IT, e-learning and teacher development[1]

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This paper traces some of the ways that IT has changed and continues to change our lives, and how information and communication technologies or ICT are changing learning in schools. The real potential of ICT is the way it changes learners and the major focus of the paper is on e-learning, a term that combines pedagogy and technology. For this potential to be realised, teacher development is critical, and to this end some of the rich resources available for use by teacher educators through global gateways are described. The paper concludes by outlining why e-learning is important in teacher development.

Information technology, e-learning, ICT, online learning, teacher development, global gateways, portals

PREFACE

It is a privilege to present this year's Jim Richardson Annual Lecture in Education, in honour of a great educator. It is a particular pleasure because Professor Jim Richardson's career and mine have been very much intertwined, rather like the game of catch up as I'll explain.

Jim's first academic appointment in Australia was to the Remedial Education Centre at the University of Queensland, there to work with Professor Fred Schonell. Later, when Fred Schonell, who was now Sir Fred Schonell, became Vice-Chancellor at the University of Queensland, Jim Richardson became Director of the Remedial Education Centre. It happened that my first academic appointment was also to the Remedial Education Centre – at the lowest level in universities at that time, namely as Tutor in Education. However, when I took up my appointment, Jim Richardson had moved on and was now Professor of Education at the University of New England in Armidale. At the Remedial Centre I got to know something of Jim Richardson and became acquainted with his classic publication, *Books for the Retarded Reader*, which was to go into six editions, quite an achievement for books in education.

Three years later I was appointed to the University of New England as Lecturer in Education but again our paths were not to meet because in the preceding months Jim Richardson had taken up an appointment as Foundation Chair at Flinders University. His was a joint appointment for he was also Principal of the then Bedford Teachers' College, in whose buildings we are now meeting. Jim seemed like a star figure to me but he was always a step ahead and our paths did not cross. However, he influenced me indirectly because in Armidale I founded and became director of the NEED Educational Clinic, which was modelled very much on the Remedial Education Centre at the University of Queensland.

We were to meet finally, three years later, when I was appointed to the second Chair of Education at Flinders University, there to work alongside Jim Richardson. At last I had caught up with him. I could not have wished for a finer model and colleague.

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One other episode at the University of Queensland has a bearing on today's lecture. In the first few months of my initial appointment there, the university took delivery of its very first computer, only the third in Australia. I remember it well – it was a GE50 and the 50 might have stood for 50 tons for it occupied a whole room. Each department of the university was invited to send a staff member to learn about this 'new' machine and, as newest member in my Department, the Director of the Remedial Education Centre who followed Jim Richardson, called me in and said, "I'm not quite sure what these computers are but I think they could be important. You should find out about them." He was right and I followed his advice, for when I moved to the University of New England I became the first graduate in what was Australia's first post-graduate Diploma in Computing Science.

Let's move 40 years forward to the present.

INFORMATION TECHNOLOGY UPDATE

The old GE50 mainframe computer soon became a dinosaur as computers went through wave upon wave of innovation. Any of today's desktops or laptops is far more powerful and faster than that early GE50. Coded instructions on paper tape gave way to batch processing via 80-column cards, which in turn gave way to typing instructions at an individual workstation, to today's pointing and clicking in a windows-like environment. Developments in the near future are likely to see finger interaction replaced by voice communication.

Let's look at other trends in IT.

- The days of videotape are numbered. Multinational companies like Philips Electronics announced that they have ceased production of the video-recorder.

- DVD has replaced CD-ROM as a storage medium, as is readily evident if you visit any video rental store.

- Dial-up access to Internet service providers has been overtaken by broadband connections.

- The world of photography has changed markedly as still print and slide cameras have given way to digital cameras. "Digital boom forces Kodak to shutter up shop" was a recent headline in *The Weekend Australian* (18-19 September 2004).

- The end of the phone as we know it has arrived, announced the chief executive of Telstra recently. Australia is on the cusp of a "sharp change" he said at the company's October 2004 AGM as the number of fixed-line telephone services dropped by more than 100,000 compared with a year ago. We are seeing landlines increasingly replaced by mobile and internet-based telephony.

- Laptops are giving way to a new generation of powerful pocket PCs, Palm Pilots, and PDAs.

- The world has become googlised as we google for information, and another new word from IT has entered our vocabulary. A recent newspaper report describing the release of an Australian hostage in Iraq said that his captors "Googled his name on the Internet to check his work before releasing him".

Other IT trends that are changing our lives include the following:

- The occupation of door-to-door encyclopaedia salesman has passed into history as their DVD counterparts or virtual copies on the Internet have replaced hardbound encyclopaedias.

- Bankbooks and chequebooks have become casualties of Internet banking.

- The personal letter has almost disappeared having been replaced by instant SMS messaging on mobile phones using a new kind of English language.

Because IT changes the way we interact with the world, IT changes us.

At the same time, IT has left in its trail many unfulfilled promises such as, for instance:

- gadgets that clean one's home automatically;
- food pills that do away with cooking;
- the paperless office; and
- more leisure time.

Meanwhile, what has been happening in our schools?

CHANGING PARADIGM FOR SCHOOLS

Much has been written about the way IT, or rather ICT (information and communication technologies), are changing, or perhaps it would be better to say, have the potential to change, much of what happens in our schools. Morel and his colleagues at the University of Geneva (2003), for instance, have stated that we are witnessing a paradigm change in our schools – from teacher-centred to learner-focused. As ICT becomes integrated into every aspect of a school's activities, UNESCO's (2002b) *A Planning Guide* succinctly captures the changes in student and teacher roles in the newer kinds of emerging learning environments noted by Morel and his co-authors (see Table 1, adapted from UNESCO, 2002b). These changing roles of teachers and students have been aptly summed up in the quip that teachers change from being "sages on the stage" to becoming "guides on the side".

Table 1. Changes in student and teacher roles in teacher-centred and learner-centred learning environments resulting from ICT integration

Learning Environments	
Teacher-centred	**Learner-centred**
Student role • Passive recipient of information • Reproduces knowledge • Learns as a solitary activity	Student role • Active participant in the learning process • Produces and shares knowledge, participates at times as expert • Learns collaboratively with others
Teacher role • Knowledge transmitter, primary source of information, content expert, and source of all answers • Controls and directs all aspects of learning	Teacher role • Learning facilitator, collaborator, coach, mentor, knowledge navigator, and co-learner • Gives students more options and responsibilities for their own learning

Along with changed student and teacher roles, ICT is contributing to changing the whole structure of schools. 'Closed door' classrooms are stretching their walls to embrace the wider community; the instructional emphasis is moving from memorising facts to inquiry-based learning; rigid class timetables are becoming more flexible; and technologies once firmly located in schools are being accessed from beyond the perimeters of the school (Moran et al., 1999).

The changing nature of schools brought about by the integration of ICT in teaching and learning is supported by a further UNESCO publication (2004) that has as one of its major themes how ICT can create new, open learning environments:

> More than any other previous technology, ICT are providing learners access to vast stores of knowledge beyond the school, as well as with multimedia tools to add to this store of knowledge. (UNESCO, 2004)

This UNESCO handbook's incredibly wide coverage – embracing educational technology of the mind, the new literacy, multiple intelligences, wearable computers, goals of education, information objects, the mathematics of informatics, and much, much more – details the potential

of ICT to impact on every aspect of the life of schools, changing them irreversibly from schools as we now know them.

The real potential of ICT is the way it changes learners, which brings us to e-learning.

WHAT IS E-LEARNING?

Today nearly everyone is familiar with e-mail and progressively we are becoming acquainted with e-banking. We also hear about e-commerce, e-business and e-trading, and so it was almost inevitable that the term *e-learning* would be coined. How common is this term?

Look up *e-learning* in one Internet search engine and receive 13,929 hits (AltaVista). In another search engine, receive a staggering three and a half million hits (Google) – even more hits in both search engines if the variant *e-learning* spelling is added!

As a market activity in commerce and industry, e-learning has been enthusiastically accepted by the corporate sector. "Corporate e-learning is one of the fastest growing and, we believe, most promising markets in the education industry" according to Urdan and Weggen (2000, p.1). On Wall Street, stocks in e-learning companies form a key part of the Nasdaq Index. The same corporate report concludes: "We believe e-learning will change the way corporations deliver training in nearly all segments of the business process" (p.31).

E-learning is making a similar impact in education. Numerous papers have begun to appear on the topic in the K-12 schools sector, the higher education sector, and the vocational training sector. The following reports, chapters in books, and research journal articles typify the increasing interest in e-learning, and appropriately all are available online:

- *From teacher education to professional development for e-learning in an e-society* (Morel, et al., 2003)

- *ICT and future teachers: Are we preparing for e-learning?* (Jones, 2003)

- *E-learning: emerging issues and key trends* (Eklund, et al., 2003)

- *Future trends in eLearning: lessons from history* (Martinich, 2003)

- *Developing e-learning content* (Australian National Training Authority, 2003)

But what is e-learning and how does it relate to ICT? In answer the first question, one definition of e-learning goes as follows:

> the delivery of content via all electronic media, including the Internet, intranets, extranets, satellite broadcast, audio/video tape, interactive TV, and CD-ROM. (Urdan and Weggen, 2000, p.8)

Other writers (for example, Jones, 2003, p.1), equate e-learning with digital learning – what is often referred to as online learning – and therefore exclude media like audio and video tape, CD-ROM and DVD. But it is useful to distinguish e-learning from online learning, as does the Australian National Training Authority:

> e-learning is a broader concept [than online learning], encompassing a wide set of applications and processes which use all available electronic media to deliver vocational education and training more flexibly. (Australian National Training Authority, 2003, p.1)

It is useful also to separate e-learning from distance learning, which generally includes text-based materials as well as electronic media. These relationships between e-learning, online learning, and distance learning are seen graphically in Figure 1.
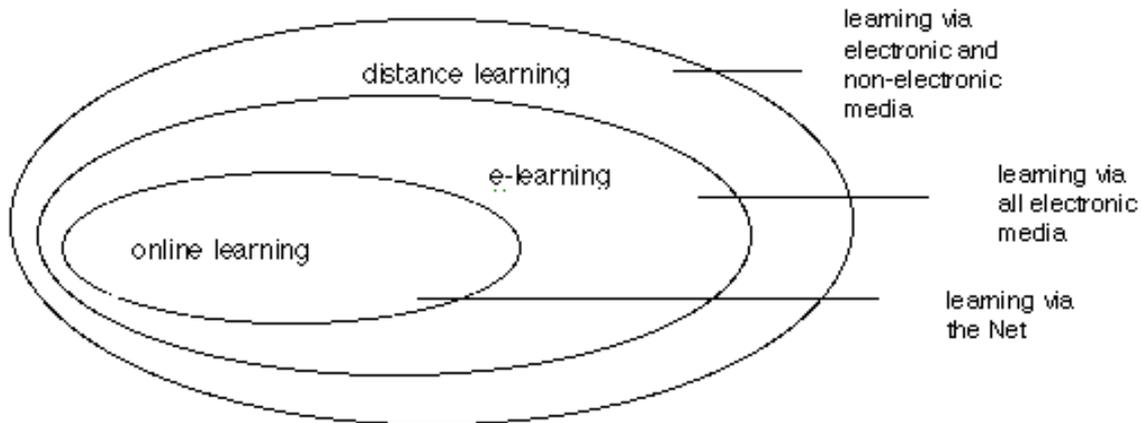
Figure 1. The relationship between online learning, e-learning, and distance learning

Figure 1 serves as a reminder that e-learning is broader than online learning since it includes all electronic media, like CD-ROM and DVD for instance, both of which are off-line media, as well as web technologies. At the same time, e-learning is a sub-set of distance learning, which also utilises print media.

E-LEARNING AND ICT

The second question posed above was how ICT relates to e-learning.

UNESCO uses the term *ICT* or information and communication technologies to describe:

> the tools and the processes to access, retrieve, store, organise, manipulate, produce, present and exchange information by electronic and other automated means. These include hardware, software and telecommunications in the forms of personal computers, scanners, digital cameras, phones, faxes, modems, CD and DVD players and recorders, digitised video, radio and TV programmes, database programmes and multimedia programmes. (UNESCO Bangkok, 2003, p.75)

In so far as ICT include hardware, software and telecommunications, ICT is seen to be the means to support student learning via electronic media. E-learning, then, is the growth in students' understanding and knowledge when they utilise ICT in instructional settings. Thus in the context of teacher development – both the initial training of teachers and their continuing professional development – e-learning for teacher development includes all the courses, workshops and other activities, formal and informal, where student and practising teachers learn about integrating ICT across the curriculum to support student learning.

E-learning, then, is a useful term because it places the focus where it should be – jointly on pedagogy and the new information and communication technologies. It embraces learning by, with and through ICT. The term itself – *e-learning*, or learning via electronic media – nicely combines in its name all these concepts.

GLOBAL GATEWAYS TO ONLINE RESOURCES FOR TEACHER DEVELOPMENT

In this section, the focus turns to teacher development and the enormously rich resources that are available online for use by teacher educators who are familiar with how to access them.

The world's most popular Internet search engine, Google, announced (19th February 2004) that it had added a billion pages to its gigantic store of 4.28 billion pages. A problem arising from this growth is how to sift through the enormous number of 'hits' that result from most search queries, such as the three and a half million hits for the entry *e-learning* noted at the beginning of this

paper. Not only is the number of hits far too many to look at in a single lifetime but many of the web pages in Google's vast database are of dubious quality, or may even have changed location or disappeared since being indexed. For this reason, it is now a recognised convention to indicate in a list of references the date when a website was accessed (see the URL references at the end of this paper).

A practical solution to the problem of too much information is the emergence of global gateways to online knowledge networks in particular fields. These global gateways might be more familiarly known as *web portals*, although a large number of other terms are in vogue – information portals, super portals, vortals, hubs, networks, directories, digital libraries, virtual libraries, and clearinghouses (Lonsdale, 2003). These terms all refer to a single access point or website to which users can go for particular information, and sometimes, as well, for a range of other services such as news, weather information, and discussion forums.

Whatever the term used, global gateways provide a necessary filter to help reduce information overload. Even more importantly, the filtered information has been evaluated before placement, and often links to sources and resources are accompanied by brief descriptions or annotations. Like the rapid growth in information, the number of web portals has similarly increased markedly in recent years, as evident in the fact that Lonsdale's (2003) guide to online knowledge networks in education is already in its third edition (the first edition appeared in 2001). This most recent edition is online, making it additionally valuable.

Six web gateways from around the world are overviewed briefly below (see Table 2). Between them, these portals provide links to a rich source of e-learning materials for teacher development.

Table 2. Selected education web gateways from around the world

Web Gateway	Particular Focus	Developer
• ICTs in Education • Education Network of Australia • Institute for Information Technologies in Education • Multimedia Educational Resource for Learning and Online Teaching • Knowledge Resources • National Grid for Learning	• Distance education and ICT • K-12 schools, vocational education and training, higher education • ICT in education • Higher education • ICT for education and teacher training • K-12 schools and teacher education	• UNESCO, Paris • Educationau, Adelaide • UNESCO, Moscow • California State University, Los Angeles • UNESCO, Bangkok • British Educational and Communications Technology Agency, London

Two further web gateways that might have been included (AskERIC Education Information and ERIC Clearinghouse on Teaching and Teacher Education) were closed at in 2003 and are expected to open in a new form at a later date.

ICTs in Education

UNESCO's newly developed web portal on ICTs in Education offers an entry point to a multitude of resources and sources dealing with education, particularly with open and distance education, teacher education, and information and communication technologies.

Its seven major sections and sub-sections each of which contains an annotated listing of links to websites that are judged generally useful to Member States indicate the scope of this UNESCO web portal:

Definitions of key terms
- Distance education
- Information and Communication Technologies

Educational organisations and associations
- Higher education
- ICT in education
- Open and distance education
- Teacher education

Online books, theses, research publications and newspapers
- Education and ICT research publications
- Education research theses
- Electronic books
- Online newspapers

Policy documents, reports and databases
- ICT in education
- ICT in teacher education
- Open and distance learning

Online education journals
- Education across the curriculum
- ICT in education and teacher education
- Libraries and archives
- Research in education

Resources for teacher educators
- Online tools
- Web teaching/learning materials

Other education portals
- Distance education and learning
- Teaching, teacher education and ICT

(Developed by UNESCO, Paris, France)
http://portal.unesco.org/education/ev.php?URL_ID=18613&URL_DO=DO_TOPIC&URL_SECTION=201

Figure 2. Part of the Home Page of UNESCO's Education: ICTs in Education gateway

This UNESCO web portal is additionally valuable in that it provides direct access to the organisation's key educational publications in the area of information and communication technologies. All titles may be downloaded in PDF format thus ensuring exact replicas of the original printed books. The following titles, in Figure 3 for instance, all of which would be of interest to readers of this paper, are freely available to be downloaded in full text to all who have an Internet connection.
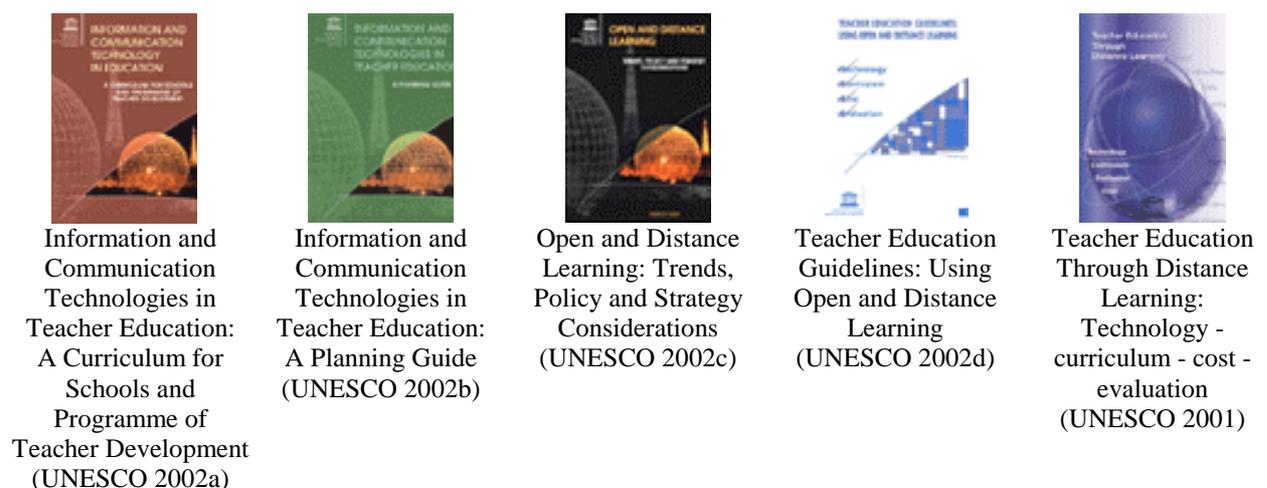

Information and Communication Technologies in Teacher Education: A Curriculum for Schools and Programme of Teacher Development (UNESCO 2002a)

Information and Communication Technologies in Teacher Education: A Planning Guide (UNESCO 2002b)

Open and Distance Learning: Trends, Policy and Strategy Considerations (UNESCO 2002c)

Teacher Education Guidelines: Using Open and Distance Learning (UNESCO 2002d)

Teacher Education Through Distance Learning: Technology - curriculum - cost - evaluation (UNESCO 2001)

Figure 3. ICT publications available online at the UNESCO gateway

Education Network of Australia

The Education Network of Australia, or EdNA portal as it is more familiarly known, with its emphasis on ICT and e-learning, is Australia's gateway to resources and services for education and training (see Figure 4). Information and resources are organised by levels of education (school education, higher education, vocational education and training, adult and community education, and international education) and what are termed *sibling sites*, which include:

ICT Leading Practice: (examples of leading practice in use of ICT; ICT leadership sites; innovative schools; ICT research; ICT models and support; ICT skills for teachers)

Technical Standards: (accessibility; architectures; assessment and competencies; collaborative technologies; learning design; learner profiling)

National Software Evaluation Project: (choosing software; software reviews; software sites; review guidelines)

Information and Communication Technologies Research: (ICT and cross-curriculum; ICT and equity and disadvantage; ICT and learning areas; ICT and levels of schooling; ICT and school change; ICT and the role of teachers/leaders)

(Developed by education.au limited, a non-profit company of the Australian Education and Training Ministers, based in Adelaide, Australia) http://www.edna.edu.au/

Figure 4. Homepage for the Education Network of Australia or EdNA gateway

The EdNA portal also includes information about online projects for teachers and their students, as well as information about national and international conferences, and links to reports and newsletters. What enhances the EdNA portal is that content contributors include all sectors of education – schools, technical and further education, vocational education, and universities.

Institute for Information Technologies in Education

Designed for policy makers of educational systems of UNESCO Member States as well as teachers and teacher educators who use ICT, this web portal, presented in Figure 5, is a rich source of information about the use of ICT in education. The portal's resources are sub-divided into the following ten categories: a) Policy Papers and Plans on ICTs in Education, b) Legislation, Curricula and Standards, c) Organisation, Administration and Financing, d) Teacher Training, e) Research and Development, f) Statistics, g) Internet in Education, h) Multimedia in Education, i) ICT in Distance Education, and j) ICT in Education for People with Special Needs.

In addition to English, specialised resources are available also in Russian, Spanish and French on this web portal.

Multimedia Educational Resource for Learning and Online Teaching

The resource material collection in MERLOT (see Figure 6), as the Multimedia Educational Resource for Learning and Online Teaching is called, is designed primarily for students and faculty in higher education institutions. Access is free though registration is required if adding to the collection. To be included in the collection, materials are peer reviewed and rated, placed into categories, and briefly annotated. Links are then made to the materials themselves, which can be located anywhere on the Internet. A useful additional description is called *Assignments*, which are designed to indicate how the particular materials might be used in a course.
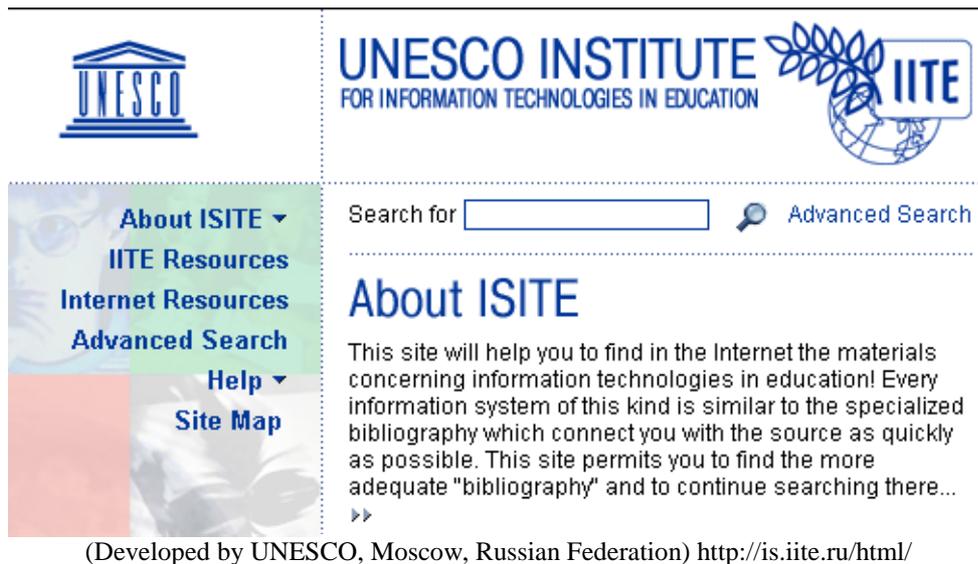
(Developed by UNESCO, Moscow, Russian Federation) http://is.iite.ru/html/

Figure 5. Homepage for the UNESCO Institute for Information Technologies in Education gateway

(An initiative of California State University and funded by a consortium of higher education institutions in the United States and Canada) http://www.merlot.org/

Figure 6. Part of the homepage for the Multimedia Educational Resource for Learning and Online Teaching (MERLOT) gateway

> An Assignment is a detailed explanation of how an instructor has used a learning material. In addition to the text of the assignment, the assignment form contains Learning objectives, Pre-requisite skills and knowledge, Educational level, Technical requirements, and other information necessary to contextualise the use of the material. These examples are provided to help faculty understand a variety of ways the material might be integrated into a learning environment.
>
> (Online at http://www.merlot.org/home/Assignments.po)

The categories of materials include Education and Science and Technology, along with Arts, Humanities, Social Sciences, Business, and Mathematics. A typical entry in the Education collection, which has in excess of 1200 items, is the following:

> Information Literacy Competency Standards for Higher Education
> Author: Association of College and Research Libraries (ACRL)
> Information literacy standards for higher education were developed by the Association of College and …
> Location: http://www.ala.org/acrl/ilcomstan.html
> Date when added to MERLOT

Registered users can add materials (to be reviewed), comment on materials in the collection, and add Assignments. When users register, they are invited to indicate their broad interests. They may then see which other members have similar interests and, if they wish, communicate with them by email.

Knowledge Resources

This comprehensive UNESCO gateway (see Figure 7) contains several components that are highly pertinent to teacher education and e-learning, in particular its collection of web portals and its virtual library.

(Developed by the UNESCO Asia-Pacific Regional Bureau for Education, Bangkok, Thailand)
http://www.unescobkk.org/ips/

Figure 7.   Part of the Home Page of the Knowledge Resources gateway (UNESCO Asia-Pacific Regional Bureau for Education in Bangkok)

Web portals

The growing list of portals includes those developed by the UNESCO Bangkok Regional Bureau, as well as those developed by other organisations. Two portals most relevant to teacher education and ICT are:

- ICT for Teacher Training, and
- ICT for Education in Asia-Pacific.

ICT for Teacher Training. This gateway to Internet resources and websites, dedicated to training teachers in utilising information and communication technologies to enhance their teaching skills, contains sections on: a) ICT in Education, b) Teachers' Roles in the ICT Environment, c) ICT Training Strategies and Online Courses, d) Integrating ICT into Teaching, e) Teaching Ideas, Lessons and Curriculum Materials, f) Educational Software/Courseware, g) Using Internet Resources, h) Electronic Collaboration, i) Bringing Your Classroom Online, and j) Evaluation Tools and Indicators.

ICT for Education in Asia-Pacific. This second portal promotes initiatives within the Asia and the Pacific Program on ICT in education and is funded through the Japanese Funds-in-Trust. Included is information on different dimensions in the use of ICT in education, ranging from ICT policy development in education; integration of ICT in both formal and non-formal education; professional development; collection, processing and dissemination of innovative practices and successful approaches; to the development and application of a set of indicators to evaluate the impact of ICT use in education. The portal also serves as a clearinghouse for a wealth of resources arising from ICT-based education programmes throughout the region and elsewhere, organised under the following sections: a) Projects in ICT, b) ICT Policy and Strategy, c) ICT in Teaching/Learning, d) ICT in Professional Development, e) ICT Indicators, f) ICT Resources, and g) Links to other ICT-based Education Programs.

Virtual library

The IPS Virtual Library contains links to a wealth of worldwide electronic information resources, from many different sources, on topics dealing with education, social and human sciences, culture and communication. This website facilitates virtual access to library resources without being physically present in any library or information resource centre.

The Virtual Library offers over 1,000 website links to bibliographic, full-text and statistical databases in specific subjects related to various aspects of education, social and economic issues, gender, population, social, science, culture, health, HIV/AIDS, and related areas. It also contains

links to libraries and archives; full text electronic journals and periodicals; Internet references; and reference materials such as atlases, encyclopaedias, dictionaries and maps.

National Grid for Learning

The National Grid for Learning (NGfL, see Figure 8) is gateway to a large network of selected websites that offer high quality content and information in a wide range of areas: learning resources, games and quizzes, lesson plans and worksheets, reference material, libraries and archives, museums and galleries, and learning opportunities. NGfL is funded by the Department of Education and Skills and developed by BECTA, the Government's leading agency for ICT in education. Although much of the material focuses on the United Kingdom, there is much that would be applicable elsewhere.

(Developed by the British Educational and Communications Technology Agency (BECTA) on behalf of the British Government) http://www.ngfl.gov.uk

Figure 8. Homepage for the National Grid for Learning (NGfL) gateway

The resources are organised into user groups across K-12 and further/higher education, and also by broad subject category (business and economics, IT and computing, and maths and sciences, for example). The range of learning resources is extensive, for instance, an online course on using the Internet, courses and tutorials on use of software such as Photoshop and Illustrator, and collections of resources to support teaching of all subjects in primary and secondary schools. Similarly, users may access a wide selection of lesson plans and worksheets, including games and tests for all school subjects and many at the tertiary level too.

Use of the National Grid for Learning is free but registration is required. Registration allows users to save links to their searches and favourite teaching materials in their own user area, as well as to receive free alerts when new resources are added in areas of particular interest.

WHY E-LEARNING IS IMPORTANT IN TEACHER DEVELOPMENT

Knowing about global gateways or portals to online resources can help key decision-makers with responsibility for teacher development who may be asked why e-learning is important. Additionally, it is useful to consider the changing emphasis in the national goals of education in countries around the world. In all UNESCO Member States, there is a realisation of the role education plays in making the transition to an information economy in order to contribute and prosper in the globalised context of which all countries are now part. As White (2003) succinctly puts it:

> It is the school system that provides a foundation for [each country's] future intellectual, social, moral, spiritual and aesthetic contributions in an increasingly complex and integrated world order. Competence in information technology is key to this development. (White, 2003, p.2)

Australia's national goals for schools in the 21st century typify what many other nations are striving towards. Included in Australia's set of goals is the statement that:

> … when students leave schools they should be confident, creative and productive users of new technologies, particularly information and communication technologies, and understand the impact of those technologies on society. (Ministerial Council on Education, Employment, Training and Youth Affairs, 1999)

Malaysia, similarly, has declared a Vision 2020 Plan for industry and education that has established a "Multi-media Super Corridor" close to the nation's capital, and has developed proto-type "Smart Schools", with the goal that all schools in Malaysia should be Smart Schools by 2010. The Outline Prospective Plan further aims to:

- have a quality workforce which is knowledgeable with highly tuned thinking skills, able to use technology and new resources optimally, to combine creativity and innovation effectively and has a diversity of skills and knowledge in the use of ICT.
- produce students who are knowledgeable and ICT literate and able to use technology for the betterment of themselves, their communities and their nation. (Downes et al., 2003, p.C5).

To realise the national goals for education that Malaysia, Australia, and many other nations have advanced, teacher development is clearly required to prepare teachers with e-learning skills to equip students with the kinds of critical skills necessary if they, as members of the work force, are to contribute meaningfully in their country's future development. All teachers need to be familiar with e-learning and competent in the use of ICT to assist in this development, and in order to be comfortable in these roles "teachers need to experience online learning as part of their ongoing professional development" (White, 2003, p.5).

Whatever stage of development in the use of learning technologies that teachers around the world have reached, there are new ways of storing and manipulating data and information that will influence individual intellectual development for as White (2003) goes on to explain:

> Teachers and lecturers use data and information as basic building blocks to assist learners to develop conceptual knowledge. As a result, engaging with technology can enable teachers and lecturers to store, view, manipulate and present information in many new ways. (White, 2003, p.5)

Therefore, e-learning for teacher development must play a key role if national education goals for education are to be achieved, thereby changing schools as we have known them in the past from predominantly teaching institutions to learning institutions. Many educators describe these changes as nothing less than a transformation of education (UNESCO, 2004).

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WEB PORTALS

Education Network of Australia (EdNA)
http://www.edna.edu.au/

ICTs in Education (UNESCO)
http://portal.unesco.org/education/ev.php?URL_ID=18613&URL_DO=DO_TOPIC&URL_SECTION=201

Institute for Information Technologies in Education (UNESCO)
http://is.iite.ru/html/

Knowledge Resources (UNESCO)
http://www.unescobkk.org/ips/

Multimedia Educational Resource for Learning and Online Teaching (MERLOT)
http://www.merlot.org/

National Grid for Learning (NGfL)
http://www.ngfl.gov.uk/

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