie Technology Education (part of US Carnegie Mellon University) delivery of CTE’s Certificates in Computer Programming and Software Systems Development. These fit neatly with our own certificate courses but will have the added benefit of enabling students to obtain a dual Australia/US qualification which will be recognised around the world. The Government of SA is offering 100 scholarship opportunities in 2002 on the condition that students contribute to the growth and development of the IT industry in South Australia by residing in SA and using their knowledge within the SA IT industry for a period equivalent to the term of the scholarship.

Education and the needs of global business

What are the characteristics that business is looking for in staff – their e-leaders?

If these leaders are becoming:
- customer obsessed - to better serve the customer;
- paranoid - continually trying to outsmart competitors and anticipate customers' needs;
- risk-takers - comfortable making decisions without all the information - can't procrastinate in the online world;
- admits mistakes - shares bad news quickly;
- evangelising - able to visualise the future;
- brutally frank - to themselves and others - realises their own skills shortcomings;
- thrive on ambiguity - has a helicopter view of the business environment;
- results orientated - always looking for faster ways to achieve results;
- credible and respected (Bushell).

What do they require of their workers?

They need to be:
- strategic thinkers
- able to manage rapid change
- analytical problem solvers
- innovative
- visioning
- able to handle conflict and ambiguity
- emotionally resilient
- intelligent
- capacity builders/enablers
- able to build external relationships
- consultants/brokers/marketers
- strategic partners
- self developers
- sophisticated users of information

A recent article in Campus Review about research on workplace competencies found that the 'overriding demand was for flexibility, innovativeness, creativity, enterprise, adaptability and the willingness to take risks (in addition to possessing) verbal and written fluency in English while high levels of IT literacy were also mandatory' (Maglen 2001:6).

Educating the global village raises a number of challenges for the education industry. Just as the 'impact of global competition and the ability of industries, organizations and individuals to adapt to new and evolving business environments will be the key determinant in maintaining a sustainable business future', so, for our students will be the importance of their ability to adapt and obtain qualifications which are relevant and useful in the 21st century (Hunter 2001).
What strategies can educational institutions put in place to be able to anticipate and respond to shifts in business/work requirements, particularly those as a result of the application of ICT, and be able to quickly respond through changes in curriculum, methodology etc?

Using ICT for quality teaching, learning and effective management revolves around issues that can be categorized as the 'five Ps - practical, pedagogical, policy, philosophical and personal' (Cunningham 1998:2).

**Practical factors.** In summary practical issues include two related categories - financial and infrastructure.

The financial implications include:

a) Capital required to establish an ICT infrastructure including quite high initial costs of hardware and software etc. This quote from the experiences on one TAFE College is typical of the financial issues facing many educational institutions:

The increased use of multimedia means that more high-end equipment, software and peripherals are required and that the aging infrastructure needed a major upgrade. The practice of purchasing one new computer and passing the older ones down the line to other staff or students is no longer acceptable. The economics of this new approach is significant and will impact on the overall financial position of the Institute. Leasing options must be a major consideration (Hampton 2000).

b) Funding required to train staff and to release them from normal duties for training.

c) Funding required to be able to pay computer teachers and support staff the equivalent to what they would receive in the market place.

d) What is the best and affordable means to provide student access to technology - should the institution lend or perhaps even subsidize the purchase of equipment? (as the OU did in the early days with cassette recorders, others now do with laptop computers) - how are the funding implications of this practice met? What is the overall infrastructure investment required and how can this be funded? My own institution is currently faced with costs of A$400,000 per year to replace obsolete equipment to meet current industry standards.

e) Issues of intellectual property and copyright, particularly the cost of adapting materials into, for example, online formats and providing access to resources online.

Infrastructure requirements include:

a) Changes to facilities and perhaps even the purchase of new furniture to provide appropriate physical access and meet occupational health and safety standards – including any special air-conditioning requirements.

b) Provision of a reliable electrical supply.
c) Changes which may be required in classroom layouts to accommodate more flexible learning, for example, combining online and regular classroom courses gives students more opportunity for human interaction and the development of the social aspects of learning but this can have quite large impacts on the provision of appropriate spaces and technology support. For example, Torrens Valley Institute of TAFE's campus at Tea Tree Gully that was purpose built for flexible or open learning delivery.

d) Establishment of special units for the development of ICT enhanced courses and materials, online development etc. For example units in South Australia such as the Education Technology at Onkaparinga Institute of TAFE and for Applied Learning Systems have been established to develop interactive multimedia products for use within educational settings.

- The focus for ETC's activities include staff development, research and development, product design and development and (CD-Roms, videos, web sites, computer based learning packages, print based learning packages, artwork for fliers, posters, reports etc), and infrastructure support and development. The products range across programmes as diverse as heavy vehicles, vineyard practices and hair and beauty courses. ETC has been highly successful providing the opportunity for the Institute to move at quite a fast pace into the adoption of ICT.

- A similar, state wide based service, the of Applied Learning Systems, is a for considerable expertise in online development and instructional design in addition to supporting our video conferencing network, providing access to learning opportunities for people in remote rural areas of the State.

e) Rethinking how traditional student and staff support services will be provided.

- For example, a common question that is often raised in discussion on online delivery is 'can we do away with physical libraries'? Perhaps a more relevant question is 'how will traditional services need to be changed to meet the demands of ICT delivery of courses?' Salmi (2001:118) cites examples of universities without traditional libraries, relying on digitised documents and online digital libraries and databases. This may be a reality but an expensive option still out of reach for most institutions. Other strategies need to be explored and the true reality will be libraries and library staff seeking the combination of the traditional books on shelves and references services and online options.

- Similarly, counselling and information services to students will need to be different to those we are currently providing. Tafestudents.com is a web site which provides TAFE students in South Australia with information about their courses, access to
Pedagogical issues

‘Be it calculator, TV, cassette recorder, videodisc or computer, (the use of ICT) needs to be tempered with reference to sound pedagogical principles. The Web is the latest in a long line of technology that can be used for teaching and learning and it coincides with change at universities teaching approaches. We need to be reflective about the direction and the nature of such change and to keep the focus on pedagogical concerns’ (Fetherston p. 7).

The discussions held in Jomtien earlier this year at the Education International conference resulted in recommendations that provide a basis for discussion on the use of appropriate technologies and methodologies. In essence there was a clear message from Jomtien that educational practice needs to keep pace with appropriate technology ‘as a means of improving education’ but not at the expense of further denying the right of access to education by all.

There is no argument that to live and work in an ICT dominated world, learners need to graduate with competencies which will ensure that they are critical thinkers and competent problem solvers and able to analyse, interpret, evaluate and apply information to vastly different systems. This raises a range of pedagogical issues for school, vocational education and universities including:

a) Facilitating an integrated, collaborative approach to teaching and learning. Using the internet alone will not ensure that this happens - to be truly effective we need to ensure that our students also have access to interdisciplinary skills across the curriculum. To implement this may require changes in how teaching and learning occurs with, for example, much more collaboration between teachers of all disciplines. Integrating learning across the curriculum can also involve the community as a learning environment.

b) Using ICT to enhance learning by catering for individual learning styles, allowing learners to make connections with knowledge and analyse, explain and apply knowledge to practical applications, make decisions and work co-operatively. The Internet ‘seems to have considerable potential to be able to meet this challenge because of its ability to assist with the individualisation of instruction’ (Fetherston p. 5). Constructivist approaches to teaching and learning with increased emphasis on personal meaning and application of knowledge places increased demands on students and teachers and the way in which learning occurs.

c) Selecting and combining different media that suits students’ learning styles, for example, using the technical features of the web to the advantage of teaching and learning activities.
An example is the use of simulation software is to be used at Adelaide Institute where our Justice Studies department is about to commence work with the Metropolitan Police Force in London in collaboration with the South Australian Police to develop a critical incident management training exercise. The model will be used to teach students undertaking the Certificate IV in Interagency Practice (Child Abuse) at Adelaide Institute of TAFE and makes use of several technologies. It is a team based simulation system to support the management of serious crime training. Each syndicate has a computer and will receive video, audio and documentation in the same format they would receive if the incident were occurring "live". The learning occurs when students reflect on the management of the exercise and the decisions they have made. This training software has wide application for any areas in which students required training in decision-making. It allows students to engage in decision-making processes but more importantly, to analyse the reasons behind the decisions they have made.

A similar project is also underway in collaboration with Flinders University to develop an online problem-based course in Child Protection. The Online course requires students to 'work in a virtual town'. Students will be asked to assist families living the 'town' and to work with members of other agencies to resolve problems of child abuse and child neglect.

d) Assessment. For example, if computer based assessment is used that it is an appropriate and valid assessment process.

e) The internet needs to be regarded not just as a delivery medium, especially for distance education, but as a potential teaching and learning tool for all students across education sectors.

f) Impact on teachers

- ICT facilitates a more interactive approach
- teachers' ability to change their practices

**Personal issues for teachers** as a result of the changing demands which ICT facilitated teaching places on teachers.

The challenges for teachers include:

a) Understanding their need to embrace and keep up to date with technology and its application to educational practice. To create a more active and interactive learning environment, faculty must have a clear vision as to the purpose of the new technologies and the most effective way of integrating them in their programme design and delivery (and as a result) must educate themselves in the use of the new pedagogical channels and supports (Salini p117-8).

b) Acceptance of pedagogical change, moving from being 'one-way' instructors towards becoming facilitators of learning.

c) They will need support as they undergo personal, social and professional change.

d) The need for greater flexibility in use of staff may impact on issues such as working conditions and tenure etc.
c) Perceptions of teachers and their role by students. Because of the impact of the media and the Internet, students spend more time in front of the computer and TV than at school, less effort required to absorb new facts etc, ‘teachers and schools, having thus lost their leading place in the learning experience, face the new tasks of making school more appealing to children while implicitly providing them with a “users’ guide” to the media’ (Delors p. 142-3).

f) Communities challenging decisions regarding curriculum and being more involved in school organization.

Professional development is a key strategy for teachers. Two models from the vocational sector in South Australia are:

a) Adelaide Global, an e-learning unit at AIT, the staff of which have the responsibility to provide leadership and support to teachers and to further develop the online skills and expertise amongst staff at AIT. Activities of the unit include development and delivery of training associated with online teaching learning or course material development and promotion of e-learning.

b) The Online Network for Education (ONE) is an online network for all TAFE staff interested in online learning development and delivery. The network is used to distribute information about online learning, training, funding, projects, events and people. Activities of the network include delivery of professional development, maintenance of a website and organization of events such as ‘The Games Online’.

UNESCO activities that fit into this category include:

a) ASPNET – providing access to world wide activities and resources for teachers and students.

b) UNEVOC – providing access to information resources, databases and initiatives to facilitate the development of technical and vocational education and training systems throughout the world.

c) Adelaide Institute of TAFE (AIT) and the Korean Research Institute for Vocational Education and Training (KRIVET) as UNESCO’s of Excellence for TVET – providing a focus for best practice, research and leadership.

Policy issues

For ICT to be successfully implemented within the organization, a solid underpinning of mutually reinforcing strategies and initiatives is required. These may be informed by government as well as a result of institutional policy and planning.

The ICT initiatives for compulsory education in South Australia are founded in the States’ information economy policies and the Department of Education, Training and Employment’s own policy directions documents.

For the State, the imperatives are seen to be:
- engagement and participation;
- capturing attention;
- stimulating imagination;
- connecting people; and
- linking to specific initiatives to achieve these outcomes.

The South Australian Department of Education, Training and Employment has for several years been implementing a series of strategies which will ensure that students obtain high level skills in the use of information and communication technologies. This commitment is recognized in the State policy Directions for South Australia 2000-01, which states:

- All students will leave school as confident, creative and productive users of new technologies, particularly information and communication technologies; and
- All students aged 6 to 16 years will have received an education in the use of information technology and telecommunications, and will leave school with an industry-recognized information technology qualification.

In addition to embedding information and communication technologies as an integral part of the South Australian Curriculum framework, strategies have included the development of what have been called Discovery schools which have the role to positively influence other schools on how to use learning technologies. They are doing this by reflecting on, researching and further developing ways in which they embed learning technologies in their school curriculum. These schools share their models of best practice with others by providing professional development programmes, developing teacher resources and hosting visits by other schools. In addition, some of these schools are exploring the creative use of online technologies that can help open up the learning opportunities for rural and isolated students and teachers. The schools are supported by a network of teachers, a database of best practice and special rewards for initiatives.

Also part of the technology strategy is the establishment of the Technology School of the Future that has the mandate:

- to be the major for teacher development in learning technologies in SA;
- to provide facilities for student groups with their teachers to trial and develop best practice in the use of learning technologies;
- as a research role to investigate new developments in hardware, software and teaching techniques;
- to provide out of hours programmes for students of all ages; and
- to develop partnerships with a wide range of industry leaders in the use of technology in schools.
Research into the effectiveness of the outcomes of the Discovery Schools by the University of South Australia and Flinders University suggests that the project has been successful in changing attitudes and practices of both teachers and students.

Institutional policies will have similar themes underpinned by sound strategic planning – both for the short term and the long term. Not surprisingly, due to the ‘lack of strategic planning, many new distance education institutions have adopted inappropriate technologies, failing to assess their adequacy against the purpose of their programmes, the competency of their professors and the learning needs of their students’ (Salmi 2001:124).

Universities have been traditionally early adopters of technology and the Open University in the United Kingdom has been a leader in its philosophy and planning regarding ICT. ‘Since it was founded, the OU has always sought to make use of whatever technology is most appropriate for its educational objectives and best meets the needs of its students. As technology develops the University continually reviews and revises its methods and systems’ (Open University 2001). These technologies began with radio and television, cassette recorders, video players moving through to use of satellite and digital broadcasting, computers for teaching and learning (from mainframe and terminal based technology through to networked PCs and home based computers) to using the internet and electronic conferencing systems.

**Challenges**

**Quality:** What impact does using ICT almost exclusively to deliver courses (such as the AVU) have on quality issues? Is it more difficult to maintain standards? Are there different criteria for measuring quality and evaluating outcomes?

**Equity:** Earlier we looked at the ‘digital divide’ and as the OECD Educational policy analysis states, this is ‘rooted in broad societal and economic issues.’ It is important therefore that educational policy and planning must address equity issues in relation to access to ICTs in schools, libraries and learning technologies and ICT skill development and training (OECD 2001:94).

**ICT in the non-formal education sector**

Non-formal education can take many forms including corporate training (self and/or employer funded), continuing education and what we used to call leisure education. ICT is also impacting in these arenas. Just using the Internet itself is a non-formal learning experience!

**University of the third age online**

U3A is an abbreviation for University of the Third Age, an organization that aims to provide educational stimulus and support for older people. These are communities of people who come together to learn from one another, sometimes described as ‘a learning co-operative of older people’. It encourages positive ageing by enabling its members to share many educational, creative and leisure activities.
Two years ago a group of U3A members in Australia applied for a grant from two Commonwealth departments - the Department of Education, Training and Youth Affairs and the Office of Older Australians within the Department of Aged Care - to establish U3A Online. Subsequently a group of U3A Online supporters got together and formed a public company, U3A Online Resources Ltd.

The principal objects for which it was established are:

- Through the use of existing and emerging technologies to provide educational opportunities and resources for older persons;
- To establish and maintain a resource and information clearing house to assist and promote the University of the Third Age movement by providing support, service and promotion to that movement, its members and the general public;
- To assist older persons in accessing and utilising existing and emerging technologies for the purpose of education; and
- To promote education for older persons by the use of existing and emerging technologies.

This initiative is continuing with a growing number of courses that are being offered online (http://www.u3aonline.org.au/u3aresources.html).

a) Corporate training is an area that has proven difficult to research in regard to the use of ICT. Qantas, Australia’s major airline, has for a number of years used online learning for some of its staff. The rationale was based on the premise that cabin staff particularly are mobile and need to be able to access their training from around the world. Online methodologies are also reported by organizations such as banks, the health sector and government departments, usually however in conjunction with formal educational institutions. Cost has been cited as one of the major deterrents to the use on online learning.

b) The ILO World Employment Report: Life at work in the information economy outlines some very interesting examples of the use of ICT in what could be considered part of the non-formal education sector as they all involve learning of some kind. Examples include use of ICT by women in call centres, teles and outsourced work such as medical transcription and software services. The report cites case studies of where new technologies and networking have empowered women to access learning opportunities and to improve their social and economic status and to challenge discrimination and overcome gender barriers. These include women in:

- Uganda – Sapphire Women who sell their crafts over the Internet
- Bangladesh, - Grameen Bank funded mobile phone services
- India – SEWA computer awareness and using the Internet courses which have led to members selling crafts through their own web sites.
However as the report states, 'unless these (initiatives) are supported by deliberate policies to ensure participation, ownership, education and ICT training for women – as well as family friendly policies in the information economy workplace – the old gender biases will persist' (ILC Chapter 4).

Libraries throughout the world are s that have always providing opportunities to facilitate non-formal learning and equally have been very early and continual users of ICT. My local public library provides training in the use of email and the Internet for the older members of my community – a wonderful initiative that brings confidence in the use of ICT to people such as my 80 year old mother.

What of the use of ICT at home? A very futuristic example is the Samsung Intelligent House where the concept of ‘homing from work’ becomes a reality. Now you can run your home from work – letting in tradesmen, supervising them via videoconference, instructions to them via email, taking deliveries, ordering your food from the Internet panel on the refrigerator, turning on the oven so you meal can be cooked when you arrive home and so it goes on. There are obviously training issues involved with this example.

The challenge for us in the formal education system is not to forget that as much education occurs in the non-formal sector as does in our component. The use of ICT may bring both sectors closer together – what would your role be to facilitate this?

ICT and Delors

This paper has considered some of the practical implications of the increasing application of ICT in education. The Delors report provides a framework for educational practice and it is appropriate to conclude on a positive note with some points that illustrate ICT’s application to the attainment of Delor’s ‘four pillars’.

Learning to know - as the report states, learning to know ‘also means learning to learn, so as to benefit from the opportunities education provides throughout life’ (Delors 1998:97).

Use of ICT can facilitate:
- education as a process of discovery
- learning to discriminate between the useful and not so useful information
- how to use information to achieve goals
- education which leads to citizenship and democracy.

Learning to do - which is essentially learning to operate in the world of work. This may occur both within the informal or formal education sectors. ICT is increasingly important when used appropriately to ensure attainment of:
- transportable skills across workplaces
- the capacity for innovation and creativity.
Learning to live together - 'in the spirit of respect for the values of pluralism, mutual understanding and peace' (Delors 1998:97) ICT provides opportunities to:

- share information
- discover others
- work towards common objectives.

Learning to be - 'so as better to develop one's personality and be able to act with ever greater autonomy, judgement and personal responsibility.' (Delors 1998:97) ICT can play a significant role in:

- supporting 'education's essential role ... to give people the freedom of thought, judgment, feeling and imagination they need in order to develop their talents and remain as much as possible in control of their lives' (Delors 1998:94)
- providing opportunities for citizens to understand and adapt to society's changes
- facilitating individual development and social interaction

'...traditional responses to the demand for education that are essentially quantitative and knowledge based are no longer appropriate. Each individual must be equipped to seize learning opportunities throughout life, both to broaden her or his knowledge, skills and attitudes, and to adapt to a changing, complex and interdependent world' (Delors 1998:85).

Learning the treasure within: the responsibility of all throughout life:

- 'It is clear that ICT alone is merely a tool, and tools do not substitute for the need for genuine development. ICT, however, offers tools that can accelerate development by providing greater access to and use of information.
- Literacy and education (have) a critical role in reaping the greatest advantages from the emerging digital era. Education is not merely an outcome of economic growth, it is an important input to growth as well - and an input whose importance is increasing. The promotion of education and literacy generally, and digital (and information) literacy in particular, is a key challenge facing all countries (IL0 2001 Chapter 3).


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Using ICT as a Subject, Tool for Curriculum, and Co-curricular Resource

By Dr Kan Tin Lee, Principal Lecturer IT in Education, and Head, Department of Information and Applied Technology, Hong Kong Institute of Education, SAR China

While all educators realize that use of ICT can be a valuable resource for improving teaching and learning, the process of integrating technology into the curriculum is not easily or quickly accomplished. It challenges all educators to reconsider teaching practice, the curriculum, the role of teachers and the ways in which ICT can be incorporated into school curriculum to maximize educational outcomes.

Abstract

This paper discusses ways in which ICT have been applied in educational settings as a tool to assist and generate learning across all levels of education. It highlights the need for effective professional development to be provided for teachers so that they are able to adequately identify the educational issues involved in the integration of ICT. Any implementation calls for substantial rethinking of curricular and educational practice. Time and effort must be expended when developing in teachers a critical understanding of the technology as a shaper of information and values. Teachers need to go beyond training in technical competence and the use of the technology merely as a tool. The focal point should be that use of ICT must provide students with a variety of experiences and contexts to integrate their skills and knowledge both in and out of school.

Finally, true cross-curricular integration can take place only when teachers appreciate that integration of information technology has rich potential for enabling more effective learning where the technology is subordinated to the learning goals of the school. It is only then that teachers will critically select the appropriate digital content based on the needs and learning styles of their students and infuse it into the curriculum. When this paradigm shift occurs, teachers will have become more sensitive to the kinds of learning that students engage in and can critically examine the implications for the management of learning and the effects on students' attitudes and perceptions of the task in hand. Last but not least, in discussing the use of ICT as a co-curricular resource, a working model for the development of an integrated learning environment is used to amplify all of the issues raised in the paper.
Introduction

Information and communications technology (ICT) offers new and innovative modes of learning for all students at all educational levels. ICT can bring about classrooms without walls when teachers are ready to realize the potential of this powerful tool. However, at the present time, despite the technology changes in society, teachers in schools are still to a great extent using the approach of helping students acquire information from textbooks and acting as the information giver. All of their formal teaching in classrooms is still driven by traditional teaching practices although there may be occasions when ICT is used. Breaking away from traditional approaches to instruction means taking risks and this is not easy for teachers to do on their own. It takes time for teachers to recognize the value of using ICT and to become fully committed to the view that information is available from sources that go well beyond textbooks and themselves. As change agents they must help students understand and make use of the many ways in which they can gain access to information and how to make use of this information in a meaningful way. At the very least teachers need to employ a wide range of technological tools and software as part of their own instructional repertoire.

For educators at all levels who are preparing students for the information age, the challenges of introducing and integrating ICT into education have become even more challenging. The teacher of the future must not only be accomplished in the use of ICT but also in the integration of ICT into the curriculum. It is therefore inevitable that for any effective change to occur the use of ICT in teaching and learning must be accompanied by a corresponding change in curriculum. As Yelland (2001) has unmistakably pointed out, effective computer integration is not found in classrooms that are traditional and use didactic teaching methods.

Many countries throughout the world have launched initiatives in response to these challenges. The integration of information technology into school curricula is almost invariably a key element of such initiatives. Numerous professional development programmes have been initiated to provide teachers and teachers-to-be with the opportunities to recognize that use of ICT can improve the quality of the educational experience by providing rich, exciting and motivating environments for learning. Research has informed these initiatives and has illustrated the benefits of ICT for student learning. Several studies indicate that high motivation is evident in students who use ICT to learn whilst other studies highlight the opportunities which ICT presents to encourage the development of creativity, imagination and self-expression. All of this highlights the very complex nature of integrating ICT across the curriculum and the challenges that we face daily.

Why bother using ICT in teaching and learning?

As sophisticated electronic technologies become standard equipment in schools, the roles of students and teachers will change. Before this change can take place it is critical that teachers accept the use of ICT in the classroom. Concurrently school management teams need to plan...
and provide as much scaffolding as possible to ensure that teachers interpret the prospects of technological innovations in a positive manner because schools have been known to be resistant to curriculum innovations. Unless teachers are given recognition for the key role that they can play, they will continue to be gatekeepers of classroom change and prevent themselves from being able to focus on the key issues that really matter. The following are particularly important. When introducing ICT in schools, all teachers need to:

- emphasize content and pedagogy not the level of sophistication with hardware and technical skills;
- engage students in meaningful and relevant learning;
- allow students to construct knowledge;
- bring exciting curricula into the classroom;
- integrate technology into the curriculum and devise alternative ways of assessing student work;
- adapt to a variety of student learning styles to cater for individual learning differences; and
- continuously expand and welcome further opportunities for teacher learning.

The ability to achieve all of the above implies that teachers must have a comfortable level of ICT skills. They must acquire the basic skills in ICT and then go on to ensure that the students in their charge can also make progress in use of ICT in an incremental way. Unless teachers are functioning at a comfortable level of ICT skills and knowledge they will be unable to use ICT as a primary tool for teaching and learning across the curriculum.

Even supposing that the teachers have the ICT skills they will need to carefully consider when, what and how to teach the ICT skills to their students (TTA, 1998:3). Teachers may choose to use very simple or complex technologies to achieve their educational vision. Bridget Somekh (1997) has demonstrated that “the use of IT can provide innovative learning experiences, but in all cases a great deal depends upon the teacher to provide the context which makes this possible”. She goes on to indicate that “teachers need to be competent and confident users of hardware and software, but this in itself is not enough. They need also, to understand how to organize the classroom to structure learning tasks so that IT resources become a necessary and integral part of learning rather than an add-on technical aid”. She asserts that unless teachers “believe in an innovation it is very unlikely that they will introduce it effectively”. Teachers need to be convinced of the value of ICT because many teachers tend to perceive themselves to be technologically incompetent and often feel deskilled and demoralized when they first begin to use computers in the classroom.

Therefore, whenever schools consider introducing ICT as a subject in its own right, it must always go hand in hand with the integrative approach and
be accompanied by the teacher’s keen interest in expanded paradigms as they relate to the roles of teachers and students. Learners must be encouraged to construct, evaluate, manipulate, and present their ideas while demonstrating understanding of curriculum concepts and innovate constructs. It is precisely in this way that we should aim to prepare our students to work in the types of classrooms where knowledge is actively used and students are given more responsibility for their own learning when ICT is effectively integrated as a tool of technology into the curriculum.

Clearly we are all convinced that teachers need to inculcate the willingness to learn enough about ICT to make effective use of it in the classroom. For teachers to rethink and re-structure teaching and learning they must first learn enough about the relevant technologies to apply them in their professional lives, and to translate them to their students as part of the integrated learning of the subject matter. Whereas in the past, the role of school was thought to be the dispenser of information, in today’s context this role can no longer hold. The information explosion has changed the nature of knowing from the ability to recall information to the ability to define problems, to retrieve information selectively and to solve problems flexibly, which therefore changes the nature of learning from the need to master topics in class to the need to learn autonomously. Teachers and students now need to learn how to learn in an ICT rich environment.

Teachers need to perceive ICT as primarily a tool for teaching and learning across the curriculum although there are foundation skills in ICT that students need to learn before they can participate fully in an ICT rich classroom. The National Council for Educational Technology (NCET, 1994) in identifying potential outcomes, stated that the effective use of ICT can:

- provide the flexibility to meet the individual needs and abilities of each student;
- reduce the risk of failure at school;
- provide students with immediate access to richer source materials;
- present information in new, relevant ways which help students to understand, assimilate and use it more readily;
- motivate and stimulate learning;
- enhance learning for students with special needs;
- motivate students to try out new ideas and take risks;
- encourage analytical and divergent thinking;
- encourage teachers to take a fresh look at how they teach and ways in which students learn;
- help students learn when used in well-designed, meaningful tasks and activities; and
- offer potential for effective group work.
The fulfillment of any of the above outcomes could be extremely daunting in the eyes of the teacher. Many ICT skills are assumed and students would have to be provided with the opportunity to learn those skills in the right context. It is still the case that in many countries teachers and students continue to use computers in a presentational mode while use of ICT in the general content area curriculum is neglected or grossly underdeveloped. Nonetheless, there are indications that teachers and administrators are beginning to recognize that computer skills should not be taught in isolation, and that separate “computer classes” do not really help students learn to apply computer skills in meaningful ways. This change is an important shift in approach and emphasis. A meaningful, unified computer literacy curriculum must be more than the teaching of isolated skills.

While specific technical skills are certainly important for students to learn, they do not provide an adequate foundation for students to transfer and apply skills from situation to situation. These curricula address the “how” of computer use, but rarely the “why” or “when.” Students may learn isolated skills and tools, but they will still lack an understanding of how those various skills fit together to solve problems and complete tasks. Students need to be able to use computers flexibly, creatively and purposefully. All learners should be able to recognize what they need to accomplish, determine whether a computer will help them to do so, and then be able to use the computer as part of the process of accomplishing their task. Individual computer skills take on a new meaning when they are integrated within this type of information problem-solving process, and students develop true “ICT literacy” because they have genuinely applied various computer skills as part of the learning process.

It needs to be cautioned here that from the experiences of many countries, teaching ICT as an isolated discipline is not an effective way to encourage the use of ICT in learning. This method cannot provide a meaningful environment for students to learn and apply the techniques in context. Teachers must invariably integrate ICT elements into different key learning areas and encourage students to use ICT to enhance their learning. The success of this integration depends very much on a number of factors, including the nature of the subject content and the readiness of teachers.

Unquestionably it is the teachers who hold the key to the effective use of technology to improve learning. But, if teachers do not fully understand how to employ ICT effectively to promote student learning, the huge investments in ICT initiatives will easily be wasted. Notwithstanding the many years of experience in a variety of educational systems, the issue of how to introduce the use of ICT to teachers and to encourage them to use it in the classrooms has yet to be resolved one way or another in many countries. It is true to say that this issue continues to haunt many policy and decision makers today.
Using ICT as a tool

The discussion above has highlighted the importance of integrating ICT into the curriculum to enhance learning outcomes. Clearly, the curriculum must be adapted or re-designed so that it is ready for ICT integration. A tools approach assumes that general-purpose software such as word processing or paint programs or an Internet World Wide Web browser, can be flexibly applied by the learner to various topics but students are still not playing an active role. And by active we mean constructive learning. When students play an active role the role of the teacher changes to that of a facilitator of learning. The list below highlights the possible changes.

Changes in classroom structure as a consequence of schools that have adopted a fully integrated technology are listed by Collins (1991) as the shift:

- From whole class to small-group instruction;
- From lecturo and recitation to coaching (teacher's role from 'sage on the stage' to 'guide on the side');
- From working with better students to working with weaker students, facilitated by student-directed learning;
- Toward more engaged students;
- From assessment based on test performance to assessment based on products, progress and effort;
- From a competitive to a cooperative social structure;
- From all students learning the same things to different students learning different things; and
- From the primacy of verbal thinking to the integration of visual and verbal thinking, with organisational, artistic, leadership and other skills contributing valuably to group projects.

ICT literacy will become as important as literacy in language and mathematics. Rowe (1993) asserts that "like reading, writing and mathematics, computing gives the student a basic intellectual toolbox with innumerable areas of application. Each one of these tools gives the student a distinctive means of thinking about and representing a task, of writing his/her own thoughts down, of studying and criticizing the thoughts of others, or rethinking and revising ideas, whether they are embodied in a paragraph of English, a set of mathematical equations, the simulation of a social process, or the development of a computer programme. Students need practice and instruction in all these basic modes of expressing and communicating ideas. Mere awareness of these modes is not enough" (Rowe, 1993: 71).

It is worth pointing out that in educational settings where computers are used, they should not themselves be the primary object of study, but essentially a tool. Rowe has contended that research conducted into "the effects of the computer on students' cognitive development has too often tended to regard the computer as a single factor of change introduced into a classroom, which is presumed otherwise to remain the same. The
computer is perceived as an independent variable the net effects of which can be controlled and quantified. In reality there are no net effects. The introduction of the computer into the classroom is far more than a treatment. The characteristics and potentialities of the computer become inextricably intertwined, not only with the way students might go about learning and problem solving tasks, but with the tasks themselves and the whole context of learning and teaching. It is not the features inherent in the tool but how students and teachers use it that determines the effects of computers in education (Rowe, 1993:83).

Using ICT across the curriculum: a working model for designing an integrated learning environment

When ICT is introduced into the classroom teachers need to consciously redesign learning environments so that students can transfer their newly gained ICT skills and confidence to other applications that can be used in an ICT rich environment. Once teachers and students acquire some ICT skills they can adopt a transferable learning style so that each further development in ICT use should become an easier step.

Essentially when the learning environment has to be redesigned we are implying a far-reaching paradigm shift for teachers. Table 1 below depicts this shift.

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<tr>
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<tr>
<td>Objectivist learning theory</td>
<td>Constructivist learning theory</td>
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<tr>
<td>Teacher-d</td>
<td>Student-d</td>
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<tr>
<td>Teacher as expert, information giver</td>
<td>Teacher as facilitator, coach, guide</td>
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<td>Teacher as knowledge transmitter</td>
<td>Learner as knowledge constructor</td>
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<tr>
<td>Teacher in control</td>
<td>Learner in control</td>
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<tr>
<td>Focus on whole classroom teaching</td>
<td>Focus on individual and group learning</td>
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In ICT rich environments it is more conducive for teachers to begin to help students pursue their own inquiries, making use of technologies to find, organize, and interpret information, and to become reflective and critical about information quality and sources. Teachers become advisors and facilitators of learning helping students to frame questions for productive investigation, directing them toward information and interpretive sources, helping them to judge the quality of the information they obtain, and coaching them in ways to present their findings effectively to others. This ultimately requires teachers to become even better prepared in the content of the subjects they teach, and the means by which the content can be
taught and learned. In all of this, teachers need an "attitude" that is fearless in the use of ICT, encourages them to take risks, and inspires them to become lifelong learners.

In the next section, discussion will be based on experiences gained in the development of an integrated learning environment (ILE) for schools in Hong Kong. This example will help to elucidate some of the key points raised above and put into perspective the potential that can be realized when ICT is fully integrated into the learning environment.

Many schools in Hong Kong now have much greater access to ICT, but, in essence they have changed little in their basic approach to teaching and learning. Students rarely use computers either for content-area learning tasks in general or for a large portion of the time spent on any single learning task. When used in any subject area for instance Chinese, English, mathematics or general studies, ICT is likely to be focused on the acquisition of factual information rather than higher-order thinking and problem-solving. To a great extent teachers are still using the ICT tool as the equivalent of a glorified blackboard or as a replacement for paper-based charts and materials. When probed about how teachers used ICT with their students, they were more likely to describe the use of software applications as enrichment or remediation rather than regular instruction. For students, skills in using IT are developed in Computer Literacy classes (skills like keyboarding, Chinese character input, basic computer operations, using email, searching the WWW, using the intranet), but students spend little time applying these skills in meaningful projects or cross-curricular activities.

The ensuing discussion is based on a project, which is currently ongoing. It involves the design of an ILE which can demonstrate how such an environment can be used a co-curricular resource in schools.

In developing the ILE, particular attention was given to the following important points:

a) If teachers are to use the ILE for maximum benefit, then they have to become pedagogical design experts and facilitators of learning. They have to be prepared to change their traditional teacher roles to include using technology appropriately to create alternative and meaningful learning paths for their students. It is only then that they will be able to cater for the individual learning differences of the students in their classrooms.

b) Teachers need to present materials in interesting ways to stimulate intellectual curiosity. Careful thought needs to be given to provide clear explanations and quality feedback. They will observe student behaviour by using the monitoring system and be ready to provide clear structure and organization to the materials presented. Individual student profiles will provide data for further follow-up action.

Designing an Integrated Learning Environment (ILE)
c) Teachers need to be learner-centred and always willing to listen to students to better understand how students make sense of the curriculum so as to decide how to change it to cater for individual differences. Any changes made must aim to make a difference to student motivation, learning, and achievement.

When using the ILE teachers can gain more confidence and can subsequently focus more on maximizing natural learning and motivation with instruction that:

- is meaningful and relevant from the individual learner’s perspective;
- provides appropriate learning activities;
- attends to the climate and context in which learning occurs;
- provides choice and caters for individual interests and creativity, and
- adapts to a variety of individual differences.

Through continuous improvement of the resources (produced by teachers) currently available in the ILE, it is envisaged that the environment can support learning in these ways:

a) To bring exciting curricula into the classroom by extending access to resources beyond the school classroom to supplement existing content;
b) To provide tools and scaffolds that enhance learning – teachers can represent data in different ways;
c) To give students and teachers more opportunities for feedback, reflection, and revision,
d) To give students the chance to self evaluate their learning and experience the opportunity for more focused and individualized feedback from teachers where improvement is needed;
e) To build an entire community that is inclusive of teachers, administrators, parents and students; and
f) To expand opportunities for teacher learning that include helping teachers to think differently about learners and learning, to reduce the barriers between students and teachers as learners, to create new partnerships among students and parents, and to expand communities of learners that support ongoing communication and professional development of teachers.

During the last eighteen months, the real challenge for teachers has been how to use the ILE to match the learner's needs, and support how they best learn.

Keen to achieve a degree of success with the ILE, the schools involved in the project have given careful attention to issues of learning diversity and associated teaching practices across the curriculum. Both schools have been made aware that the implementation of the ILE must be viewed as a means to enhancing learning and not merely for the sake of learning the technology; it implies 'whole school' change.
As it currently stands the three key features of the ILE that can facilitate teachers to cater for individual learning differences within the classroom are listed below.

1. **The ILE allows teachers to use a variety of teaching strategies**

   For the initial six months, teachers made a huge effort in coming to terms with a philosophical understanding of the contribution that the ILE can make to learning and teaching needs. Teachers agreed that in order to maximize the learning outcomes, they must plan and organize appropriate activities to include using a range of teaching and learning approaches to provide useful and effective learning experiences for students. Teachers can try out the following strategies when using the ILE. Use of these different strategies below can free up the teacher’s time and allow them to give more individualized attention to those in need of more help i.e. the lower ability student group:

   - Direct teaching through whole class and small-group sessions;
   - Allow students to apply their learning, either on their own or with others;
   - Opportunities for students to reflect on their own learning (Personal Profiling System);
   - Opportunities for peer coaching; and
   - Opportunities for students to work collaboratively in class.

   By using the ILE, teachers can set suitable learning challenges:

   - Modify teaching schemes to emphasize particular content;
   - Pupils can have more time to complete tasks – in school or at home, all students do not have to complete the same tasks at the same time;
   - Particular students may revisit their work as often as they wish – more individualized treatment;
   - Attainment of students can be logged for individual attention and feedback by the teacher; and
   - Summary assessment of class performance is available for the teacher to take appropriate action.

   More specifically, teachers can consider the following:

   - Identify, adapt and modify materials to allow for differential expectations of learning objectives;
   - Add challenge to tasks for more able students;
   - Provide small guided steps, more focused and structured to enable students who work below the demands of the learning objectives and activities, or to cater for different learning abilities;
   - To vary contexts, resources, or teaching and learning styles to take account of the individual learning needs of students; and
   - Materials can be adapted to provide more support for students who need it.
Most importantly, use of the ILE can help students develop positive cooperative learning relationships, enabling them to work together while researching topics and creating presentations. In such relationships, students help each other to learn. They will all benefit from the experience of learning with and from other students. The ILE will promote classroom learning activities in which students work in small groups rather than in isolation or as a whole class. It is also imperative for teachers to ensure that the classroom reflects a collaborative atmosphere as a prelude to using ILE. The ILE will provide teachers with more flexibility to respond to diverse student needs in the following ways:

- Overcome potential barriers to learning and assessment for individuals and groups of students;
- Opportunities for students to learn at their own pace;
- Students can use computers at a time that suits them – in class, after school, at home, on weekends;
- The computer allows experimentation so the students can try things out;
- Facilitate individual student’s learning process and student’s independent access to information; and
- Monitor and document each student’s progress – individual tracking and personal profiling.

In all discussions with teachers, it has always been emphasized that they should be concerned first with good curricular content and second with incorporation of technology. The fact that the schools have adjusted their timetables for 2001-2002 to allow teachers to participate and the willingness of teachers to adapt their teaching and learning resources are clear signs of change of school culture.

2. Assessment

In terms of assessment the ILE provides a secure basis from which teachers can plan lessons to meet the needs of all students in the class. Assessment can become continuous and supportive. The ILE will facilitate the following:

- Identify the type and use of resources and make use of a resource range appropriate to the individual ability level of students;
- Better understand ways in which students progress in learning;
- Formative developmental feedback is emphasized;
- Teacher should help students toward success, not merely to point out their shortcomings;
- Assist students to remediate any personal learning problems through ongoing feedback;
- Students should be allowed to resubmit work and not be penalized;
- Emphasis is on understanding rather than on memorization and repetition;
Students allowed broad flexibility and encouraged toward self-direction.

Opportunities for assessing students' progress are built into the activities of each topic:

A study plan is prepared for each student which is pitched at an appropriate level. The outcomes of the activity are used to review progress and check whether students are ready to move on to the next activity. The objectives and expectations in the study plan can be used to help students review their own progress. Teachers' feedback to students can range from informal (oral comments) to formal comments (written feedback via the ILE).

The above personal profile system provides evidence of what students have achieved and their progress through time. It is not necessarily a detailed record of achievement for each activity where a mark is awarded. In using this system, teachers need to think and reassess current practices relating to assessment that entail the following:

- Find effective new and improved assessment methods;
- Emphasizing deep learning rather than surface learning;
- Interest in using new teaching methods;
- More frequent formative and summative assessment is possible;
- Teachers can be alerted sooner to adapt their teaching;
- Can spend less time marking;
- Self-assessment in the student's own time, at their own pace, when they are ready;
- Increased student confidence; and
- Students like instant feedback

At a later stage, use of the ILE can lessen teacher workload in assessment through use of the following:

- Electronic delivery of tests;
- Electronic generation of tests;
- Electronic recording and analysis of results; and
- Use diagnostic tools to interpret individual learning differences.

3. Use of learning resources

When teachers begin to use the ILE in mainstream teaching, the following can be achieved:

- High level of student motivation for learning
- Provide students with experiences outside the classroom
- Provide students with opportunities to develop initiative and independent learning
- Enable students to enjoy learning through use of IT and be motivated by it
• Make available to students a wide range of IT tools and resources that are varied and up to date
• Direct students to use the ILE as a self-study resource
• Direct students to use the ILE as a revision resource
• Use the ILE as a communication tool
• Use the ILE to give immediate feedback to students on their understanding

Teachers have been alerted to possible strategies and fruitful avenues to explore in the quest for effective teaching practices. The project team has been able to provide stimulus in developing situation specific strategies. It is the aim of the project to assist teachers to sustain systematic attention to any changes that are currently occurring and to pay particular attention to issues of teaching and learning with a focus on restructuring of curriculum and teaching practice so that the full benefits can be realized.

Suffice to note at this stage of the project that priority must be given simultaneously to the development of teacher technical competence as well as dealing with the educational issues. Time and effort needs to be expended in developing in teachers a critical understanding of the technology as a shaper of information and values. The professional development of teachers needs to go beyond training in technical competence and the use of the technology as a tool. Both schools are well aware the integration of information technology has rich potential for enabling more effective learning, but, this can be achieved only if, at every point, the technology is subordinated to the learning goals of the school.

The above example hopefully provides some insights into the teacher's role in use of ICT whereby the teaching and learning environment is in sympathy with the child's level of development. We hope that the full potential of ICT and its integration as a learning tool into the curriculum within the school can be realized. With adequate training, professional development, technical support teachers will be able to make progress and the stress levels and workloads of teachers and support staff will be reduced in time.

As Dede (2000) had asserted implementation of IT based resources in the classroom is not the blind adoption of recipes and materials for innovation developed by others, but instead the reflective adaptation of a process that enabled a similar group to succeed in improvements actualized somewhere else. He stressed that any research-based curriculum development projects need clinical, applied studies on adapting exemplary innovations via reflective interplay between basic research and practice, a bi-directional process that helps both sides evolve toward increasingly sophisticated objectives.

As illustrated any developmental work with ICT must be designed to undertake careful foundation work with a small number of schools in a systemic and systematic approach. The importance of taking an approach that has a chance of engaging deeply embedded change cannot be
underestimated if the policy and decision makers truly wish to go beyond surface change that will be washed away with the next demand on the educational system.

In Davis (2001) it has been suggested that the power stations will be the teachers as they rise to the challenge of supporting individual learners and their own professional development needs. Policy makers worldwide will want to create such a community of practice where the teaching profession starts to promote its own development and that of the educational system.

It is important not to make over optimistic predictions about what ICT can do for education, including individualized learning, based on simplistic views of the processes of education. During 2000 in the USA Linda Robert of the Federal Office of Technology Assessment commissioned a set of papers to inform future development. These papers note that significant issues remain, and that individual teachers will be unable to implement changes with IT, including individualized learning, unless the system itself adapt to the complexity of systems of education.

In time all countries will succeed in their endeavours to develop models of ICT use in schools that can facilitate teacher coping with ICT integration so as to set pupils on a path to lifelong learning. Persistent efforts can achieve a flowering of innovative teaching and learning that will result from a change in teachers' beliefs as well as practices.

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Using ICT for Teaching, Learning and Management
Using ICT for Quality in Teaching-Learning Evaluation Processes  

By Ms Jillian Dellit, Director, Learning Federation Secretariat  
Australian Education Systems Officials Committee  
Adelaide, South Australia

Abstract  
ICT does not automatically add quality. There is however, growing evidence that ICT application to the core business of education can accelerate and improve learning on a number of fronts. It can also provide the means of gathering, connecting and analysing data about teaching and learning in ways that enable us to more accurately diagnose student need and evaluate programs. To apply ICT in these ways requires changed approaches by educators.

This paper looks at the contribution that ICT can make to quality in teaching, learning and evaluation through improvements in cognition, pedagogies, convergence, culture, and data.

Introduction  
ICT does not automatically add quality to teaching and learning. It is possible to use information and communication technologies for trivial purposes, to waste students’ time with information and communication technology or even worse, to use information and communications technology for destructive or immoral purposes. We can certainly use ICT to further entrench inequalities and to favour particular groups. There is evidence in the USA, for example, that African American and Hispanic students are given more repetitive drill and practice tasks on computers and fewer sophisticated simulation applications than their white peers [Weginsky 1998; Kreuger 2000].

There is however, growing evidence that ICT application to the core business of education can accelerate and improve learning on a number of fronts, from basic skills (Mann 1999; BECTA 2001); problem solving (Oliver and Omari 1999; Williams 1999), information management (Peabody 1996), work habits (Adnanes 1998), motivation (US Congress 1995; Allen 2000; Combs 2000; Diggs, 1997; Sherry, 2001), establishing life-long learning habits (Schollie 2001) and concepts development (Yelland 1998). In addition, information and communication technologies are being applied to the management of learning and to the business models of educational delivery. One recent report that evidences this trend is the USA based, Year Four CEO Forum School Technology and Readiness Report [CEO Forum 2001]. This report links assessment and accountability with cocooa, analysis, and most importantly, alignment. These concepts will be discussed later in the paper.
Educators therefore have a choice. We can push the boundaries of information and communications technology in education, seeking to exploit its capacities to improve our outcomes by extending us beyond the limits and paradigms we currently experience or we can limit it to the boundaries that we currently know, challenging only our technical skills. If the teaching profession and mainstream educational institutions follow this path we will be overtaken by newer, more commercial models of ICT enabled education. Ignoring it is not an option at all.

This paper looks at the contribution that ICT can make to quality in teaching, learning and evaluation through improvements in cognition, pedagogies, convergence, culture, and data.

There are several levels on which ICTs can push the cognition boundaries. New media allow us to represent in rich and diverse ways. This is not simply a matter of learning styles although diverse learning styles can be supported by ICT. New media enable us to traverse the boundaries of art, science, language and senses. They allow us to represent and simulate experience. ICT allows us to accelerate or decelerate processes for purposes of understanding. Just as an experiment allows us to reproduce, represent or test a pattern of activity in the physical world, multimedia allows us to represent and experiment in a 'virtual' world – transferring control and concept to the learner in new ways. We can improve safety, for example, using technology (the difference between a flight simulator and learning in the air) so that the concepts are transferred, confidence is built through simulated experience and skills are developed, long before the risk has to be taken.

Eliot Eisner (1998: 105) claims:

Everyone knows what a culture is – it is a place for growing things, and schools are places for growing minds (Cole1985). The curricula we offer and the teaching methods we employ are means for creating minds. It is in this sense that the curriculum is a mind-altering device (Bernstein 1971) and the school a culture of growing minds. As this conception of mind takes root in our conceptual life, it creates an optimism for education for it emphasises the possibilities of schooling, its capacity to make a difference in the kind of minds that students can come to own.

The best cognitive understandings and practice can be captured and communicated by ICTs and applied to the task of growing minds in ways that improve the quality of learning for many, rather than few children. ICTs can give teachers access to great conceptualisers – inside and outside their own ranks – to assist them in planning and programming cognitive development. Best of all, the interactive capacity of ICTs provides more opportunities for students to engage as creators and manipulators in the learning process.

ICTs support us in bringing together aesthetic as well as scientific considerations, allowing us to overlay knowledge and meaning with skill and competence. We can, for example, enable students to design in ways that demonstrate perspectives difficult to create in classroom spaces, that reveal
new ways of seeing; we can bring serious research more easily into creative writing or we can incorporate story treatments into science using multi-media to enrich and stimulate better learning outcomes (Williams 1999).

Brain research now available to all teachers with an Internet connection enables us to stimulate specific brain s – and to be more targeted in our efforts to stimulate cognition in individual students.

We can, in short, use ICTs to qualitatively improve cognition by conceptualising more creatively, improving teachers’ knowledge and by tailoring learning resources to meet the particular needs of a child at every stage of his or her education.

**Pedagogies**

It has been widely recognised that harnessing the power of modern technologies for learning purposes requires that appropriate learning strategies be developed that harmonise effectiveness in learning with the technology role. This recognition underpins the UfN National Grid for Learning relationship, and a general interest in fostering innovation in learning strategies (Keams & Papadopoulos 2000:77).

ICTs provide many opportunities to more easily use a variety of pedagogies. As a tool, ICTs can support didactic or facilitative approaches, collaboration and interaction across time and distance, enquiry or interrogation, open or closed research, lock step or mind-map. Online technologies support and make easier constructivist approaches, just as they make behaviourist approaches easier. The capacity of ICT to deliver information or to communicate with a mass of students in quite individual ways opens up the possibility of tailoring pedagogy to the needs of a student in time and place without the limitations imposed by peer groups. This provides the opportunity for software that utilises, for example, multiple intelligence theory.

While it is true that:

Information technology can only contribute substantially to the improvement of schooling if it is appropriately embedded in powerful and interactive learning environments [established within] the broader context of [supportive] pedagogy, curriculum and school organisation (DEETYA 1996:14), when it is so embedded, the improvement could be substantial. ICTs, for example, lend themselves very readily to holistic learning, collaborative grouping, problem-oriented activities and integrated thematic units. Teachers wishing to teach in this way will be both more efficient and effective if they employ ICTs to reach their goals. The ICTs of themselves will not improve pedagogy. They will, however, support and assist teachers who shift their pedagogies to be more student-d, project-based and collaborative. Scaffolding techniques are readily supported by ICTs. Systems, principals and teacher training institutions can use ICT to drive in these directions, using it to provide the scaffolding for the teacher as the teacher does for the student.
We are experiencing convergence on many fronts (Wise 1999, 248), fuelled by information and communications technologies. Technologies themselves are converging. Medical technologies are converging with educational technologies (for example, the application of brain scanning to educational purposes, of chemical impact on the brain to behaviour modification) online technologies are converging with offline technologies (through, for example, the use of XML), digital technologies are interacting with media, with publishing industries, with entertainment, distribution and production industries. Such convergence has profound implications for the organisation, management and conception of education and educational delivery.

Further, as Dias and Atkinson (2001:8) point out:

Research indicates that some of the most interesting and innovative uses of technology take place in classrooms where multiple uses of technology are implemented.

Inevitably, convergence is also occurring within the curriculum, across traditional subject areas, most of which were classified (and thereby conceptualised) in the eighteenth and nineteenth centuries. In the last thirty years new subjects have been added to curricula – subjects such as media studies, ecology, computing studies, creative writing, environmental studies. As useful as these subjects might be, the continual addition of areas of study to timetables and the already crowded curriculum will not serve as a useful model for the future. In the end, if we are to achieve quality outcomes for the students of the future, we must use ICTs to assist us to manage the convergence.

Multiskilling is one response. Knowledge management, using the organising capacity of digital technology is another. Alignment is another.

Multiskilling seeks to layer skills over knowledge areas, constructing a matrix that brings together, at the point of an educational outcome, both subject knowledge and discipline, with other skills or competencies (such as problem-solving, information technology skill, high level literacy skill or team skills). Multiskilling places high demands on teachers, who must themselves be multiskilled in order to manage the multiskilling demands of a curriculum. Information and communication technologies play a significant part in multiskilling because they provide enabling tools to speed processes and link knowledge.

Knowledge management brings search engines, thesauri, 'see also' and 'see' algorithms to link data-bases, texts, graphics, formulae and logic trees that by-pass the 'silos' of traditional subject thinking – assisting students in making connections across many areas of study and creating new domains of knowledge specifically for groups of students. Digital curriculum content can be built to capture some of this convergence. This is illustrated in the appended matrix for productions by the Sydney-based Open Training Education Network – Distance Education (OTEN-DE) of a prototype Physics Unit (Dobbs 2001).
Convergence is a significant opportunity and challenge for educators. We must meet the challenge and find ICT applications to assist us in managing convergence more effectively than we have in the past because the world itself is convergent as well as divergent; we need to educate for both.

Alignment
Alignment is an emerging concept in education facilitated by information and communication technology.

Schools can only be effective in enhancing teaching, learning and helping students achieve well-defined educational objectives when the standards, objectives, teaching, curriculum, resources, technology use and assessment are all aligned. The content and methods of assessment must be aligned to measure standards and objectives. Technology provides valuable tools to align the system to promote student learning by providing a means to monitor alignment and communicate these initiatives to the public (CEO Forum 2001:13).

This records the conscious application of a business model to education. Certainly, in the past we have sought consistency in education. We have allocated resources according to priorities and we have sought to have Maths teachers ensure, for example, spelling within their subject area rather than expecting a mother-tongue language teacher to ensure mathematical words are spelled properly. The emerging notion of alignment, however, does more than this. It does more because technology now provides the tools to enable us to more precisely align, and to measure the extent and quality of that alignment.

In a recent visit to the USA, the author observed the Oklahoma VISION project, initiated by the State of Oklahoma in partnership with Intel, Dell, Microsoft and a number of content providers. At the moment teachers in Oklahoma are restricted in what they teach by the available and approved textbooks. This project seeks to return responsibility and accountability to teachers for how learning is achieved. It also brings content producers into the accountability framework.

Western Heights, the initiating district, in Oklahoma, is looking for:

- disaggregated content that can be matched to specific topics in the curriculum;
- flexibility for teachers to choose what works for specific curriculum topics and groups of students;
- payment on the basis of what is used;
- the capacity to alter content use in response to test results;
- the capacity to change teaching methodology in response to test results;
- the capacity to link content use to a range of other data about students, teachers and the learning process in order to analyse data, diagnose need, restructure programs and redirect resources;
- the capacity to allocate funding to the level of the teacher on a daily basis in response to diagnostic data.
In other words, Western Heights District Oklahoma is seeking the alignment of their curriculum, their documented outcomes, the content teachers use to achieve those outcomes, test results, methodology, student data, teacher professional development and finance. This amounts to a new business model for education and is only possible with the help of very sophisticated information management systems and electronically delivered content. In order to achieve this vision, Oklahoma sought the assistance of a non-profit company, Jes & Co who specialise in matching interoperable, standards-based solutions to administrative and academic requirements for technology from schools. Jes & Co are developing a non-proprietary Learning Management System (Jes & Co 2001) that allows the free exchange of data between different education functions.

The Australian based Le@rning Federation (2001) initiative to develop a critical mass of high quality online curriculum content for Australian schools faces similar challenges to the Oklahoma project. At the moment our challenge is to align sufficient technology standards to allow us to exchange learning objects based online curriculum content between states and deliver to the school level in a way that protects intellectual property rights and allows teachers to construct their own learning sequences. A 'learning object' is a component of online material that can be identified, tracked, referenced, used and reused for a variety of learning purposes. For example, a learning object could be a single file such as an animation, a video clip, a discrete piece of text or URL or it could be a collection of contextual files that make up a complete learning sequence (Le@rning Federation 2001b). The learning object is likely to be larger than a digital object – it is a unit that has an educational purpose. Key to the initiative is the expectation that, although the curriculum content is designed in sequenced units of work, teachers will unpack, re-sequence and combine components with other materials of their own. It is Lego-like content, designed to fit the culture of resource borrowing, creation and combination amongst Australian teachers. We are; however, acutely aware that quality does only reside in the learning object itself, but in its pedagogical surrounds and in the teacher’s capacity to easily link content with outcomes, with assessment data and with student profile information. The quality of the alignment as well as that of the object and he delivery will determine effectiveness. At the school level, alignment has always been an issue. In the digital world, however, we can provide teachers with the tools to access and manipulate data, bringing effective alignment within reach.

It is difficult to imagine a more potent lever for changing the priorities of schools than the evaluative methods we employ. What we count counts. What we measure matters. What we test, we teach....

The promise of new paradigms resides in their potential to provide methods and approaches that are both more equitable and closer to the values practitioners cherish Eisner (1998:109).
If we are to use ICT to better achieve the quality of educational outcome that we want; if we are to maximise cognition, skills development and improve our outcomes through alignment, we need to increase our respect for data. The debate about testing that has occupied education in the schooling sector in much of the English-speaking world for the last decade has obscured the importance of reliable, valid data to the improvement of educational outcomes and the increased effectiveness and professionalism that teachers can access by using ICTs to manipulate data, create intelligence and measure their effectiveness in sophisticated ways. Assessment Boards and accrediting agencies in Australia, for example, statistically moderate examination scores against teacher-based school assessments over many years. At a school level, with interfacing databases it would be possible over time to identify methodological, motivational approaches, resources, activities, strategies that impact on outcomes. We don’t have to rely on externally imposed tests in order to extract better value from data and evidence.

Joe Kitchens, the District Superintendent in Western Heights District in Oklahoma has been able to identify that a significant number of students failing in State maths tests demonstrated poor understanding of Set Theory. Further examination revealed these students had mostly been taught in a similar way. By comparing this with the way successful students had been taught and retraining the teachers of the failing students, Western Heights was able to turn the results around.

Australian educators are enculturated to be sceptical of the reliance of USA educators on test results and textbook delivery. However, the point remains very powerful. ICTs give us the efficiency to analyse performance data – however derived – to identify key points of success or problem (that is, to diagnose), to compare and to intervene. To fail to use the technology for this purpose is to choose ignorance over enlightenment.

To take advantage of this capacity of ICTs to assist us in evaluation we will need to develop a more research-oriented culture in teaching. Garvin’s comments (2000:218) apply to teachers as well as principals and educational administrators:

All of us are flawed statisticians, who commit a wide range of interpretative errors. We have trouble separating signals from noise, do a poor job estimating probabilities, rely on misleading rules of thumb, and are over-certain of our own understanding and skills. To combat these errors and improve the accuracy and quality of learning, experts use a variety of techniques that could be easily adopted by managers. They keep running lists of their predictions to overcome hindsight biases. They solicit critical feedback to combat overconfidence. They review flawed choices to uncover hidden assumptions. They enlist the help of coaches and third-party observers to ensure that their words match their deeds. They compile extensive experience banks to enrich their repertoire of

1. In conversation with the author, September 2001.
analogies and increase their skill at pattern recognition. They use formal decision aids to calibrate their judgements and improve consistency. All of these techniques are designed to heighten awareness and develop a more refined understanding of how decisions are actually made.

We need teachers who are attuned to data and its interpretation. We need systems that aggregate the right things and that make it easy for teachers to record their observations. We need more diagnostic specialists in education as well as more identification of teachers who are good conceptualisers and multi-media communicators. These are new specialists. ICTs open up much the same opportunities in education as medical technologies opened in the health industry over the last 50 years – and they will demand a similar set of specialisations. The other factor required to ensure the quality of education improves with ICT application is the training and quality of teachers and related professionals in the creation, use and interpretation of data and applications generated from use of those ICTs (Oliver 2001).

Education is an information and communications based industry and ICTs give us the ‘grunt’ to achieve better outcomes. As well as allowing us to communicate better with our students, and to provide them with more and better information, they give us better information about our craft and communicate finer-grained intelligence more quickly. We need to be prepared to respond.

I do not believe we will ever create the kind of algorithms that are useful in treating quantitatively rendered data, but we have learned that there is more than one way to parse reality, and, with more refined approaches for describing, interpreting, and appraising the educational words we care about, greater confidence in methods that elude the security of rule will, I believe, develop (Eisner 1998:108).

Finally, it is important to view our use of and assumptions about ICTs through a lens of culture. The Delores Report made a couple of predictions about online content and information technology use.

It seems that the differences will be chiefly between societies that will be capable of producing the content and those that will merely receive the information without taking a real part in the exchanges (Delores 1996:65).

There is no doubt but that individuals’ ability to access and process information is set to become the determining factor in their integration not only into the working environment but also into their social and cultural environment (Delores 1996:172).

This paper began by stating that ICTs do not have to be used to educationally liberating, or even moral, ends. It is fitting it conclude with a further reminder of the obvious. ICTs do not have to privilege one culture over another. Educators almost universally use the book as a tool, adapting it to the needs of particular cultures. We need also to use ICTs universally in education, without adopting the economic and cultural assumptions that have driven its rapid globalization.
Quality and evaluation are culturally determined. The Delores Report and its reception has demonstrated that there are internationally shared values amongst educators. Quality in education, however, also depends on specific local application, on meeting the needs of specific individuals in specific social and cultural settings, respecting specific cultural values and communities. As we take up the use of ICTs in education we need to exercise care that we respect and make room for cultural values and differences. The standards that enable convergence and alignment and conceptualisation must also protect and nurture divergence. Quality is not served by hegemony or monoculture.

Applied with intelligence, diligence, research and commitment, ICTs provide powerful means of improving the quality of education along with significantly improved data for diagnosis and formative evaluation. This potential will be realised if educators in all sectors take up the challenge and hard work of adaptation and change required if we are to develop both ICTs in education and the profession in its use of them.

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Presentations

4. ICT and Pre-service Teacher Education: Towards an Integrated Approach
   By Mr Zhu Zhiting and Mr Yan Hanbing, College of Educational Sciences
   Shanghai 200062, China

5. Teachers Using ICT for Networking and Professional Growth
   By Ms Soledad Tuviera-Lecaroz, Vice-President, EDUVISION 2000, Inc.
   Philippines

6. Training Teachers for the Application of ICT in Education
   By Ms Marian Brooks, Principal, Cranford Community College
   Adviser to Ministry of Education, United Kingdom
ICT and Pre-service Teacher Education: Towards an Integrated Approach
By Mr Zhu Zhiting and Mr Yan Hanbing, College of Educational Sciences, East China Normal University, Shanghai 200062, China

As ICT is becoming an integral element for educational reforms and innovations in primary and secondary schools, this situation calls for an enhancement of pre-service education on ICT for prospective teachers. This paper focuses on issues relating to pre-service teacher education on ICT. Problems with existing approaches to pre-service training on ICT are first addressed. Cases that represent partial solutions to the existing problems are introduced. Based upon our own experiences in ICT training for pre-service and in-service teachers, an integrated curriculum for pre-service teacher education on ICT is proposed within the framework of cultures.

Keywords: ICT, pre-service teacher education, integrated approach, cultural perspective.

Introduction
As seen by us in today’s universe of education, the use of ICT has caused substantial changes for learning. Firstly, the rich representations of information changes learners’ perception and understanding of the world; secondly, the vast distribution and easy access of information has changed relationships between educators and learners; and thirdly, the flexibility of spatial and temporal dimensions in the cyberspace changes human beings’ learning life. All of these changes evidence that ICT is becoming an integral element for educational reforms and innovations in current society, and our education is reaching an age of e-education.

Undoubtedly, ICT is bringing about new opportunities for educators, because it can provide powerful support for educational innovations. However, the use of ICT in education creates ever-new challenges for teachers. They need not only to learn the skills of using ICT, but also to learn how to design innovative instructions through an integration of ICT with curriculum. Reasonably, for undergraduate students who are prospective schoolteachers, they should be well prepared for using ICT in education. It has become a common sense that, for a pre-service teacher education program without an integration of ICT, it could not be said to be a complete one.
Problems with current pre-service teacher education on ICT

In China, teacher universities undertake major responsibilities for fostering schoolteachers. To meet the challenge of e-education, these universities have made considerable efforts to reinforce their students’ ICT competence. Up to June 1999, more than 99 per cent of teacher universities have set computer education as a mandatory course, and about 76 per cent of universities have established ICT related departments.

The education program for undergraduate student who are prospective teachers traditionally consists of four main parts [Fig1 (a)]:

- Basic courses, which set up a common foundation for all students;
- Specialist courses, which build up respective knowledge bases for students of different specialties;
- Educational courses, which contribute to acquire educational theories for prospective teachers commonly;
- Educational practice, which usually takes place in the last year of study when the students go on probation in schools for 2 up to 4 months.

Since the 1990s, two clusters of technological courses started to add onto the curriculum of pre-service teacher education [Figure 1 (b)]. The first cluster falls into ICT basics, including modules such as computer basics, programming, software tools, and network applications; the second cluster is related to educational technology, including modules such as instructional media, computer-based instruction, and multimedia authoring.

![Figure 1. An "add-onto" approach for technology in pre-service teacher education](image)

However, a number of problems have been found with such an "add-onto" approach for technological courses, because:

- The ICT basics are taught by teachers from computer sciences, thus only technical issues are focused, but nothing doing with pedagogical uses of technology;
The courses of educational technology are taught in rather traditional ways and show few evidences of using new technology to support instructional innovations; and

The students don’t know how to use new technology in their classroom instruction when they go to probationary positions in schools, because they lack previous practices of applying ICT into curriculum.

As seen by us, in the current practice of pre-service teacher education, technology is taught in separation from the study of specialization, educational theories and educational practice as well. Undoubtedly, this situation will hinder the development of competence for prospective teachers in using ICT to support instructional innovations, as they will teach in the way as what they were taught.

With the recognition of problems with existing pre-service teacher education on ICT, we have been looking for better solutions in the past three years and have acquired considerable experience in pursuing an integrated approach for ICT education. Three cases are described below, which could be considered as a partial solution for problems described above.

In East China Normal University that we are working with, a training was founded in the first half year in 1999, which is dedicated to pre-service training on ICT for prospective teachers. The occupies a space of 2500 square meters, which contains multimedia classrooms, networked CAL labs, courseware development labs, media production, and microteaching labs as well. The facilities of this can afford instructional and practical activities for 300 students simultaneously. Ten training modules have been developed by the, including Basics of computer and Network Applications, Courseware Design, Multimedia authoring, Distance Learning, Instructional design and practice, and so on. Students receive two phases of training. In the first phase, they learn the methods of using ICT in education through hands-on practices associated with study of modern pedagogical theories. In the second phase, they do authentic pedagogical practices in microteaching labs in combination with their educational probation in schools. This approach creates a good linkage between technological learning and pedagogical practice. By the end of November 2001, more than 2500 students from local teacher universities have accepted training. A student from Biological Department of ECNU said after training, “This training taught me a lot of knowledge about ICT and its uses in education. It make me become more confident when going to teach in school”. In China, this type of training can also be found in other teacher universities, such as Beijing Normal University (BNU), Nanjing Normal University (NNU), South-China Normal University (SCNU), and so on.
A convergent model for the curriculum of instructional technology

Instructional Technology, which relates to the use of ICT in education closely, is a mandatory course for students in most of teacher universities in China. There have been a number of published textbooks for this course. Common critiques to these textbooks are:

- Theories are overtalked and show little relationships with the use of technology in education;
- New ICTs and their educational uses are not well introduced;
- Design of innovative instruction with the support of new technologies is extremely weak.

In a summary, the main problem with these curricula is the divergence of theories, technologies and pedagogical practice [Figure (2a)].

![Diagram of divergent and convergent models](image)

**Figure 2. Curriculums on technology in education**

Based on our exploratory efforts in these years, we recently developed a new curriculum of instructional technology, which focuses on educational uses of ICT and attempts to converge theories, technologies and pedagogical practice, with a focus on pedagogical practice (Figure 2b). The curriculum consists of three parts: Practical Activities, theoretical lectures, and support materials.

**Practical Activities:** this part includes 15 modules, which involve a variety of hands-on plus minds-on activities, such as:

- Learning theories
- Searching information
- Discussing pedagogical issues
- Designing lesson plans
- Creating e-works
- Self/peer evaluation
- Communication/publishing

Quite a lot of these activities need taking advantage of materials from the other two parts. Thus this part becomes the main clue of the whole curriculum.
To some extent, these activities embody essential elements composing innovative instructional processes, including research-based learning, resource-based learning, collaborative learning, and performance-oriented evaluation. We believe that learners who acquired innovative experience during the training process would transfer these innovative elements into their own teaching practice.

**Theoretical lectures:** This part includes 8 lectures; each lecture either introduces new perspectives regarding the use of ICT in education, or addresses innovative learning models with support of new technologies, or discusses methodological points critical to the design of creative learning systems.

**Support Materials:** This part collects a set of tools, including lesson templates, lesson plan samples, students' e-work samples, and evaluation rubrics, which are designed to scaffold different practical activities.

As illustrated by Figure 3, this curriculum makes a better integration between theories, technologies, and pedagogics.

<table>
<thead>
<tr>
<th>Theories (lectures)</th>
<th>Pedagogics (Activities)</th>
<th>Technologies (Tools)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning theories</td>
<td>Studying theories</td>
<td>PowerPoint</td>
</tr>
<tr>
<td>Media and instruction</td>
<td>Social forms of thinking</td>
<td>IE Explorer</td>
</tr>
<tr>
<td>Learning rules</td>
<td>Skill forms of thinking</td>
<td>Search Engine</td>
</tr>
<tr>
<td>Instructional process</td>
<td>Competence in problem</td>
<td>E mail</td>
</tr>
<tr>
<td>Instructional design</td>
<td>Cognitive strategies</td>
<td>BBS</td>
</tr>
<tr>
<td>ICT and instructional innovations</td>
<td>Cognitive evaluation</td>
<td>Chat Room</td>
</tr>
<tr>
<td>Evaluation</td>
<td>Cognitive publication</td>
<td>Word</td>
</tr>
</tbody>
</table>

**Figure 3. An integration of theories, pedagogics and technologies**

One of our recent practices on pre-service ICT training is the adoption and adaptation of the Intel-Teach-to-the-Future (ITF) teacher-training curriculum. Funded by Intel Corporation, the ITF project represents an international effort that through training to enhance schoolteachers' competence for using ICT in their classrooms. The goal of the curriculum is to train classroom teachers how to promote inquiry-based learning and effectively integrate the use of computers into their existing curriculum so that the students will increase their learning and achievement. Starting from 2000, over 18 thousand school teachers have been trained in China.

The ITF training curriculum was developed for in-service school teachers. We are exploring the possibility to adapt the curriculum for pre-service training. As a pilot, 40 students from Zhojiang Normal University took part in 4-days of training using the ITF curriculum of a slight adaptation. The feedbacks from trainees show that all of participants considered this training useful and valuable. Through the training, participants not only got to know the operation of technology, but also deeply realized that effective integration of ICT into instruction would enhance learning effect and high-level thinking.
ability. As a result, these participants know more about the ideas of technology-supported instructional innovations, and can design lesson plans demonstrating a good integration of technology.

Our experiences in pursuing an integrated approach to pre-service teacher education on ICT could be summarized as follows:

- Integrating in-campus training on ICT and field practice (on probation).
- Integrating theoretical learning and pedagogical practices. It is of importance that theories should be learned in the context of practice.
- Integrating hands-on and minds-on, that is, learning by doing in combination with mental activities such as brainstorming, group sharing, and peer evaluation, and self-reflection.
- Training for transfer, that is, the process of training should be ICT-supported and integrated elements of instructional innovations as more as possible, so that the student trainees will be able to use these elements in designing their own instructional process later.

Based upon our already acquired experiences in pre-service and in-serve education on ICT, we are considering the possibility to develop an integrated curriculum, which is aimed at accomplishing three "integrations":

1. Integration of learning ICT in general and applying ICT in education.
2. Integration of theories, pedagogics and technologies within the framework of learning cultures.
3. Integration of multiple publishing media.

### Integrated curriculum with a cultural perspective

#### Table 1. Knowledge in categories contained in the integrated curriculum

<table>
<thead>
<tr>
<th>Main topic</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>What is ICT in general?</td>
<td>Information tools, productivity tools, communication tools, problem-solving and decision making tools²</td>
</tr>
<tr>
<td>Why use ICT in education</td>
<td>Knowledge race, educational reforms, life-long learning</td>
</tr>
<tr>
<td>How to use ICT in classroom instruction</td>
<td>Presentation, practice, testing, inquiry, cooperative learning</td>
</tr>
<tr>
<td>How to use ICT for personal and professional developments</td>
<td>Distance learning, research, academic productivity</td>
</tr>
<tr>
<td>Safe and ethical use of ICT in education and in general</td>
<td>Content filtering, acceptable use policy, fair use of e-resources in education, anti-virus, ......</td>
</tr>
</tbody>
</table>
2. Integration of theories, pedagogics and technologies within the framework of learning cultures

In the age of information, as quite a lot of learning activities take place in a single cyberspace of zero distance, thus different learning cultures will meet together. The first author of this paper suggested a two-dimensional model for a classification of learning cultures, which identifies four different types of learning models: individualism-objectivism, individualism-constructivism, collectivism-objectivism, and collectivism-constructivism. As shown by Figure 4, he also tried to link most of existing ICT-supported learning models to particular learning cultures.

We believe that each type of learning models has its specific value for the development of learners' competence. Therefore, prospective teachers should learn to make a comprehensive use of different learning models. They need to know learning theories underlying each type of culture; they should be clear what pedagogical models are linked to each culture; and they must be able to use suitable technologies to support a specific pedagogical model. With these considerations in mind, we suggest a knowledge profile for each type of learning cultures as shown by Table 2. In the column of technologies, the items of italics represent selective tools when teaching.
### Table 2. Knowledge profile in terms of learning cultures

<table>
<thead>
<tr>
<th>Theories (of learning and instruction)</th>
<th>Pedagogics (Learning models)</th>
<th>Technologies (Tools)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Objectivism-Individualism</strong></td>
<td>Tutorial</td>
<td>Multimedia authoring</td>
</tr>
<tr>
<td></td>
<td>Drill &amp; Practice</td>
<td>CM system</td>
</tr>
<tr>
<td></td>
<td>Testing</td>
<td>Adaptive learning technology</td>
</tr>
<tr>
<td></td>
<td>Simulation</td>
<td></td>
</tr>
<tr>
<td><strong>Objectivism-Collectivism</strong></td>
<td>Presentation</td>
<td>PowerPoint</td>
</tr>
<tr>
<td></td>
<td>Virtual lecturing</td>
<td>Virtual reality</td>
</tr>
<tr>
<td></td>
<td>Simulated demo</td>
<td>Grouping tools</td>
</tr>
<tr>
<td><strong>Constructivism-Individualism</strong></td>
<td>Microworld</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Inquirv</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Case study</td>
<td></td>
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<tr>
<td></td>
<td>Simulated learning</td>
<td></td>
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<tr>
<td></td>
<td>Problem-based learning</td>
<td></td>
</tr>
<tr>
<td><strong>Constructivism-Collectivism</strong></td>
<td>Social constructivism</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cooperative learning theory</td>
<td></td>
</tr>
<tr>
<td><strong>Integration of learning cultures</strong></td>
<td>Computer-supported</td>
<td></td>
</tr>
<tr>
<td></td>
<td>collaborative learning</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Virtual learning</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Community</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Collaboratory</td>
<td></td>
</tr>
</tbody>
</table>

3. Integration of multiple publishing media

The contents of the curriculum will be organized into three parts:

![Figure 5. Media profile of the curriculum](image-url)
Pedagogical practices, which contain procedural knowledge prescribing learning activities for training participants with reference to theoretical lectures and resources in context.

Theoretical lectures, which contain descriptive knowledge introducing learning theories and instructional design theories in topics.

Resources, which contain support materials and technological tools serving for pedagogical practices. When the curriculum is intended to be used in different cultural zones, it is important to create culturally-different materials such as unit plan samples, student's e-work samples, and multimedia stuffs, which can be called cultural packages.

Three different types of media will be used simultaneously (Figure 5):

- Printed book, which is used to record major parts of theoretical lectures and pedagogical practices as well as a minor part of the resources.
- CD-ROM, which is used to record major part of the resources.
- Website, which is used to contain extensive parts of the theoretical lectures and the resources.

We would like to share experiences with international colleagues.

Teachers Using ICT for Networking and Professional Growth
By Ms Soledad Tuviera-Lecaroz
Vice-President, EDUVISION 2CCI0, Inc.
Pasig City, Philippines

What is professional development?

Professional development refers to a variety of activities, both formal and informal, designed for the personal and professional growth of teachers and administrators. It includes individual development, continuing education, and in-service education or staff development, as well as, curriculum writing, peer collaboration, study groups, peer coaching or mentoring (according to the thesaurus of the ERIC database), classroom visitation, attendance of conferences, action research, publication of papers, etc. Professional development activities are varied because they have to serve teachers and administrators not only at different levels of instruction or management but also at different points in their career development. It involves a wide variety of subjects and activities to insure that teachers acquire and maintain the competencies required to face the diverse challenges involved in teaching and learning (Howell, 1996).

Although like training it involves the learning of new skills, more importantly, it is concerned with the development of new insights into pedagogy and stimulates an on-going reflection into one's own practice. Professional development is purposive, meaning, it has to have specific goals or explicit targets that are both institutional and personal in nature. That it has to be an on-going program rather than a time-bound project is best expressed in a quotation from Donald Oriich, author of Staff Development: Enhancing Human Potential. He wrote, "Regardless of the adequacy of one's pre-service or university preparation, no one in the teaching field from kindergarten teachers to graduate faculty in universities will be adequately prepared at an entry level to remain current for an entire career" (Howell, 1996).

Recent studies have also confirmed that staff development is a key process in improving learner performance (E-learning for educators: Implementing the standards for staff development. NSDC/NIC1 report, 2001). The National Staff Development Council reports that teacher access to "high quality, results-driven, content specific staff development increases student achievement." (Killion, 1999, National Commission on Teaching and America's Future) and that investment in staff development produces greater increases in student achievement than comparable investments in class size, increasing salaries or even hiring more experienced teachers ("E-Learning for Educators", 2001).
The National Staff Development Council lists the following as constituting best practices for professional development:

1. Results driven or focused on the effects of professional development on the learning achievement of students;

2. Standards-based or derived from standards about quality professional development that are in turn developed from the standards of learning expected from K to 12;

3. Job-embedded or connected to the daily work of teachers and not just reserved to training "shots" or other similar activities during week-ends, summers and other holidays; and

4. Content rich, which means oriented to developing a deeper understanding of the content of one's discipline.

To this list should be added another dimension, that is, that the professional development program of an individual educator should be situated in the context of a plan, actually, two plans, one's personal road map of professional growth and that of the educational institution, division, or district to which the educator belongs. More and more professional development must be viewed as a systemic issue involving public policy, as it is concerned with licensing and other regulations, teacher training institutions, the schools that hire and maintain teachers, professional associations and many other groups and agencies.

The Planning Guide adopted by the California School Board also suggests a number of useful design elements for high quality professional development. Some of these are:

1. Professional development programs respect and encourage the leadership development of teachers. There are a variety of such roles, including, mentoring new teachers, acting as consulting teachers, coordinating alliances and networks among teachers, doing advocacy work, etc. The route of professional development should consider these roles and should not relegate teachers to just being recipients of training.

2. Provide for balance between collaborative/collegial work and individual learning. Central to the development of the professional development enterprise is a learning culture that is collaborative. Examples of collaborative activities are joint planning and problem solving, study groups, team teaching, participation in alliances. In helping a teacher craft her professional development plan, she should be helped in availing of opportunities for participating in exercises that meet her personal learning needs while at the same time enabling her to help in the learning of others in her group.

3. Build in accountability practices and evaluation of professional development programs to provide a foundation for future planning. All professional development plans have to be evaluated against data about student learning, institutional/district/division needs and goals and against teaching and content standards.
The American Association of State Colleges and Universities Task Force on Professional Development for Teachers Report lists three premises of Professional development ("To Create a Profession: Supporting Teachers as Professionals" AASCU Report 2001):

1. The teacher is the single most important factor in student learning.

2. Student learning will increasingly be the measure or determinant of teacher effectiveness, meaning, teachers would be evaluated in terms of their capacity to promote student learning, regardless, of student background and preparation.

3. The quality of a teacher is affected by his knowledge of content and by his knowledge of how to teach. It is at the intersection of knowledge of content and knowledge of strategies that much of staff development efforts should be focused.

Technology has the potential to transform the professional environment for educators. Through the application of network technologies to research and collaborative planning, teachers can break loose from the isolating environments that the teaching profession had imposed on them in the past. Technology impacts not only on the teaching and learning process but also on the ways and opportunities educators learn.

The developments in technology influence two important aspects of education. One is the way schools train prospective teachers (pre-service) and the other is how schools design continuing education for their teachers to learn on the job either at the physical workplace or at virtual learning (in-service). Both of these ways are going to be discussed by other panellists during this session. Let me just make some brief comments on pre-service and in-service as they relate to my topic.

Universities and other teacher training institutions have an active role in professional development beyond just providing undergraduate or graduate level teaching. This is because subject matter expertise and discipline knowledge reside in the universities. Further, the discovery of new knowledge and the reinterpretation of established knowledge are core functions of universities. Universities conduct and publish research, which can be harnessed in the service of teacher education and the public schools. Finally, there reside enormous creative talents in the university that could be tapped to provide professional development (AASCU Report 2001).

Unfortunately, although most teacher-training curricula provide for computer literacy, most of skills are taught in stand-alone courses and meaningful technology infusion in the various subjects is not modelled enough or at all. The masteral programs, on the other hand, tend to overly emphasize the content of the discipline to the detriment of teaching skills for that discipline. The masteral level courses are also often not grounded enough in the realities of classroom teaching environments.
Other masteral programs have the net effect of removing teachers from classroom practice and "promoting" them to administrative jobs.

The information age is also affecting our concept of teaching licensure. The old model of a lifetime credential, a programme, which required limited professional development, or the perception that a master's degree was the final step to achieve the lifetime status of a teaching professional, is being replaced by licensure requirements that mandate continuous development. A new model of a development programme, one that is characterized by continuous growth, self-direction and self-reflection and by the participation of relevant stakeholders, is emerging and is in-fact made do-able by the very opportunities which technology offers to the teachers.

Teachers are members of learning communities; they learn from each other. Exchanging ideas with one another and solving common problems are powerful ways of learning among teachers. But the demands of teaching have often prevented regular or sustained sharing. Fortunately, technology can provide some solutions to structural problems that serve as obstacles to sustained collaboration among teachers.

Let us now look at the conditions that would facilitate the effective use of ICT skills in professional development.

Inadequate training is the most important obstacle to the effective use of technology in instruction and in professional development. If teachers did not get enough of it in pre-service, then the learning gaps must be filled through in-service training. In this regard, our experience in the training of public school teachers in the Philippines is instructive. We have observed that first time technology users are not usually able to infuse technology in the teaching of their subject areas if their training consisted simply in using tools to improve their personal productivity. If training was oriented towards automating tasks that were formerly done manually, then it is not likely that the teachers are going to use technology in transformative or really powerful ways as in constructing new knowledge. If teachers are limited to using technology simply to automating the production of work sheets, tests and the like, because of a lack of useful technology integration models during training, then they are not likely to harness the power of technology for creative professional development and collaborative activities either.

**Release time after training.** We have also found out that release time after training for teachers is critical if they are to persevere in using technology in the classroom and if they are to finally arrive at some "comfort zone" in using technology in instruction and for professional development.

The release time is to enable teachers to engage the software, study how it fits into the course, or do lesson plans that demonstrate thoughtful technology integration.
Liberal access to computers and the Internet. The discomfort teachers feel in using technology in the classroom is exacerbated by the awareness that their students are more technology-savvy than they are. This is the reason why administrators must provide teachers liberal access to computers and the Internet. Since most schools and school systems already suffer from various resource deficiencies, administrators are challenged to manage this resource lack in more creative ways, including, making loans available to enable teachers to buy their own computers or devising some kind of professional development time swap for a laptop as Jamie McKenzie in "Creating Learning Cultures with Just-in-Time support" suggests. A teacher can pledge a number of after class, week-end or holiday hours to work on a specific set of professional development activities in return for the use of a laptop at home. Teachers may also be given vouchers or pre-paid Internet cards to be used in Cyber cafes when school access to the Internet is inadequate.

Access to technical and curriculum support. Technology infusion in the various subject areas is a complex innovation that requires a considerable change in pedagogy and possibly, a shift in the personal beliefs of a teacher about how teaching and learning take place. If a teacher has not seen technology infusion modeled in pre-service, she would have a greater need for technical and curriculum support as she struggles to use technology for teaching and accessing technology-based professional development opportunities. A teacher needs this kind of support to be continuing, low threat and just in time. Support can come from both teckies and teacher mentors or coaches who have experience in technology integration.

Shared vision on how ICT will be integrated in teaching and learning. As I have mentioned earlier in this presentation, professional development is a "systemic" concern. The only way to insure that individual professional development plans will have any substantive impact on student performance is to anchor them on a vision and a set of goals which have been formulated with inputs from all stakeholders, including, the individual teachers. Since public funds will support most of the professional development plans, accountability requires that said plans be aligned with institutional or district needs and goals.

Examples of professional development strategies involving ICT:

While the potential of technology to offer creative opportunities for individual and collaborative learning for educators is no longer the subject of debate, the realities of education in the Philippines and other developing countries include the fact that computers in schools are inadequate, connectivity is limited and expensive and most other technology resources are unevenly distributed. Can technology in this context still promote the best practices in and the design elements of high quality professional development? The following are examples of ways by which our educators can make use of the power of technology to meet professional development goals even when computer access and training are limited and connectivity, expensive:
1. Teachers of the same subject area can take turns researching on professional development issues or topics that could be discussed during departmental meetings. Articles could be downloaded, indexed according to topics, the addresses hyper linked to the actual sites, and saved in the staff development folder of a server. Teachers can access the articles offline.

2. About 3-5 networked computers may be set aside for use of teachers exclusively for professional development purposes. Committees maybe formed within each department to determine content and pedagogy related issues in their disciplines for which web-based resources would be identified. Whenever possible, the appropriate websites could be web-whacked and stored in the server or in CDS for off line viewing of the teachers. Teachers are also given evaluation forms that they use for evaluating the web sites for relevance to learner performance and their own professional development needs. The committees regularly review the websites according to the comments of the teacher users.

3. CD’s of professional development articles and web-whacked sites can be made available to rural schools that have no connectivity. Selection of sites maybe done at the Division offices under the supervision of the subject area supervisors. The supervisors can also design guides to facilitate the discussion of issues during staff meetings. Central schools with internet connectivity may also be designated to do the research and the downloading of Internet-based materials.

4. Use of an intranet system which features a discussion or “knowledge forum” – Teachers, especially new ones, may seek the assistance of more experienced teachers by posting questions relating to the content and teaching of their respective disciplines in the intranet discussion system. The subject area chair can summarize the threaded discussion and circulate the summary during faculty meetings for additional comments.

5. The development by year level multi-disciplinary teams of “internetized”, multi-disciplinary lesson plans or lesson plans, which have been enhanced with the use of various web-based resources. The more experienced teachers develop and post these in a web-based intranet system within the school. New teachers are encouraged to try out the plans in their classes and to report on their experiences during face-to-face staff development meetings. The new teachers are expected to develop their own enhanced lesson plans eventually.

6. Videos of lessons demonstrating seamless technology infusion in various subject areas can be viewed and critiqued by teachers during staff development meetings.
7. Teachers develop electronic portfolios using authoring tools that do not require programming knowledge. The electronic portfolios contain the statement of professional development objectives and a description of activities undertaken to meet the stated objectives. An important feature of the portfolio is a journal of the teacher's reflections on the effects on her teaching of the activities she has undertaken. The journal will also include “success stories” with technology integration strategies used in class. The portfolio may be discussed with a peer mentor.

Some general suggestions:

1. A technology skill/competency continuum for educators must be adopted by an institution, division or district against which individual “technology growth plans” would be benchmarked.

2. A teacher or administrator creates a written professional growth plan outlining the route to powerful practice (McKenzie, 1998). The school can develop or adapt an existing survey questionnaire that would help the individual educator assess areas where professional growth is necessary. The areas should be related to, among others, improving learner performance in a particular subject or competency or skill requirement areas. The technology skills continuum for educators that has been adopted by the institution or the division/district is an important input to this plan. The teacher reviews the options or opportunities to meet these goals and discusses these with an immediate supervisor for the latter’s suggestions. The plans are collated so that the school heads/superintendents can determine the infrastructure requirements for meeting the plans. The Superintendent/School head commits support and the necessary resources. Face to face meetings together with on-line discussions and reporting through e-mail are done to follow up the implementation of the plans.

3. Teachers join on-line study groups within and outside the school to explore new and better ways of teaching and to share lesson plans, web-based resources, and experiences with web-based activities.

4. Appointing a facilitator for on-line discussions is a big help to first-time participants. The facilitator usually directs the discussion to key topics, keeps the over-all goals and structure of the discussion clear to all, models expected on-line behaviour and generally, provides the “glue” to keep individuals connected together in virtual space. (EDC/ Centre for Children and Technology, 1997).

5. In a department, say, Mathematics or Science, teachers “specialize” on specific aspects of technology. One may be “expert” on a particular technology tool, on web page development or on infusion strategies. Each “expert” becomes a technology coach on the subject for others in the department.
6. Visits to workplaces that have technology rich environments, such as newspapers, television or radio stations, factories, hospitals are organized. Teachers observe, interview and record their observations about the role of information technology skills in the organizations they are visiting. Later in the day, the teachers reflect on the impact of these technology rich environments on their own curriculum requirements. The reflections may be shared with other teachers through e-mail or for those who have no reservations about having their work read by more, posted in the school’s web site. The reflections will also be saved in the teacher’s electronic portfolio.

7. Short tutorials on very discrete technology skills embedded during the workday are conducted in lieu of formal and lengthy generic training programs. The tutorials maybe conducted by another teacher for a small group.

8. The talents of technology-savvy students are harnessed by making them techno aides. Teachers will have access to a pool of technology aides when they are on the Internet or using a software and encounter technical difficulties. The students earn extra credits for their services as techno-aides.

9. A school, division or district based 24-7 technical support hotline for teachers who are enrolled in e-learning courses or are participating in on-line collaborative or other telecomputing projects where they encounter technical difficulties. The availability of technical support can, in fact, decrease the dropout rates from on-line courses that are caused by frustrations with the software and other technology requirements such as saving PDF files, uncompressing zipped files, or the like. Technology has the potential to draw out teachers from the isolation of classrooms. Some teachers have through indifference or intellectual incompetence or through circumstances, such as, lack of time, lack of opportunity because of remote locations, lack of resources, etc. have accepted a role confining their professional practice to the classroom. Their isolation kept them from participating in activities that could have improved their own practice. They also had no impact on or contribution to the larger educational community. To these teachers, technology offers both the tools and the opportunities to draw a personal road map that would bring them to better practice and to becoming an active contributor to growth of new knowledge.

To define professional development in the context of the digital age is to define what makes a teacher effective in the information age. Technology can help teachers assume a personal responsibility for shaping their learning.

For technology to be used in powerful and transformative ways, however, a certain set of conditions must prevail. Professional development is a systemic issue and its effectiveness may require structural changes or reforms.
Finally, teacher training institutions, professional development schools, professional societies and public educational agencies must continue to identify, study and disseminate examples of effective technology integration that answer professional development needs.

References


Training Teachers for the Application of ICT in Education
By Ms Marian Brooks, Principal, Cranford Community College Adviser to Ministry of Education, London, United Kingdom

Abstract

This presentation draws directly on recent practice and research in relation to effective training of serving teachers in the application of ICT, set in the context of the speaker's experience as principal of a Community College in West London. It highlights the need to provide appropriate support in adapting teachers' activities to fit a changing paradigm of learning, and the role of school leadership in understanding and leading that process. Finally, it demonstrates the value in a group of schools working together to derive maximum benefit from sharing expertise and experience in staff development.

Note: The following text consists of the main points from the PowerPoint presentation. The full text of this presentation will be published on the Conference Report Web Site.

Cranford - the context:
- 1350 students, mixed comprehensive school
- 91 per cent ethnic minority, 85 per cent with English as second language, 43 languages spoken
- High level of turbulence, refugee and social mobility - 50 per cent by Year 11
- 85 per cent stay on post-16 years of age
- 4000 adult learners per year
- Major challenges - literacy and numeracy
- Low levels of prior attainment
- Examination results above national average
- Above 95th centile on national benchmarking
- Well above average numbers staying on post-16 and entering university

Why use ICT in schools?
- It represents a major step in the development of human capacity
- It has contributed to change in almost every field of endeavour
- It provides a tool to improve human efficiency and creativity in a way beyond any previous invention
- It is reshaping the economic structures of developed societies and must be widely used to ensure the continuing ability of the country to create wealth and sustain its existence
To ensure knowledge and skills are widely shared and the highest possible proportion of the population has the opportunity to use such technology.

Raising a standard - self esteem:

- Climate of achievement
  - Finding avenues to success
  - Promoting self-esteem
  - Removing barriers
- High level of access by students, broadband connection to Internet, integrated network
- Multi-channel learning - interactive whiteboards, digital interactive TV, high quality software

Creating a climate - equipping staff with skills:

- Take them from where they are; share fears
- Demonstrate real leadership and example
- Learning happens for everyone, all the time
- Emphasis on improving the quality of teaching and learning
- Peer training is the most powerful avenue
- Ease workload through more efficiency

Joined-up thinking:

- Instructional software is often the least appropriate way to demonstrate value
- Need to identify transformational capacity in software, hardware
  - whiteboards, concept mapping
  - collaboration on resources and materials
- Solutions to the problem of integrating assessment alongside learning
- Use for activities relevant to staff (just-in-time learning)
  - recording attendance, assessment, access to school information, communication in school and outside
  - compiling and sharing data, producing reports
  - making data available, reducing power control over access
  - all publications on-line and up to date
  - develop confidence, application into teaching
- Immense value in equipping teachers with personal tools - most effective in transforming practice
- Wider access to training materials, often web-based or on-line, serving the dual purpose access to training and improving skills, confidence
- Sharing of experiences, 'Talking Heads', teachers' conference groups
Working together:
- Secondary school with pyramid of primary schools
- Economies of scale for staff development, technical support, software
- Knowledge pool larger, avoids loss of momentum through mobility
- Eases engagement of suppliers through access to larger group

Relationship with Cranford Cluster of Six Schools:
- Established over 4 years
- Capital, hardware, bids and equipment loans
- Technician support, training, access to facilities, support for acquisition
- Outreach teaching, INSET, curriculum partnerships
- All six have ICT cited as a major strength by Ofsted and have shown above average improvement in standards

Web Site: www.cranford.hounslow.sch.uk
Presentations

7. National Policies on ICT in Education
   By Prof Bernard Comu, Grenoble, France

8. ICT and Education System Management
   By Mr Andrew Bollington, Head of ICT, International Baccalaureate
     Organization, United Kingdom

9. ICT and School and Student Management
   By Prof H P Dikshit, Vice Chancellor, Indira Ghandi National
     Open University, India
National Policies on ICT in Education

By Prof Bernad Comu, Grenoble, France

All countries are facing the question of making their educational policy evolve, in order to integrate Information and Communication Technology (ICT). ICT brings huge changes in the Society, in the knowledge, in the ways one can access the knowledge, and in the school. These changes, and the ability to evolve, must be taken into account in educational policies. We propose some core principles for educational policies integrating ICT, and we look at topics and actions to address in such a policy. The need for policies is not only at the national level, but also at the very local level (a school) and at the international level. And the ethical dimension is particularly crucial in an educational policy, since ICT may lead to new risks in the gaps, and since we must carefully remember that knowledge is a public good and education a public service.

The huge changes that Information and Communication Technology (ICT) brings in the Society and in Education make necessary strong policies: not only policies for integrating ICT into Education, but also global educational policies taking into account the changes and the evolutions. The developments of ICT make necessary a profound renewal of educational policies.

We will discuss some conditions, some principles and some questions which have to be taken into account in educational policies.

\[ \text{ICT and changes} \]

a) ICT brings huge changes in the society

New tools and resources are now available in all domains of our life; but it is not only a question of technique and tools; it is new concepts and new processes which provoke profound changes. One speaks about the information society, or the communication society; we are entering a kind of knowledge society, a society where knowledge becomes more and more important, a society in which knowledge is an essential and marketable good. An educational policy must take into account the fact that we now are in a knowledge society.

b) ICT brings huge changes in the knowledge

In every subject, there are profound changes, in the contents, in the concepts, in the way one addresses the subject. Mathematics is becoming more experimental, new fields for research have appeared, simulation and modelization influence several disciplines, particularly natural sciences, physics, chemistry; the availability of numerous data has changed the way one works in geography, in history, in literature, etc.
And, in addition to traditional knowledge, there is a new form of knowledge: the "e-knowledge", which is a digitalised knowledge, a more abundant knowledge, an interactive form of knowledge, knowledge accessible anywhere at any time.

But there are also more profound changes. It is no longer possible to split all the knowledge into fixed disciplines: the traditional subjects do not cover the whole field of knowledge which is now necessary in order to understand the world and to use the new resources and tools available. As an example, let us quote a French philosopher, Edgar Morin, who wrote a book about "The seven necessary kinds of knowledge for the education of the future" (Edgar MORIN, 1999). He describes seven topics to be taught, explaining that the world is more and more complex and that we must have a more transverse, global and complex approach of the knowledge:

1. Teach the weaknesses of knowledge: what is human knowledge? Teach its errors, its illusions. Teach to know what to know is!

2. Teach the principles of relevant knowledge. One must be able to take into account global and fundamental problems, in which partial and local knowledge will then be used. The knowledge cannot be split into disciplines. One must be able to consider the objects of knowledge in their context, in their complexity, in their whole.

3. Teach the human condition. Teach the unity and the complexity of human nature. This needs input from biology, from human sciences, from literature, from philosophy. Teach the relationship between the unity and the diversity of what is human.

4. Teach the world identity. Teach knowledge at a worldwide level. Teach the history of the planetary era, teach the solidarity between all the parts of the world.

5. Teach how to face the uncertainties. Sciences have established a lot of certainties, but they also have revealed many uncertainties. Teach the uncertainties in physics, in biology, in history.

6. Teach understanding. Understanding in all its meanings, mutual understanding between human beings. And teach what misunderstanding is. It is a crucial basis for peace education.

7. Teach the ethics of humanity preparing citizens of the world. Teach how democracy relates to the mutual control between society and individuals.

c) ICT brings huge changes in accessing the knowledge

ICT make resources more and more abundant, open and accessible. It facilitates access to information. The knowledge is no longer only available "in the teacher's head" or in libraries: everyone can access the knowledge, through diverse ways like CD-ROMs, web sites, etc., from anywhere, at any time. Knowledge is not only delivered in schools, but is available at home, in "internet cafes", etc.
As a consequence, this changes profoundly the way the knowledge is “hierarchized”. We are no longer in the logic of the chain, in which the one who knows teaches the one who does not, in which the educational system is organized from top to down. We are now in the logic of networks, in which learners and teachers are in similar positions. This changes a lot in the organization of schools and of educational systems. An educational policy must take this into account.

But there is a risk to reduce knowledge to information. Information is not knowledge. Knowledge needs some human and intellectual treatment, knowledge needs time, knowledge is not only information.

d) ICT brings huge changes in the school.

Because of the changes in the knowledge and in the way one can access knowledge, schools are changing, and the role of the teacher is also changing. The teacher is not "the one who knows". He has more and more to be a guide, a tutor, the one who helps pupils in accessing the knowledge, in sorting it, hierarchizing it, validating it, organizing it.

The traditional classroom is an organization in which a group of pupils, together with a teacher, are in the same place at the same time for learning activities. ICT now allows to carry on "classroom activities" in other forms: at different moments in the same place, at the same moment in different places, or at different moments in different places.

And the school is not a "closed world": now schools can communicate with the external world, with other schools, with other people.

The school is also available at a distance, in digitised forms (virtual schools, virtual campuses, ...).

The good strategies are the ones which combine distance and on-site activities, which combine the diversity of possibilities made available by ICT.

"E-Education" is not at all replacing the traditional education. It reinforces education.

All the changes in the role of the school and in its place in the society make necessary to reflect on the specify of the school: what does the school provide, which no other place can provide; in what is the school necessary for the society? An educational policy must address these questions.

The Society has new expectations towards the School. In its report to UNESCO: "Learning: The Treasure within" (Jacques DELORS, 1996), the Commission for Education in the XXIst Century describes the four pillars of Education: Learning to know, learning to do, learning to live together and to live with others, and learning to be. The society expects the school to learn these four dimensions to pupils.

And there are two major expectations towards teachers and schools:

- Forming citizens in a world marked by change and dominated by the ephemeral; transmit the basic values of society and the universal values of humanity.
A policy must also take into account the agents of Education: The role of the teachers is becoming more and more difficult, more and more diverse, more and more complex, and the list of competencies they are supposed to master is becoming longer and longer! The teaching profession is becoming in many ways a "new profession", and new professions are appearing in schools, with new required competencies and new tasks. Educational policies must identify the evolution in the role of the teacher, and identify new professions and be ready to meet the needs.

**Some core principles**

Let us list some core principles which must be addressed by educational policies.

a) Generalisation: It is now time for every pupil and every teacher to be involved in ICT in education, not only the more enthusiastic and the more willing!

b) Integration: ICT has to be integrated in every subject, in every component of the school activity. It must not be reduced to one discipline just added to others.

c) ICT in education is not only a matter of equipment, hardware, machines. It is mainly a matter of pedagogy. The pedagogical aspects must be central in educational policies.

d) ICT is just a technology, a tool. It does not contain in itself any solution to educational problems; it has to be used as a tool by pedagogists.

e) ICT is a tool for developing communication and networking in education. Thus one must accept plurality and diversity in education. There is not one truth, one good way, and education is the place where ideas, concepts, processes, must be discussed and accepted in their diversity.

f) ICT enhances the "collective intelligence": Education in the XXIst century does not only aim at developing individual intelligences, but also aims at a "collective" one, which not only the juxtaposition of individual ones. "Internet is mainly a tool, the more recent we found for perfecting our intelligence through cooperation and exchange... The true revolution of Internet is not at all a revolution of machines, but of communication between human beings... Internet enhances our capacity for collective learning and intelligence... Each community realises that it is one of the dimensions of the production of human sense... Internet forces us to experiment new ways of being together... The ethic of collective intelligence, consisting in interfacing different points of view..." (Pierre LEVY, 2000).

g) I.C.T. encourages team work, and I.C.T. encourages project based pedagogies, and pedagogies based on creativity and constructivism.

h) "Practice what you preach"! I.C.T. is mainly a matter of practice, and teachers must practice it, not only give lessons about it!
i) Do not just put new technologies on the old contents and pedagogy. Integrating I.C.T. into education changes the contents, changes the pedagogy, changes teaching and learning. "Whatever you can improve oil lamp, it will never become an electric one!"

j) The velocity of changes is such that one cannot tell what will be the school in ten years! Thus a major characteristic of education is to be able to evolve and adapt continuously.

k) ICT makes education more professional. Therefore, teachers need professional tools and professional competencies. Integrating ICT into education, providing computers and networking tools, is a way of increasing the professionalism in schools.

l) ICT can be considered as a revolution... (Dale Spender, 1996: "...it is an Information Revolution we are currently experiencing... and it is the new technologies that are launching education... As we move from book culture to digital culture, we are on the brink of being able to rethink the entire process of teaching and learning...") ...but in educational policies we need evolutions, not revolutions: "move slowly, but move!"

An educational policy must not be split into independent components. It must address globally a number of topics, and include a number of coherent and interlaced actions.

a) The main topics that a policy must take into account can be listed as follows:

- Local culture and local political choices.
- Changes in society and megatrends in the evolutions.
- Educational philosophy and sustainable answers to the evolutions.
- Technology issues.
- Process issues.
- Pedagogical issues.
- Ethical issues.
- Issues of economy.

b) What can a policy be made of? If we look at national policies as they are described in official documents, we can see that lots of actions are addressed, such as:

- National official documents on the use of ICT.
- National or official bodies responsible for supervising the national policy.
- National projects for the introduction of technology.
- Short term and long term schedule for implementing the projects.
- Sharing responsibility for the purchase and maintenance of hardware.
- Place of expenditure on equipment predominates in specific budgets.
- Development of networking, distance and communication facilities.
- Projects with a variety of aims (equipment, distribution of software, teachers' skills, pupils' skills, development of software, use of the Internet...).
• Including ICT in the curriculum.
• ICT as a separate subject, or ICT as a tool in education.
• ICT is usually taught as a separate subject in general upper secondary education.
• Do we need specialist ICT teachers?
• ICT and teachers training.
• The place of ICT in teachers' in-service training: Available? Compulsory?
• Research and development programmes.

A coherent policy must address all these topics, and certainly others, simultaneously. It would be a mistake to think that one can start with one topic, complete it, then come to the next one, etc. All of them must be carried out altogether. When there is a particular difficulty with one of them, a "bottleneck", then particular means to overcome it must be looked for.

No change will occur spontaneously! And good will is not enough for integrating ICT into education. Strong policies are necessary, at different levels: national level, but also local (according to the different systems of our countries), and in each school.

It means that at each level, reflections must be carried out, projects must be elaborated, policies must be designed. In each school, teachers and teaching teams must do so. And at the level of a city, or a wider region, another level of policy must be designed. Of course, national policies are essential. And international exchange, international reflections, international plans are particularly necessary in the field of ICT, because ICT is the domain of distance cooperation, communication, international partnership.

An important question to be addressed is: What is the most pertinent and adequate level for each task? For example: are equipment plans to be designed and carried on at the school level, at the city level, and at the national level? Same question for maintenance of the hardware, for teacher training, for research plans, etc.

There are many international texts and agreements about ICT and Education. Let us quote two of them:

a) The Dakar Framework for Action (World Education Forum, Dakar, Senegal, April 2000):

"We hereby collectively commit ourselves to the attainment of the following goals:... ensuring that by 2015 all children, particularly girls, children in difficult circumstances and those belonging to ethnic minorities, have access to and complete free and compulsory primary education of good quality...".

Strategies: Harness new information and communication technologies to help achieve Education For All goals:
ICT must be harnessed to support EFA goals at an affordable cost. These technologies have great potential for knowledge dissemination, effective learning and the development of more efficient education services. This potential will not be realised unless the new technologies serve rather than drive the implementation of education strategies. To be effective, especially in developing countries, ICTs should be combined with more traditional technologies such as books and radios, and be more extensively applied to the training of teachers.

The swiftness of ICT developments, their increasing spread and availability, the nature of their content and their declining prices are having major implications for learning. They may tend to increase disparities, weaken social bonds and threaten cultural cohesion. Governments will therefore need to establish clearer policies in regard to science and technology, and undertake critical assessments of ICT experiences and options. These should include their resource implications in relation to the provision of basic education, emphasising choices that bridge the "digital divide", increase access and quality, and reduce inequity.

There is a need to tap the potential of ICT to enhance data collection and analysis, and to strengthen management systems, from central ministries through sub-national levels to school; to improve access to education by remote and disadvantaged communities; to support initial and continuing professional development of teachers; and to provide opportunities to communicate across classrooms and cultures.

New media should also be engaged to create and strengthen partnerships with education systems, through the promotion of local newspapers, informed coverage of education issues and continuing education programmes via public service broadcasting.


... "We have noted that, while the use of ICT in education and training is expanding rapidly in most of our countries, much remains to be done. The development of teachers' own ICT skills is one need, the development of ICT infrastructure and support and of more effective uses of ICT as an aid to learning are others. We see the potential benefits and are determined to put in place policies which help all students and teachers reap them..."

... We recognise the increased demand for a wide range of competencies... to participate in the knowledge economy... We are determined to work further on this, taking a broad view to include the needs of a knowledge society and not just those of a knowledge economy"... The ethical dimension is a crucial one in the elaboration of an educational policy integrating ICT. Both for national reasons and international reasons. There are many questions to be addressed in that perspective:
Does ICT increase or reduce the gap between the "haves" and the "have-nots"? (At different levels: in a given classroom, in a school, in a city, in a country, at the international level).

Does ICT facilitate equal access to Education for All?

Is there a risk of commercialisation (merchandisation) of the knowledge and teaching?

Policy makers must always remember that Knowledge is a public good, and Education a public service. How can we ensure that the missions of a public service will be achieved by our educational systems?

Is globalization a risk or a good opportunity for education? Globalisation may lead to a worldwide culture, to some kind of "world knowledge" or "world education", with a loss of local specificities. But globalisation may also enrich our cultures and our educational systems. Michel SERRES said: "a new humanism is appearing. Humanism is becoming technically possible!" And Jean-Marie MESSIER (Vivendi Universal) wrote: "Towards a society where cultures learn to meet and mix successfully. I do not trust a global culture, but I trust local cultures, able to mutually enrich and leading to universal successes and myths. Global means a standardised production one tries to impose to all; universal means a single production, born somewhere, and going all around the world."

ICT enhances the possibility of international cooperation, of distance team work, and developing countries may take a huge benefit from this, both in their own educational policy, and in their cooperation with developed countries.

**Conclusion**

There are several steps and levels in the integration of ICT into education: Three of them can be identified and must help in the timing of the implementation of a policy (Raymond Morel): applying, integrating, transforming. In a first step, new technologies are applied to existing educational policies, to existing pedagogies, to existing ways of learning and teaching. But they are added, as something external. Progressively, integration appears, both in contents and in methods; policies of the second level are those which actually integrate ICT into education. And as a third step, we aim at a transformation of education, with ICT as one of the transforming agents.

Transformation is the major aim. Technology is nothing but a tool, education aims at preparing the citizens of tomorrow. Education is a major investment for the future. "Education for All" is a goal for all our countries, and we think that ICT can help meeting that goal. Any educational policy is based on a conception of what a society is, of what the relationships between human beings are, of what humanism is. The fundamental question is: "Which world are we preparing?"
Good morning and thank you for the opportunity to present to this most prestigious conference.

My task is to talk about the use of ICT and Education System Management and I hope you won't mind if I take my examples from the experiences of the organization for which I work – not because I believe in any way that we have a perfect solution, but simply because I want to reinforce my ideas and views with practical examples from a system that I know and understand in detail.

The International Baccalaureate Organization (IBO) is a relatively small, not for profit organization based in Switzerland. We were founded in 1968, but it is in the last ten years that the organization has grown very rapidly. Our not for profit status means that we have to develop and implement our management systems within a relatively small budget and maximise what we can get for our money. Today, the IBO offers three programmes. We are best known for the Diploma Programme that is aimed at 16 to 19 year olds and recognised by universities around the world. However, we have more recently introduced the Middle Years and Primary Years Programmes, giving us a continuum of education from the kindergarten to pre-university. Well over 1,300 schools in 103 countries use one or more of our programmes. To deliver formal external assessment in the Diploma, we work with some 3,500 examiners.

By most national standards, this is not a large education system. Indeed, our relatively small size gives us the ability to innovate. However, we are faced with the challenges of distance, time and quality. Distance, because to mark a typical exam paper will involve people in several continents working together on the same paperwork. Time because we operate a very tight schedule in order to best meet university needs around the world (students who take examinations before the end of November receive their results in very early January). And Quality because we operate a high quality and very comprehensive assessment procedure which is resource intensive. At the same time, we are very aware of the need to maximise the benefits we can receive from the intelligent application of technology.

Our strategic plan states: "The IBO believes that properly resourced and managed ICT encourages efficient administration, global communication, improved collaboration and access to information; these are all essential to the organization's growth and development. The Internet provides a global network that makes it possible to communicate and work with each of the
IBO's major stakeholders. The IBO is committed to developing fuller use of the Internet.

To this end, the use of the Internet has been at the centre of our ICT developments since 1997.

I would argue that the information and communication technology revolution of the past decade is on a similar scale to that of the Industrial Revolution of the 19th century, but with a much wider global reach. While the initial phase of Internet enthusiasm was reserved for the new start-up companies, the so-called 'e-businesses' which made bold claims but frequently lacked a workable business model, it seems that the real achievements of the Internet will benefit those 'bricks and mortar' companies that translate their working business model to maximise the use of new technology.

The IBO has developed a model that puts our main stakeholders at the front of our developments. The database and electronic mail systems that facilitate our systems are at the back. The link between the two is achieved by five web sites, each focused to meet the needs of a particular group.

1. Our public web site at http://www.ibo.org is only about 10 per cent of our electronic presence, but provides key information to the wide range of people who want to find out more about the IBO.

2. Our school coordinators, the people who control the administration in each of our authorized schools have their own site called IBNET. This site allows them to register candidates, submit marks, download results and complete the vast majority of administration necessary to run the programme in a typical year. During this examination session, every IBO school worldwide has registered candidates electronically—we no longer have a paper-based administrative system for working with our schools.

3. Teachers are encouraged to use our online curriculum centre. This centre provides immediate access to all of our subject guides, but in such a way that teachers can add resources such as web sites, books or teaching plans that other teachers can then use. The site also has an extensive conferencing facility and an online faculty of experienced teachers to guide and promote discussion.

4. Our staff intranet is becoming our core internal administrative system. Staff use the Intranet to access the main organizational data and to complete numerous administrative tasks from booking annual leave to raising invoices.

5. Examinet is the fifth of our sites, designed for IBO examiners to use when marking student work. In addition to submitting marks, we are currently developing a system called e-marking to allow the on-screen marking of assessed work.
Four of the five sites are secure, using encryption, firewalls and passwords to ensure that only authorised people can access information. Security has been a key issue in building the confidence necessary to promote the wide scale use of these systems.

The five sites each have their own unique look and feel. http://www.ibo.org is built on a complex content management system that allows end-users in each of the IBO offices to add and update pages via a simple web interface without any programming or HTML experience. Delegating maintenance in this way is essential if the content of complex sites is to remain up to date.

IBNET has a simple, clean user interface and many forms. This is very much a two way web site in which school coordinators provide us with information, and we immediately respond. Our candidate registration process used to take months. Today, a coordinator can fill-in a simple web form and have a confirmed registration in seconds. Errors are reduced by as much as 60% and time is saved. This web based method is similar in concept to the EDI (electronic data interchange) systems that were widely promoted before the web, but has one very significant benefit – coordinators can have real time access to their data, and thus an immediate response. Indeed, we return to coordinators information that was simply impractical on a paper based system – a personalised examination schedule for each student for example – and have found that this value added data is enthusiastically received by coordinators who are more than willing to overlook the data entry work that they are doing on our behalf.

The Online Curriculum Centre has a range of facilities for teachers, but our experience has shown that one of the most valued is our team of online faculty members. These experienced teachers and examiners spend a few hours each week logged into the system and are paid an honorarium for their time. Teachers who use the site benefit from the vast personal knowledge that is brought to the more formal written material provided by the IBO. This human touch has been a key factor in the growth of this web site.

Examnet is the most recent of our five sites. More than 75 per cent of our examiners have opted to use the site for the current November exams. This allows us to collect marks more quickly and importantly, to verify data as it is being entered. The site is currently being developed to include online examiner training, a system to promote collaboration between examiners on the development of exam papers and a system to allow the on-screen marking of student work.

It is interesting to look at the lessons we have learnt from our on-screen candidate registration system on IBNET.

We moved this system from a DOS based EDI system in 1997 – a system used by about 40 per cent of our schools. Within two years of being on the web, this had increased to 90 per cent and today is 100 per cent. This ability to close down old paper based administrative systems is key to making the migration to the new business models of the 21st century. A dual economy in which both paper and electronic systems are available is
costly and error prone. With a relatively small investment in technology, this system has handled nearly 200,000 subject registrations this year.

Why does it work? Our experience with registrations has translated well to the other systems we run:

- Immediate feedback and results give coordinators an incentive to use the systems.
- A huge reduction in errors, by as much as 60 per cent in some processes, saves everyone time and frustration.
- Value can be added to data by using the information supplied to help the supplier, even if that is of no direct benefit to us. Understanding the needs of our end-users is essential to promoting use.
- 24-hour access, worldwide fits the structure of the IBO and avoids the difficulties of communicating by mail and telephone across continents.
- Because data in our systems is immediately available to those who supply it, we promote the concept of joint ownership of information. This encourages people to keep information up to date.
- While some processes take longer via the web, our overall aim is to deliver real time savings for coordinators. If we biased the system too much towards our gain, we would lose the goodwill that promotes high usage levels. Our design aims to be simple and straightforward on the basis that training at a distance is rarely possible. Because of the global use, the technology needs to be based around a low common denominator of PC without the overhead of jazzy technology that can slow an essentially administrative focussed system.

However, the most important aspect of these five sites is not their individual functionality, but the fact that they work together. Because of the link via the common database, it is possible to describe a scenario in which a coordinator registers a candidate on IBNET, a teacher submits some marks for internal assessment, a member of IBO staff allocates an examiner to mark the work, the examiner submits the marks, and a member of the general public immediately sees updated statistics about the number of candidate registrations this year. A seamless process that is supported by a common database. Information is only entered once, used many times and presented to the end-users in a form that meets their needs. Electronic mail is used to trigger people to act on important information of which they might not already be aware.

The IBO has learnt a lot from developing these working methods, and we are also benefitting on a daily basis from the smoother administration that is now possible. We still have a long way to go before all of our systems are fully integrated into this model, but we have already done enough to establish some key principles.

- We think of the web as a multi-media telephone, not as a book. If you only post information to the web, it's akin to using the phone with earplugs!
- We give end-users the ability to manage content and data – our own staff where possible, but also the coordinators and examiners we work with. Where data is ‘owned’ by the supplier it is more accurate and up to date.

- We search for the value added features in any system. Often, it’s something of little interest to us that will most motivate someone else to use one of our systems.

- We integrate everything into a common database. Nearly all data needs to be used by more than one person.

- We take security very seriously as the credibility of these systems and the data they contain depends on it.

- We use enterprise standard software and servers to build these systems. If you want a system to have a major impact on the effectiveness of your organisation, then you need to be prepared to invest in the architecture that will make it deliverable and reliable. I hope you have found our work and experiences interesting. While we are a somewhat unique organisation, I have tried to generalise the lessons we have learned and do believe that the application of web based technology to education system management must continue to be a core objective for systems worldwide.
Abstract

The presentation will be based on some very successful ICT interventions under the "Head Start" project that has its main focus on ICT-enabled education. The target group of schools under the project was schools situated in places with very weak infrastructure, and limited facilities in terms of transportation and other means of communication.

While achieving the target of providing a network system of multi node computers at more than 1800 schools within a short period of nearly 18 months, the emphasis has been on ICT-enabled education rather than ICT-based education.

The project included all the aspects for effective implementation, like computer maintenance in rural and remote areas, a massive training of teachers in ICT from identified schools, and the development of highly interactive software for both teachers and learners. Distinction between ICT-based education and ICT-enabled education will be highlighted. The strategies to replicate the systems developed under the "Head Start" project in other countries of South East Asia and Africa's Sahara Region will be discussed.

In India and countries in its neighbourhood, a very encouraging trend is emerging, where the Government/Non-Government agencies and others are focusing their greater attention on overall improvement in the quality of life of our people. There is a very great desire and aspiration in our people to achieve better standards of life, comparable with those in the developed countries. There also seems to be some urgency to achieve the desired objectives within a reasonable time.

In the foregoing background a large number of long-term and short-term projects have been formulated by the Government agencies and others in these countries which have greater focus on the rural and less developed areas of our region. There is a strong feeling that massive efforts are required to provide education, better living conditions, better health care and general awareness for empowering our people living in rural and less developed areas.

Implementation of such projects and plans involve a massive target group of people for whom these welfare projects have to be addressed. It is...
also realized that for effective implementation of these programmes and projects, a very large target group of trainers is required to meet challenges in different areas of our focused concern and attention. When added to the general problems of lack of infrastructure support, weak communication systems and several other similar constraints, this makes these efforts more challenging.

In the background of these grass-root facts and realities, it is understood by our people, those within the Government and in Non-Government agencies handling the welfare projects and plans, that the distance and open learning system is the only system which could handle such large number of trainers and learners effectively. It is very satisfying to mention here that the open and distance learning institutions, especially some of the Open Universities in India, have taken major initiatives to share national responsibilities in the foregoing directions by effectively coordinating and cooperating with Government and Non-Government agencies in implementation of projects and plans for well-being of the community in general.

It was very thoughtful on the part of constitution makers for these universities to provide a special clause to accept the challenge of handling the programmes focused on the well-being of the community. In the emerging scenario, this provision is very effectively and successfully being implemented by the open and distance learning system. To give some idea of a very high rate of success in such endeavours, initiatives and interventions, we will consider some of them in a little more detail.

Capabilities and initiatives of the Open University System under IGNOU and its network of State Open Universities From Primary Education to IT enabled education under the Head Start Project.

The State Government of Madhya Pradesh conceived and formulated an extremely functional and successful project for Primary Education by motivating and involving the community in a big way to expand quality education in the State. The community was required to provide better space and other infrastructure for the School, and the Government empowered the community to select teachers of their own choice for handling the teaching of the students.

The State Government conducted the year-end examination and depending on the percentage successes of the students in the examination, the teachers concerned were paid for the entire period of teaching appropriately. Thus, the Government provided funding for recurring expenditures only and avoided massive funding and substantial delays related to infrastructure support. Since the children of the community were to be provided education, the community chose better teachers. Under this project, known as the Education Guarantee Scheme, the Government in the State could activate more than 7000 nodal schools with each having a capacity of nearly 100 students. Each nodal school was supporting nearly 10 other schools in its neighbourhood. This system thus provided primary education to a very massive group of students in rural areas.
The programme was successful because the community had a right to change a teacher, if the teacher was not found to be effective. Since a large number of students from the community were in the school, the community was more concerned about the quality than anything else for providing better education. This initiative received an international award for most successful performance and intervention in the area of primary education among all the Commonwealth countries. The project was handled by the State Government and an autonomous organization under the Government called the Rajiv Gandhi Shiksha Mission. It must be mentioned that almost all these 7000 locations were in places that were geographically remote and otherwise less developed parts of the State.

In view of the success achieved under the education guarantee scheme, as it was called, the two Secretary level senior bureaucrats of the Government and the Vice-Chancellor of the Open University [Madhya Pradesh Bhoj Open University (MPBOU)] agreed to form a group known as State level Task Group to emerge with a new idea of experimenting to provide computers for making available computer-enabled education at the very grass-root level through the 7000 schools which were already activated, under the education guarantee scheme. The task group conceived the projects in the year 1998 and after initial conceptualization and pilot runs an action plan was prepared to simultaneously take up the following activity:

- Identify one school and associate other schools within an area of nearly 10 kms to provide the computer-enabled education. The top Government officer of each district concerned was given the responsibility to identify those schools which had appropriate infrastructure in terms of building, power supply etc. required for providing computer facilities.

- The Task Group took the responsibility to finalise the actual location of centres, provide basic concept paper to the teachers and community around the identified schools, with the objective of introducing the computer enabled component with effect from the new session which started from July/August, 1998.

- The Open University which was represented on the Task Group had to play a major role in providing technical inputs required for computer purchase, their installation and providing of basic software. This was completed by the month of April, 1998.

- Simultaneous to the other processes, one Science teacher and one Mathematics teacher from each of the identified schools were called by the University for training in basic computer operations and for handling the interactive software.

- A very strong group of young computer experts and an equally motivated group of teachers selected from the whole State worked together very hard, sometimes fourteen hours a day to plan, formulate and produce what we called computer-enabled software.
The distinction between computer-based education and computer-enabled education is very subtle. The main aim in development of this software was to make them highly interactive and to support exciting of imagination in the young mind and to give chance to the student to think, to commit mistake and rectify it by going through the software. The software that was prepared by the group was tried on the students during the months of May to August and several thousand copies of CDs of a number of programmes were produced.

As a pilot project, 1000 schools were meant to be activated from the July/August 1998 session. 2000 teachers, two from each school, were called for training on computer operations, use of innovative and interactive software and to build confidence in the teacher in using the computer.

Training of teachers was conducted at six different Regional Centres of the Open University by a very efficient faculty. This resulted in achieving the target of 2000 well trained teachers who were sufficiently motivated to accept the challenge of providing computer enable education in the 1000 selected schools deep in the interior of the State.

The most satisfying and gratifying feeling that the Task Group and those involved in the implementation of the project had was the enormous response and motivation visible in the students from geographically remote and less developed areas. Our feeling and assessment is that due to excitement and appreciation for a hi-tech input in such areas the anxiety to learn new ideas, processes and skills was much more than in the general urban population. By the beginning of the 2000 session, nearly 2000 new centres were emerging. The project is going on and it is hoped that in the next few years all the 7000 schools would be provided with computer enabled education.

The Task Group also conceptualized, as a follow-up to the above initiatives an idea which in popular language and concept could be understood by calling 'IT Addas'. This means that after the normal school hours rural mass of different age groups can also have access to the information technology input available in the school. Some interesting further experiments in these directions have started happening where it was planned to put land records, details of welfare schemes of the government for direct access by the people, who could receive all important information with such a great facility available in their village.
Closing Remarks

Mr Zhou Nanzhao
Co-ordinator of APEID

Mr Sheldon Shaeffer
Director, UNESCO Asia and Pacific Regional Bureau for Education
Closing Remark
By Mr Zhou Nanzhao, Co-ordinator of APEID

Distinguished Participants
Ladies and Gentlemen

Thanks to your collective efforts the 7th UNESCO-ACEID International Conference on Education is drawing to a successful ending. I am pleased to join you in reflecting on the outcomes of our Conference.

At the official opening, the Deputy Prime Minister spoke positively of educational reform in the Royal Kingdom of Thailand and illustrated the importance of ICT in this process.

Sir John Daniel, in delivering the Raja Roy Singh Lecture, made a most stimulating and challenging address that has guided our Conference deliberations.

Sir John has reminded us that if technology is the Answer then we should ask ourselves: What was the Question. I am convinced that that 'finding answers is important', but 'asking questions is more important' and 'Questioning The Answer' is the most important part of our endeavour of finding new directions of education in general and ITC in particular.

As the UNESCO ADG/ED reminded us, we ought to look at the 'Coin of Education' from teaching-face of the coin to learning-face of the coin. We need to change our view from teaching technology to learning technology. We need expand the scope of a narrow view to a broader view of 'learning to learn, learning to do learning to be, learning to live together', with technology assisting each as a tool to serve educational purposes. We need be reminded of a crucial point: the development of the new technologies does not at all diminish the roles of teachers – quite the contrary – but it does change it profoundly and it offers an opportunity to seize.

We have enjoyed excellent presentations by outstanding plenary speakers. We've had various Roundtables and Special Interest Groups to share ideas and help develop policy directions. We have tried an experiment of conducting Demonstration Workshops to share innovative practices in applying ICT in education.

Many of our honoured speakers spoke about the importance of employing technology as instruments and resources and simultaneously cautioned us against using technology without ethics and inappropriate understanding of pedagogy. Many presentations discussed digital divide where 50 per cent of the people have not yet used the telephone. We have heard the success stories of experiments like 'Wall in the Hole in India' to sophisticated use of technology by IBO for the school systems spread over the world.
The very large number of high quality papers, numbering 130 has also been a feature. The willingness of participants to be frank and make constructive comments has been outstanding. The friendship and fellowship with each other has been most enjoyable. By all these we have broadened our visions and awareness of the many uses of ICT in education.

As one way to seek your evaluation of the impact of this conference we have distributed a questionnaire, which many of you have filled and returned. I have quickly gone over them and would like to mention one of the issues raised as for the continuation of the Conference. Many of you say that the conference has helped to create a link between the professionals and countries; it has created an audible voice for education in the international community; it has created new literature developed by the professionals that is likely to have local relevance. Further, it helped the participants to build their capacities and provide opportunities to find innovations for educational developments. Meanwhile we may see the other side of the story that the Conference takes a lot of time of lot of people including that of the ACEID/APEID staff. It also costs lot of money to organize and participate. There are other issues we need consider in continuing an international conference in view of similar ones being organized on education. The decision cannot be simple ‘yes’ or ‘no’; it needs a broad based view and wide consultation. We will keep you duly informed of the decision once it is made.

Distinguished participants,

For all the meaningful outcomes of the Conference, once again I want to sincerely thank each and all of you for your active participation and contribution in various ways. One again I want to thank our partners and co-sponsors for your most valuable support to this event.

My special thanks go to Mr Geoff Haw, who has in most dedicated and capable ways assisted APEID over the past months in the organization of the Conference as a UNESCO consultant. My sincere thanks go also to Mr. Ian Birch, a UNESCO consultant for several ACEID conferences, for his kind voluntary assistance in help with this one.

Last but not the least I thank Mr Sheldon Shaeffer, Director of our Regional Bureau for Education, for his directorship and support to the organization of this Conference. I thank all my colleagues at APEID and the Secretariat for their never-failing support and cooperation in jointly making this Conference a continued success.

Let me end by wishing you all a safe trip back home and a Merry Christmas and a Happy New Year 2002!

It is now my very great pleasure to invite Mr Sheldon Shaeffer for some final remarks to officially close this conference.
Closing Remark
By Mr. Sheldon ShaefTer, Director
UNESCO Asia and Pacific Regional Bureau for Education, Bangkok

Distinguished Participants
Ladies and Gentlemen,

On Tuesday, just a few days ago, we all came to this Seventh ACEID International Conference on Education in anticipation of what might take place during the conference. Now, after a very busy three days, we can reflect on our time here. As Mr. Zhou has said, we have been inspired by many excellent presentations and a broad range of activities. These should cause us to think more about our own practices in the application of ICT to education so that we can add to the quality of education for learners of all ages and cultures.

As I said at the opening, this Conference has generated a spirit of collaboration and partnership among many diverse groups. I greatly value the support of our friends at the Office of the National Education Commission in Thailand and the Thai National Commission for UNESCO, and express our gratitude for the enduring and fruitful nature of these relationships. I also acknowledge the assistance of the partners and co-sponsors for the way in which they have supported APEID as it organized the conference. And I must thank again Zhou Nanzhao and his tireless team – and all involved staff of UNESCO Bangkok – for their effort in putting this conference together.

With apologies to John Daniel, I would like to add my own alphabet of impressions from this conference – four C’s – beginning, unlike Sir John, with two good C’s:

- **Complexity** – the conference has shown the complexity of the field. The definitions of ICT, or even technology, are many, from donkeys to satellites. And the relationship between education and technology is diverse – education with, about, for, in, and during ICT use have all been discussed. Such complexity challenges us to think in ever more creative and synergistic ways.

- **Collaboration** – the conference has shown that further progress in ICT use in education requires more collaboration, to reduce duplication and confusing competition, to ensure complementarities in efforts, to link innovations around the region and around the world. I hope the conference has contributed to this effort.
And now two bad C’s:

- **Coverage** – with some notable exceptions, much of the focus of attention at the conference seemed to be on improving the average quality of education for the average child in the average – or perhaps even about average – school. This is laudable, of course, but I think it necessary to ensure that ICTs are used in the education of a far wider range of target groups, especially those most disadvantaged – minorities, the remote, the poor, and those with special needs. As I said on Tuesday, we must ensure that the greater use of ICTs in education serve to reduce, rather than increase, disparities in educational access and quality.

- **Compassionless** – in most cases, the conference acted as if the world were a risk-free, trouble-free place and technology, a neutral actor playing within it – again, a focus, it seems, on average children in average classrooms. But many children – and adults -- in this region face many, and increasing, vulnerabilities and risks – abuse and exploitation, violence and conflict, drugs and AIDS. But these words – let alone the issue of terrorism – were seldom heard in the discourse of this conference. In particular, the session on ICTs and AIDS drew a total of seven participants – in a region that now has over 7 million people with HIV/AIDS, one million new infections, and the potential, in a relatively short time, to surpass Africa’s disaster in sheer numbers if not in infection rates. And yet my colleague who organised the session was often asked – why a session on AIDS at a conference on ICTs? The answer to me is obvious – all possible means, including a wide range of technologies, must be harnessed to strengthen preventive education against AIDS and to lessen the impact of the pandemic on society – especially on education systems and schools, students and learning.

I hope these few comments will help improve the chances that the events of the past few days will cause us to make a real difference somewhere and somehow -- to influence educators to change and to improve their practices in the field. As a result of this conference, I hope you all go back to your offices next week and act – and continue to act – in different, more productive, more creative ways.

On Tuesday, in my opening address, I asked for your help – to tell me how conferences such as this one have changed your professional practices, so that we may make decisions on the future conferences. I do hope that you have indicated on the evaluation form how these conferences have made a difference to you. If there is a clear indication that they do, that becomes a good reason for conducting such future conferences – but perhaps differently, in rotation with other agencies, or with additional partners, or at a different time of year, or using a different format. I welcome all suggestions in this regard.
Finally, in the spirit of applying ICT to educational practices, the report of this conference will be placed on UNESCO Bangkok's website as soon as possible in the New Year.

Again, I thank everyone who contributed to the success of the conference and wish you all a safe journey home.