An introduction to learning technology within tertiary education in the UK

Edited by Jane Seale and Merce Rius-Riu

Published by the Association for Learning Technology
Oxford Brookes University, Headington, Oxford, OX3 0BP, UK
alt@brookes.ac.uk
www.alt.ac.uk

Foreword

This introduction to learning technology has been written primarily for new members of the Association for Learning Technology who are also new to the field. It attempts to reflect the diverse range of interests, specialities and disciplines that members of the Association have. For this reason we anticipate that established members of the Association may also find the booklet a useful resource.

The publication has been designed to provide a general overview of the current issues and practice within tertiary education in the United Kingdom and to give readers pointers to where and how they can access more detailed information on particular topics or projects. Throughout the booklet we have tried to highlight certain points and issues by giving examples of particular projects or naming the work of particular people. These examples have been used for illustrative purposes and readers will find many more pertinent examples if they follow up the references given in the lists at the end of each section.

We would like to acknowledge the important contribution of the following people who have read initial drafts of this pack and whose comments and suggestions for additions and amendments have been invaluable:

Paul Bailey, *University of Plymouth*
Helen Beetham, *University of Plymouth*
Juanita Foster-Jones, *The Open University*
Pat Maier, *University of Southampton*
Joyce Martin, *Becta*
Ray McAleese, *Heriot-Watt University*
Martin Oliver, *University College London*
Susi Peacock, *Queen Margaret University College*
Rhonda Riachi, *Association for Learning Technology*
Adrian Thompson, *Association for Learning Technology*
Adam Warren, *University of Southampton*

Jane Seale, King's College London/University of Southampton

Merce Rius-Riu, University of Kent

July 2001

The learning technology arena

SECTION ONE

You have joined an association called the *Association for Learning Technology* (ALT) and so naturally might wonder what we mean by *Learning Technology*. If we look at the *technology* part of the phrase, then what most people understand by technology is what is referred to in higher education as communication and information technologies (C&IT) and in further education as information and learning technologies (ILT). We will describe in more detail what particular tools might be defined as learning technologies in Section 3.1. We will also make a distinction between *basic* and *advanced* tools, where basic tools such as word-processors and spreadsheets are contrasted with advanced tools such as virtual learning environments and videoconferencing.

While ALT is interested in the tools, it is perhaps more interested in the context in which those tools or technologies are designed, implemented and evaluated: the learning or educational context. ALT therefore understands the term *learning technology* to refer not only to the application of communication and information technologies for educational purposes but also to the development of a sound theoretical basis for this application (pedagogy). In 1997 ALT members, in a discussion on the Report of the National Committee of Inquiry into Higher Education (known as the Dearing Report), debated the following definition of *learning technology:*

> ALT understands learning technology in a broad conceptual sense as the systematic application of a body of knowledge to the design, implementation and evaluation of learning resources. The body of knowledge - the fruit of research and practice - is based on principles of learning theory, instructional design and change management. Learning technology makes use of a range of communication and information technologies to support learning and to provide learning resources. ALT believes that learning technology adds value to both the efficiency and the effectiveness of the learning process.[1]

Whatever words are used to formally define learning technology, what is important is that ALT sees itself as an educational rather than technological organisation and the content of this introductory pack will reflect this important distinction.

1.1 The Association for Learning Technology: an association for all

The Association for Learning Technology (ALT) was founded in 1993. ALT aims to:

- ☐ *promote good practice in the use of learning technologies in education and industry;*
- ☐ *represent its members in areas of policy;*
- ☐ *facilitate collaboration between practitioners and policy-makers.*

ALT runs a year-round, wide-ranging events programme. ALT-C, our international conference, is the premier learning technology conference in the UK tertiary sector. It publishes a quarterly newsletter (ALT-N) and a peer-reviewed journal (ALT-J), which appears three times a year. Members benefit from free or discounted rates on all ALT events and publications.

ALT provides a focus for the expanding community of learning technology practitioners in tertiary education, bringing together all those concerned with learning technology, including researchers, developers, service providers, policy makers, librarians, publishers and hardware and software manufacturers. At its heart are teachers and trainers in universities and colleges who are seeking

SECTION ONE

to support their students' learning through the use of learning technology.

1.2 A brief history of learning technologies

A brief look at the development of learning technologies in tertiary education in the UK over the last twenty years reveals that efforts were put into three major areas:

- ☐ *Infrastructure: the hardware, networks and services required to underpin the use of learning technologies within tertiary education;*
- ☐ *Content: the design and evaluation of courseware;*
- ☐ *Practice: the application and implementation of infrastructure and content within tertiary education.*

1.2.1 Infrastructure

In the late 1970s academic networking activities were rather fragmented. In an attempt to join regional university networks with national computer centres, the first Joint Academic Network (JANET) was created in 1984. By the late 1980s JANET served around 200 sites, which included research and higher education interests outside the academic community as well as polytechnics and colleges. JANET initially offered email, job and file transfer services, but following expansion and upgrades JANET evolved into SuperJANET, providing a high performance wide-area network and connectivity to the global network. Users could now access the Web, email, Usenet News and Video. The United Kingdom Education and Research Networking Association (UKERNA) currently manages JANET, on behalf of the Joint Information Systems Committee (JISC).

1.2.2 Content

In February 1992 the Universities Funding Council (UFC) launched the first phase of the Teaching and Learning Technology Programme (TLTP). The UFC made available £7.5 million a year over three years and universities were invited to bid for funding for projects to develop new methods of teaching and learning through the use of technology. Forty-three projects were funded under this first phase: projects ranged from addressing staff development to courseware development. In 1993 a second phase began, this time funded by the newly established higher education funding councils in England (HEFCE), Wales (HEFCW), Scotland (SHEFC) and Northern Ireland (DENI). A further thirty-three projects were funded, the majority of which aimed to build on the work of those projects funded in the first phase.

Whilst the success of individual TLTP projects was varied, the programme as a whole had a wide-ranging influence and prominence within higher education. In 1996 the journal *Active Learning* published a series of articles reviewing the success of the TLTP programme and its products. For example, Kelly, Maunder and Cheng describe a computer-based learning package called Transmath, which was designed to help students make the transition from pre-university mathematics to first year undergraduate mathematics[2]. While, Bacon outlined the background to the design of courseware for the SToMP project (Software

Delegates at the ALT VLE Conference 2001 *Ian M Spooner*

Teaching of Modular Physics) and presents results of two evaluation studies. One particular finding was that weaker students seemed to benefit the most from using the SToMP courseware[3].
Software and product development in the 90's was not limited to the TLTP arena. An important forum for showcasing new software developed within UK academic institutions was the European Academic Software Awards (EASA). EASA was created in 1994 to stimulate the development of high quality software for education and research. Competitions are held every two years and jurors from across Europe evaluate submissions using a range of content, design and educational criteria. UK winners have included:

- ***Medi-CAL:*** *a child development module developed as part of 60 CAL applications, which were developed at the University of Aberdeen Medical School by Neil Hamilton, David Kindley and Icair Frade;*
- ***Glacial Analysis:*** *a CAL package developed by Jane Hart and Kirk Martinez at Southampton University and designed to teach students how to analyse glacial elements;*
- ***Merlin:*** *developed by The Institute for Learning at the University of Hull. Merlin is a Web-based learning environment designed to support distance tutor-supported courses and 'open' group-based learning and was originally designed to support the distance teaching of English as a Foreign Language.*

In the new millennium EASA is going strong. EASA2002 will be held in Sweden and UK participation is supported by a grant from JISC. In addition to *home-grown* products developed within educational institutions, commercial authoring packages such as Toolbook were beginning to change the practice of educators in the 1990's. For example, O'Connor reviews a multimedia authoring program called *Medi8or* which he used to create multiple choice question tests with accompanying graphical images[4].

1.2.3 Practice

In 1985 the Computers in Teaching Initiative was established by the Computer Board for Universities and Research Councils. The first phase focused on courseware development and produced a large body of software and course materials. It was followed up four years later by the establishment of 20 subject centres and grew to 24 over the next few years. The mission of the second phase of the CTI was *'to maintain and enhance the quality of learning and increase the effectiveness of teaching through the application of appropriate learning technologies.'* This was achieved by gathering and disseminating information and providing expertise and guidance to their constituencies.

While the CTI supported practice within the higher education community, the National Council for Educational Technology (NCET) co-ordinated educational and technological developments across the compulsory and post-compulsory educational communities. It also sought to: evaluate learning technology practice; support existing applications of learning technology; and investigate emerging technologies and associated pedagogy. The NCET is now known as Becta, the British Educational Communications and Technology Agency. Becta provides advice on using learning technologies in teaching and learning, supports the development of appropriate software and online content as well as access to general information on the implementation and integration of ICT into the classroom.

1.3 Current national learning technology projects and initiatives

In 1999 work began to upgrade the SuperJANET network to enable it to adapt to a new climate and respond to a number of key forces for change. The challenges facing SuperJANET4 include:

- *providing a fast and intelligent highway between individual regional networks and the world at large;*
- *opening out access to learning that takes place outside of the classroom;*
- *enabling seamless integration of applications across the entire educational spectrum;*
- *enriching the learning and research process;*
- *facilitating the implementation of new advances in technology.*

As part of the move to enable seamless integration of applications across the entire educational spectrum all further education colleges in the UK have been connected to JANET at 2Mbits/s. In addition, the services currently offered over JANET

are being developed to meet the specific requirements identified by the FE sector. Alongside this, the JISC has created thirteen Regional Support Centres. The initial focus of these centres will be to support the connectivity process and ensure that all FE colleges have a secure network connection. Help-desk support is also being established for several specified staff within each college[5]. This development in infrastructure is mirrored by developments in content and practice.

1.3.1 Content

The Higher Education Funding Councils have recently given the JISC the remit to converge new learning environments with digital library developments. Government funding of up to £10 million has been made available over three years to improve the applicability of learning technologies for learning and teaching. As a first stage, in 1999 the JISC invited full proposals from institutions or consortia for projects to develop the Distributed National Electronic Resource (the DNER) and thereby to extend the usefulness of JISC Services for learning and teaching. The DNER is defined as a managed environment for quality-assured information on the Internet, drawn from many sources. The DNER will provide the dissemination vehicle for the delivery of electronic resources including teaching and learning material[6].

In February 1998 Phase three of TLTP was announced. The focus of this phase has been embedding the use of TLTP materials developed in the earlier phases. The majority of these projects are nearing completion and ALT members can expect the results of many of them to be disseminated through its conference, journal and newsletter. The projects generally have signalled a move away from software development to the re-use of materials. This reflects a concern that educators in tertiary education have perhaps been *re-inventing the wheel* by developing products which already existed in similar formats in other departments and institutions.

Commercial software developers are now exerting a greater influence over the delivery of tertiary education. This is due in part to the huge rise in interest in Virtual Learning Environments. As departments, faculties and whole institutions make the decision to implement Virtual Learning Environments, companies such as WebCT and Blackboard have increased their foothold in the educational markets. This has also led to partnerships with book publishers, such as Pearsons, who are seeking to provide *content* that can be plugged into these environments. The ALT Newsletter has been running a series of reviews that have looked at the advantages and disadvantages of using products such as WebCT and Blackboard (see issues, 29-32). Now that the excitement over the new technology has died down, practitioners within the field are starting to question their educational value. For example, Simpson urges us not to forget that the use of VLEs should be more than simply providing access to information[7]. She argues:

> Virtual Learning is not a set of tools that provide access to information and space for discussion, just as learning is not a library and a lecture theatre.

1.3.2 Practice

Three current initiatives that will influence the implementation of learning technologies within tertiary education are the new Learning and Teaching Support Network, the *e-University* and the National Learning Network.

In 1998 HEFCE undertook a review of the CTI and the TLTSN (Teaching and Learning through Technology Support Network)[8]. It made a number of recommendations, which included disbanding the CTI and establishing new, broader-based subject centres, whose role would be to support the sharing of innovation and good practice, including the integration of ICT in learning and teaching. It also recommended that a single, generic technology centre be established to advise the sector strategically on the use of new technologies to support learning and teaching. 24 new subject centres have been set up, all located within relevant subject departments and hosted by higher education institutions. These centres are collectively known as the LTSN (Learning and Teaching Support Network). In addition, a Technologies Centre has been funded by JISC, which plans to work closely with the LTSN. It will investigate, develop and prove the applicability of new technologies in support of the whole education process in higher and further education. These will include technologies relevant to learning and

teaching and their integration into wider student support and administrative systems.

In 1997 the Dearing Report put forward a vision for the future in which a world market in learning materials based on educational technology will develop, and contends that higher-education institutions must be ready to take advantage of this potential bonanza[9]. In 2000 HEFCE followed this vision by launching what they called their e-University project[10]. The aim of the project is to develop internet-based higher education in order to capitalise on the expertise within HE on new technologies and secure a share of the market for virtual provision of education and training. HEFCE envisage the key characteristics of the *e-University* as:

- ☐ *being a new vehicle for delivering higher education programmes through virtual distance learning;*
- ☐ *being jointly owned, established and operated by a consortium of higher education institutions, working with private sector and overseas partners. This will not be a new, self-standing HE institution, but will draw on the expertise of existing providers;*
- ☐ *focusing on meeting expanding demand for HE programmes both in the UK and particularly overseas;*
- ☐ *being established on a scale that will enable it to compete internationally.*

The National Learning Network is a national initiative for England which began in 1999 with an initial Government investment of £74 million[11]. The NLN aims to help transform the FE learning environment and is a complete package of measures designed to increase the uptake of information and learning Technology (ILT). In the summer of 2001 the Government announced £84 million of continuing investment in the NLN over the next two years. The NLN has built on key partnerships within the FE sector – including Becta, the JISC, the Learning and Skills Council (LSC), the Learning and Skills Development Agency (LSDA), the National Information and Learning Technology Association (NILTA) and the United Kingdom Education and Research Networking Association (UKERNA) – to provide a robust network infrastructure and a wider-ranging programme of support, information and advice, as well as the development of ILT materials for teaching and learning. The first phase funded the ILT Champion Programmes for senior management and curriculum staff, which were specially designed to develop a range of practical and strategic skills, to allow the champion's home institution to make best use of the technology, and ILT materials and resources.

1.4 References

[1] ALT's definition of learning technology for debate, see: *www.alt.ac.uk/publications*

[2] Kelly A., Maunder S. and Cheng S., Does practice make perfect? Using TRANSMATH to assess mathematics coursework. *Active Learning,* **4,** 30-36 (1996)

[3] Bacon R., The effective use of computers in the teaching of physics. *Active Learning,* **4,** 37-41 (1996)

[4] O'Connor D., Rapid results with Medi8or. *ALT-N*, **17,** 6-7 (1997)

[5] Wistreich A., JISC Regional Support Centres. *ALT-N,* **31,** 9 (2000)

[6] JISC, Developing the DNER for Learning and Teaching. *JISC Circular 5/99* (1999). Available from: *www.jisc.ac.uk/pub99/c05_99.html*

[7] Simpson V., VE or VLE? Don't forget the L! *ALT-N,* **31,** 5 (2000)

[8] HEFCE, An evaluation of the Computers in Teaching Initiative and Teaching and Learning Technology Support Network. *Report 98/47* (1998). Available from: *www.hefce.ac.uk/pubs/hefce/1998/98%5F47.htm*

[9] Dearing R., Higher Education in the Learning Society: Report of the National Committee of Inquiry into Higher Education. *DfEE* (1997)

[10] HEFCE, e-University Project. *Circular letter 04/00* (2000) Available from: *www.hefce.ac.uk/partners/euniv/*

[11] National Learning Network: see *www.nln.ac.uk*

SECTION TWO

The learning technology community

In Section One, we outlined the aims of the Association for Learning Technology including the facilitation of interchange between all those involved in the field of learning technology. However, not all those working in the field of learning technology would automatically label themselves as *learning technologists*. Their identity might be more closely linked to labels such as lecturer, researcher, technician, librarian or staff/educational developer. Therefore, defining the roles of different practitioners within our learning technology community can be quite difficult because staff for whom learning technology development, implementation and use is a core job function have a wide range of job titles and descriptions.

Following on from some earlier work by UCISA-TLIG[1], a JISC-CALT project[2] has recently completed a scoping study that attempted to define and distinguish the different roles and functions of staff who are involved in the development, use, co-ordination and support of learning and teaching technologies. The study eventually identified nine specific roles, which broadly represented four types of activity (see Table 1).

The break down of roles as laid out in Table 1 suggests that the work of a lot of staff could span more than one type of activity. For example, a librarian could have a role in developing resource materials, providing learning resources support or co-ordinating access to learning resources. Those who work in staff development units could play a role in educational development or learning skills support. A computing services employee may feel that they could take on a technical development, support or management role. Similarly, a lecturer or *academic* could take on a research, implementation or management role.

Table 1: Roles and activities within the field of learning technology

Level of activity	Role
1. Research and Development	■ Education researcher: Lecturer in education or learning technologies or researcher/research assistant ■ Technical developer/researcher: e.g. VLE developer ■ Resource/materials developer: e.g. Multimedia author ■ Educational Developer
2. Support	■ Learning Skills Support: e.g. Learning Support Officer or IT Help Desk staff ■ Learning Resources Support: e.g. librarian ■ Technical Support: e.g. network maintenance staff
3. Implementation	■ Academic innovators: e.g. lecturers and teaching assistants
4. Management and Co-ordination	■ Service Managers: e.g. heads of services such as library and computing ■ Project Managers

In the rest of this section we wish to explore in more detail the evolution of the specific title *learning technology specialist* as well as discuss how general practitioners such as staff and educational developers, librarians, lecturers and researchers can play an important role in the field of learning technology.

2.1 Learning technology specialists

As learning technology develops and the use of Communications and Information Technologies slowly becomes integrated in mainstream teaching and learning practice, new skills are required from both academic practitioners and support staff. Consequently, the past few years have seen the birth of a new type of professional in tertiary education[3], the *Learning Technology Specialist*.

An early evolution of the Learning Technology Specialist occurred during the 1997 ALT Conference, when a group of participants identified themselves as *Teaching and Learning Technology Officers*. All the members of this group saw themselves as having educational technology support roles, which were extremely wide-ranging in nature. However, as many worked on publicly funded projects such as CTI, TLTP or TLTSN most members of the group felt they worked in isolation within their own institutions, rather than as part of a team or wider unit. Therefore, the group felt very strongly that they could benefit from mutual support, keeping in touch, exchanging ideas and experiences and perhaps finding and sharing solutions. The TLT-Officers mailing list was thus born, first as a Mailbase list and now as a JISCmail[4] service: tlt-officers@jiscmail.ac.uk

Despite the wide range of backgrounds, job titles and current functions of Learning Technologists the TLT-Officers group has defined a TLT Officer as someone who is:

> employed with a core activity of the job to promote and/or support the **pedagogically effective** uptake of specific learning technologies.

They go on to declare that:

> ...because a TLT-Officer promotes and supports change in educational practice they [need to] understand not only the pedagogical principles and the technology available, but also how to make best use of the latter to support and serve those principles.

The JISC-CALT project noted that learning technology specialists may be found in a number of different locations within an academic institution[2]. They might be found within dedicated learning technology units, library/learning resources units, learning and teaching development units or computing and information services units. Whilst such a variation in locations was seen as a potential obstacle to effective co-ordination of effort, the participants in the study did not necessarily see this as an obstacle to promoting change overall as they considered it necessary to work across a range of institutional cultures, structures and practices.

So, a learning technology specialist needs a large number of skills, may have a number of different roles and works in a wide range of different settings. The Association for Learning Technology has the interests of this diverse group at heart and as part of its mission strives to provide a forum for those acting as a bridge between education and the technology. An example of an early initiative to cement this forum is when the TLT-Officers group voted to become a Special Interest Group (SIG) within ALT. In addition, initiatives such as the RESULTs project, a partnership between ALT and JISC to provide an Internet portal for Learning Technology resources, are all part of a continuing effort to bridge the gap between education and technology.

2.2 Staff and educational developers

Staff and educational developers usually have a clearly defined set of roles and responsibilities that focus on developing staff and the curriculum rather than developing or supporting the technologies. Staff and educational developers can help staff to develop the skills required to select, design and evaluate appropriate use of the technology. The role of the staff or educational developer therefore involves a wide range of activities including:

SECTION TWO

- ☐ *Raising awareness via presentations and demonstrations of the applications of specific technologies in teaching and learning;*
- ☐ *Offering examples of good practice in the use of learning technologies;*
- ☐ *Developing the skills of academics by running hands-on, practical workshops;*
- ☐ *Developing academics' understanding of the pedagogical impact of different technologies;*
- ☐ *Sharing knowledge and expertise through facilitated discussion, practitioner forums, in-house publications, email lists and events;*
- ☐ *Providing individual support and guidance to academic staff, for example via secondments and collaborations, support for development projects, or more informally via clinics and drop-in sessions.*

Educational developers may also play a crucial role in planning and delivering institution-wide programmes of development that meet individual, departmental and institutional objectives for learning technology implementation. For example, the EFFECTS project has carried out extensive work on integrating Learning Technologies in HE through staff development[5]. The project has developed a generic framework, which can be adapted as an institutional programme in a flexible way according to the institution's own structures and culture. The framework is based on learning outcomes and can be mapped to existing accreditation schemes requirements such as SEDA or the ILT. The FE equivalent of this project is QUILT (Quality in Information and Learning Technology) a staff development programme designed to 'make all college staff enthusiastic about new technology and to help them incorporate it in their work'[6].

2.3 Librarians and information professionals

Librarians or information professionals contribute to learning and teaching in a number of ways[7]:

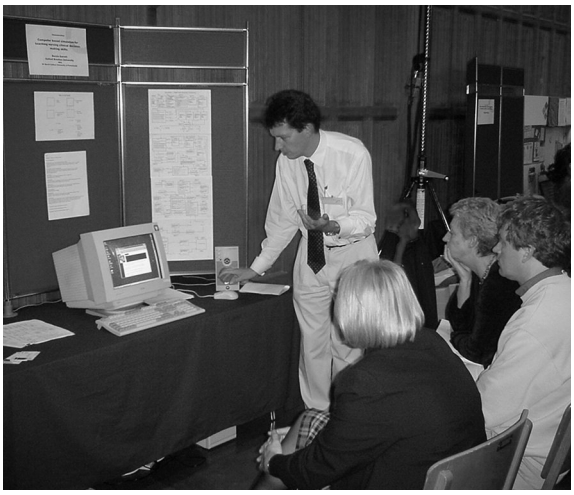
- ☐ *as mediators between learners and learning resources and facilitators of out-of-classroom learning;*
- ☐ *as teachers of information literacy and knowledge navigation skills;*
- ☐ *as designers and managers of out-of-classroom learning environments;*
- ☐ *as managers of information and learning resources;*
- ☐ *as designers of systems of access to such resources;*
- ☐ *as advisers on the appropriate use of information and learning resources.*

Such contributions mean than librarians and information professionals can play a pivotal or central role in using learning technologies to support learning and teaching. For example, the Library Association argues[7]:

> FE library staff have a depth of experience in supporting students in the use of ILT [Information and Learning Technology] learning resources. This means they have a valuable contribution to make to the design and customisation of internally created ILT materials, and to assessing the quality of such materials whether internally or externally created.

In addition to contributing to the design, customisation and assessment of materials, librarians and information professions may also support lifelong learning, develop collections of resources, teach information skills, disseminate information/raise awareness, research and develop new library resources and collect Internet resources.

Libraries have long supported lifelong learning, through the provision of resources to their users. With the advent of the University for Industry (UfI) and its *Learndirect* brand, libraries are now becoming access points for these courses. Library staff are being trained to give advice to their users, and will support them in their use of these learning materials.



An interactive demonstration at ALT–C 99

Many libraries have collections of learning technologies as part of their services. Public libraries have lifelong learning collections, which include interactive CDs and multimedia resources. Within the academic sector they may hold collections of materials produced by the institution, with related support documentation. For example, libraries within teaching hospitals may hold CAL collections that provide access to electronic textbooks and interactive medical products that can contribute towards a medical education. Librarians and Information Providers may also create collections of virtual resources. Harden[8] argues that:

> Librarians serve the interests of their client communities through the selection of material, its organisation and guidance in its use. The Internet offers fresh ways of packaging material and presenting it in novel and exciting forms.

Librarians and information professionals often participate in user education and training. Within the academic sector librarians may run short courses on using databases, and more generally, on information retrieval skills. As more universities offer distance-learning courses, there is a need to be able to pass on those key skills without face-to-face interaction.

Disseminating information, including raising awareness of currently available products, has long been a role of librarians and information professionals. In the case of learning technologies this may provide a point where new technologies can be demonstrated e.g. by co-ordinating with suppliers and providing a venue. Librarians have also been involved in research and development programmes such as the eLib and DNER programmes funded by JISC[9,10].

2.4 Lecturers

In many respects lecturers can be seen as being at the *coal-face* or *front line* of learning technology implementation. Many lecturers have the responsibility for introducing or integrating learning technologies into their teaching and assessment programmes. Some choose to do this on a small scale others do it on a larger scale, often as part of a wider institutional push for change. Lecturers choose to use learning technologies in a variety of different ways. They may use a virtual learning environment to support administrative aspects of course provision and to provide flexible access to resources and discussion forums; computer assisted assessment for formative and summative testing, or the Web as a resource for online research. In terms of the skills that lecturers are trying to promote through the use of learning technology, these can range from:

- ☐ *collaboration: e.g. Studiospace, a collaborative VLE for visual disciplines*[11]
- ☐ *discussion and reflection: e.g. CoMentor, a multi-user, virtual learning environment*[12]*;*
- ☐ *critical thinking: e.g. CALM: Critical and Analytical Learning in Macroeconomics*[13]*.*

Finally, lecturers may use learning technologies for a variety of personal reasons, such as to develop their own skills, for the challenge and enjoyment of experimentation, or because of a general commitment to change.

2.5 Researchers

There are a number of research topics in the field of learning technology, for example:

- ☐ *The use of Web sites and learning environments to support courses;*
- ☐ *Computer-mediated communication and online communities;*
- ☐ *The development of innovative systems (often Web-based and/or multimedia);*
- ☐ *Institutional change;*
- ☐ *Curriculum design and evaluation;*
- ☐ *Online and distance learning.*

The nature of these topics means that the researchers who work in these fields represent a wide range of disciplines and interests. For example, researchers with a background in education might be interested in curriculum design and evaluation, the pedagogy behind the use of Web sites and learning environments or student and tutor roles in online and distance learning. Psychologists might be interested in looking at the process of learning from an interactive system or the impact of different learning environments on individual learning. Sociologists might be interested in investigating group phenomena such as the development of online learning communities.

SECTION TWO

Those with a background in organisation and management science may be interested in exploring institutional approaches to using learning technologies to deliver teaching content. In addition, researchers from more technical fields such as electronics and computer science may be interested in the design and development of new products and systems. There is a growing feeling within the learning technology community, however, that we should be promoting the idea of a more generic approach to research. With such an approach, members of the learning technology community would not be constrained to research within their subject disciplines but would be encouraged to contribute to pedagogical research that informs pedagogical development (and vice versa). The success of such moves, however, is likely to be heavily influenced by funding bodies such as HEFCE and the LSC.

The variety of research interests and backgrounds of learning technology researchers is reflected in the composition of a number of learning technology research units, including: the Centre for the Study of Advanced Learning Technologies (CSALT) at Lancaster University[14]; the Computer Based Learning Unit at Leeds University[15]; the Institute of Learning and Research Technology (ILRT) at Bristol University[16]; the Institute of Educational Technology at the Open University[17]; the Learning Lab at Wolverhampton University[18]; and the Centre for the Study of Networked Learning at Sheffield University[19].

2.6 References

[1] Armitage S., Rothery J., and Jenkins M., *Report of a UCISA survey of support provided in Universities and Colleges for the use of technology in teaching and learning.* Universities and Colleges Information Systems Association Teaching, Learning and Information Group (1999)

[2] *Learning Technology Staff in UK HE:* a scoping study. See: *sh.plym.ac.uk/eds/effects/ jcalt-project/*

[3] Gornall L., 'New professionals', change and occupational roles in higher education. *Perspectives: Policy and Practice in Higher Education,* **3(2),** 44-49 (1999)

[4] JISCmail see: *www.jiscmail.ac.uk/files/tlt-officers/*

[5] *EFFECTS: Effective Frameworks for Embedding C&IT with Targeted Support.* See: *sh.plym.ac.uk/eds/effects/*

[6] Donovan K. and Atwere D., QUILT: a case study in the impact of a staff development programme. *ALT-J,* **8(3),** 67-74 (2000)

[7] Library Association Response to *"Networked Lifelong Learning: An ILT development strategy for FE".* See: *www.la-hq.org.uk/directory/prof_issues.feilt.html*

[8] Harden R., *Collecting Internet Resources - the issues of UK public librarians.* See: *www.earl.org.uk/policy/issuepapers/collect.htm*

[9] eLib Program. See: *www.ukoln.ac.uk/services/elib/*

[10] JISC, *Developing the DNER for Learning and Teaching.* JISC Circular 5/99 (1999). Available from: *www.jisc.ac.uk/pub99/c05_99.html*

[11] Malins J., *Studiospace: a collaborative VLE for visual disciplines.* Presentation at ALT-C 2000 (2000)

[12] Hepplestone S., *Co-Mentor - the free multi-user VLE.* Presentation at ALT-C 2000 (2000)

[13] Johnston C., *Creating CAOS from CALM.* Presentation at ALT-C 2000 (2000)

[14] See: *csalt.lancs.ac.uk/csalt/newcsalt.htm*

[15] See: *cbl.leeds.ac.uk/~www/home.html*

[16] See: *www.ilrt.bris.ac.uk*

[17] See: *iet.open.ac.uk/*

[18] See: *www.learninglab.org.uk*

[19] See: *www.shef.ac.uk/uni/projects/csnl/*

Learning technology tools

SECTION THREE

Perhaps the most characteristic feature of current technology, and current communications and information technology in particular, is the speed at which it changes and constantly develops. Had we written this booklet only a few years ago, software development and multimedia programming tools would have provided the focus of this section. Relatively recent developments in networked technologies mean that the Internet and the Web currently take centre stage.

This section is not intended as a complete listing of the learning technology tools available at the moment. Rather it aims to provide an overview of the kind of tools in use and a starting point for investigating appropriate tools further. Other technologies are being developed and tried at this very moment, which we have not included in this section: electronic whiteboards; portable tablets; flat plasma screens; online, collaborative audio-visual environments; and many more!

3.1 World ware

The ease with which electronic materials can be widely disseminated through the Web has made academics (and their institutions) turn to Web-based technologies to facilitate and enhance current teaching and learning practice. But in order to take advantage of the Internet, materials have to be available in electronic format, so we will start with the basic tools, often called *world ware* which makes it possible to progress to the use of other learning technologies.

World ware encompasses tools that are not especially designed for use in education: word processors, electronic mail, spreadsheet and presentation software, databases and so on. It is debatable whether these tools can be regarded as learning technologies, but it is indisputable that they play an important role in the use and integration of other, more specific learning technology tools. In addition, the ability to use them is now an expected outcome of secondary and tertiary education (and one of the key skills of the national curriculum) and increasingly a pre-requisite for employment. Innovative use of these tools has also been shown to have an important effect on the learning experience, and for distance learners in particular[1]. Whole projects have been dedicated to the use of some of these tools in education, like the Application of Presentation Technologies project, a project funded under the JISC Technologies Application Program (JTAP)[2].

In analysing the results of a training needs analysis the TALISMAN project concluded that:

> there is still a significant basic training requirement (54%) in the use of computers and networks …but it is impacting on the uptake of network-based learning technologies.[3]

The SCAITS project, funded by JISC has also carried out work to investigate 'how an appropriately C&IT skilled work force might be generated and maintained at a Higher Education Institution.'[4]

3.2 Web-based tools

The National Co-ordination Team for the Enhancement of Learning and Teaching (NCTeam) hosts numerous resources from projects that have investigated the use of the Web in learning and teaching[5]. One such project, TALENT, looks at organisational, educational, and technical factors that help an institution embed networked technologies[6]. An excellent introductory source on the kind of tools available is the JTAP report: *Guide to Online Teaching: Existing Tools & Projects*[7]. In the next few paragraphs we will discuss some of the main types of Web-based tools currently in use for learning and teaching.

SECTION THREE

3.2.1 Web editors and site managers

For many academics publishing material on the Web is the first step in the use of learning technologies. Making programme information and handouts available at any time to students will not in itself create a radical change in the way a programme is taught or learnt, but it provides additional flexibility of access to the materials and information that is made available. Suggestions for Web-based programme related materials and resources include:

- ☐ *Staff location and contact details;*
- ☐ *Programme outlines and timetables;*
- ☐ *Reading lists and annotated reading lists;*
- ☐ *Coursework and assessment details;*
- ☐ *Assignments, past papers and essay samples;*
- ☐ *Module notes, handouts and presentations;*
- ☐ *Links to library resources, journal indexes and full text journals;*
- ☐ *Links to related resources on the Internet.*

The days of having to learn how to write HTML pages to publish Web-based material have gone. We now have many free editing packages available on the Internet, and some of the most popular amongst academics are part of the browser itself (e.g. Netscape Composer, MS FrontPage Express). However, knowledge of HTML and an understanding of hypertext helps one to make the most of the technology[8]. There are also converters available for most of the basic tools (Word, PowerPoint etc.) that will convert documents automatically to HTML, but the user must ask him or herself how this might add any value to the document or bring benefit to the students. We need to be clear what the educational purpose of the Web material is and how the students will use the material. For example, if the purpose of the Web-based material is to increase flexible access it is likely that the students will treat them as paper resources, which means that they will probably print them out anyway. The CTI Primer, *Authoring for the Web,* provides a good introduction to design and usability issues[9]. Booklet 4 of the Book of TALENT also provides a good discussion of Web tools and Web management issues[10]. Maier and Warren also provide an explanation of the potential uses and purposes of Web-based teaching material[11].

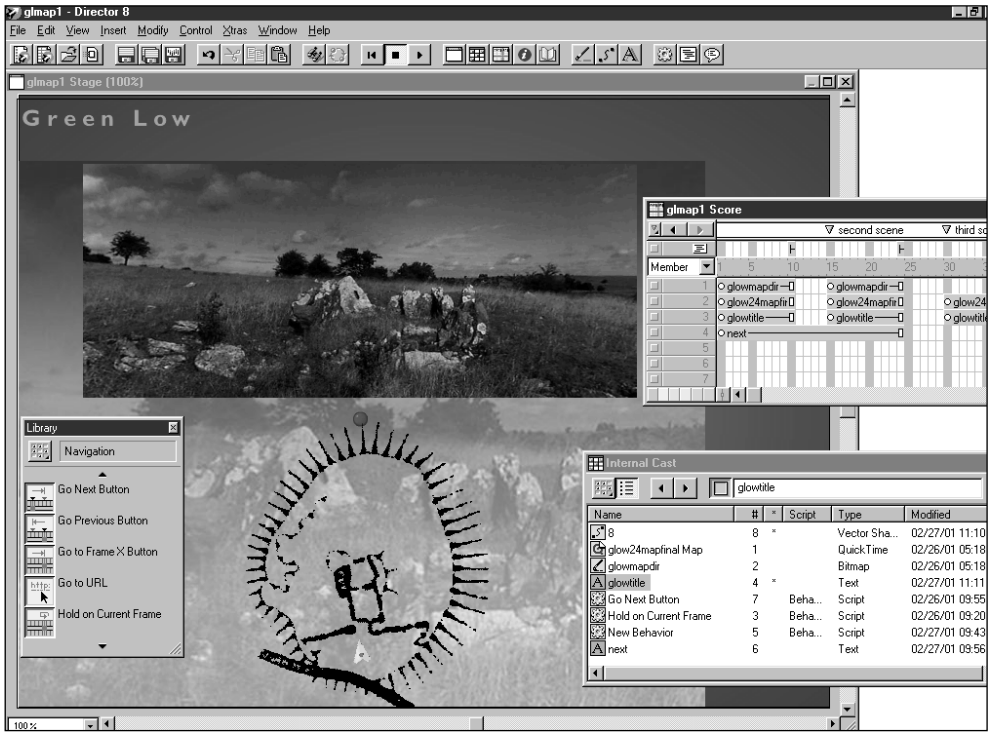
3.2.2 Communication tools

One of greatest advantages of networked technologies is that they facilitate forms of communication that are unconstrained by location or time (e.g. asynchronous communication). Current types of computer-mediated communication (CMC) tools include email, newsgroups, mailing lists and bulletin or discussion boards. Some of the advantages and disadvantages of using these tools are listed in Table 2.

Projects like TALENT[12] and FOCUS[13] contain case studies describing the use and effectiveness of CMC in teaching and learning. The Online tutoring skills project (OTiS) offers information and resources to those new to using online communication tools in teaching[14]. Gilly Salmon's book on E-moderating is also an excellent starting point[15].

Table 2: Potential advantages and disadvantages of CMC

Advantages	Disadvantages
May increase participation	It is usually text-based providing no body language or other visual cues to meaning
May increase student involvement	There is inevitably a learning curve so that discussion can be slow to start
Encourages peer tutoring and peer learning	Assessing online activity remains problematic (e.g. paraphrasing vs. original contributions)
Encourages a student-centred approach	Encouraging active participation can be difficult (e.g. phenomena of lurking)
Encourages deep understanding and deep learning	Managing large volumes of discussion can be time-consuming
Facilitates collaborative work	It may require tutors to learn new online moderation skills (or adapt their existing skills)
Makes records of discussions available	



A screenshot from a package developed using Macromedia Director *Graham McElearney*

3.2.3 Assessment tools

Computer-Assisted Assessment (CAA) has reached a very sophisticated level of development in the last few years, from the optical mark readers (OMR) of the early computerised tools to current Web-based assessment tools. Web-based assessment tools such as QuestionMark[16] and CASTLE[17] or the assessment tools within WebCT or BlackBoard (see Section 3.2.4) include electronic submission of assignments, self-test exercises and assessed tests of different types. Examples of assessed tests include multiple choice (MCQ), multiple answer, short answer (short text entry), matching objects (text, images or other multimedia objects), numeric, hot spots on graphics, etc.

CAA tools can be used to support both formative and summative assessment, and the automatic marking facilities can release a significant amount of tutor's time. Most tools also provide a date release facility where assessment exercises can be released on a particular date for a particular period of time only. The use of CAA, however, is not without difficulties, particularly for summative assessments, which can require a huge investment in technical infrastructure to allow varied sittings, disable communication sources, and limit access to other sites. It is also important to note that the initial preparation of the CAA materials can take a considerable length of time, particularly if the lecturers involved need training with the technology. An important concern amongst academics new to implementing CAA methods is plagiarism. The CAA Centre, ILT and JISC web sites all contain good information about this topic[18,19,20]. Table 3 outlines the potential advantages and disadvantages of CAA.

3.2.4 Virtual Learning Environments (VLEs)

The terms Virtual Learning Environment (VLEs) and Managed Learning Environments (MLEs) are often used interchangeably, but there is a distinct difference between the two. A VLE consists of online course material and resources, while a MLE incorporates the VLE but also includes administrative tools such as student records and management information systems (MIS).

VLEs support the teaching and learning process within a single software environment. Learning environments usually present at least three different types and levels of access: students (or guest access), tutor (or designer of the course), and administrator or server manager; each allows increased access to and manipulation of the environment. Recent developments include a further level of access for teaching assistants or markers, different from the main tutor or course

Table 3: Potential advantages and disadvantages of CAA

Advantages	Disadvantages
Can incorporate a wide range of media	No automatic marking for extended text
Can enable randomised selection from large question banks	Can encourage superficial knowledge of factual detail, although if done properly this can be avoided[11]
Can provide immediate feedback	
Enables automated marking	Can be difficult to authenticate identity of student
Allows tutor to incorporate hints into test questions	Need to think carefully about questions and questionnaire design
Can assign different learning activities based on test results	
Can be good for diagnostic purposes	
Can be fun for the students	

designer. VLEs usually present a combination of the following facilities:
Delivery of course information, materials and resources;

- ☐ *Student-tutor and student-student communication tools, including email, bulletin board and chat facilities for synchronous communication;*
- ☐ *Assessment facilities, as well as submission of coursework and assignments;*
- ☐ *Student progress tracking, individual and group profiling and statistics;*
- ☐ *Collaborative group work areas and information sharing facilities;*
- ☐ *Electronic diaries and calendars;*
- ☐ *Personalised note taking and printing.*

One of the current challenges posed by the use of learning environments is their compatibility with other institutional systems. Tertiary institutions are all struggling with the integration of traditionally independent (and usually incompatible) management information systems (MIS) such as student data, finance, personnel, administration, library, course management, and teaching and learning applications such as VLEs. Ideally, all these systems should be interconnected and able to share information as and when required, the most obvious being username and password authentication files. JISC is recommending the IMS series of specifications as a means of ensuring interoperability[21].

The JISC has dedicated a unit to investigate requirements and use of MLEs in Further and Higher Education[21] and have produced a comprehensive information pack online. Becta also offers a good introduction to Virtual and Managed Learning Environments on the Ferl Web site[22].

Although some institutions have opted to develop their own learning environment, there are now many commercial VLE/MLE providers. Some of the market leaders at the moment are WebCT[23], Blackboard[24] and various Lotus products[25]. An excellent source to aid academics and institutions evaluate and select a Learning Environment is the JTAP report, *A Framework for Pedagogical Evaluation of Virtual Learning Environments*[26]. Finally, projects such as the Instructional Management Systems (IMS) project investigate compatibility issues between different teaching and learning systems through the use of metadata and the establishment of standards[27].

3.3 Multimedia and simulations

Use of multimedia material is relatively easy, and the combination of images, sound, and even moving images can add significantly to the learning experience, as the JTAP project Virtual Seminars for Teaching Literature illustrates[28]. However, more complex interactive material, such as visual simulations, often requires more advanced programming.

Bandwidth restriction and the shortcomings of HTML when it comes to interactivity and animation, means that many educational packages are developed using multimedia software development tools such as Macromedia Director[29] or visual programming tools such as Visual Basic[30]. Many of them are now able to produce

applications, which by means of some additional software can be used over the Web. These tools are far more sophisticated and complex than their early predecessors (e.g. Guide, Toolbook and HyperCard) and developing educational software with them usually requires a partnership of technical expertise and subject knowledge rarely available in a single individual. Before embarking on such project, check first if there is any material already developed elsewhere that you could adapt and use in your teaching[11]. Find out also if your institution has any kind of support unit which can give you help and advice, and perhaps collaborate with you or even fund you in your project (see section 5).

3.4 Videoconferencing

Videoconferencing enables *real-time* audio and video interaction between individuals or groups, allowing a richer interaction between participants. The link can either be via a video- phone, digital phone lines (ISDN), or more recently over a broad bandwidth network (ATM).

Early videoconferencing and network technology have made the uptake of this medium for teaching and learning very slow, despite its growing popularity in industry and commerce for interviewing and holding meetings on remote sites. The Learning Technology Dissemination Initiative (LTDI)[31] and the JISC Technology Applications Program (JTAP)[32] both supply very useful information and reports on videoconferencing projects and case studies.

3.5 References

[1] Petre M. et al, Innovations in Large-Scale Supported Distance Teaching: Transformation for the Internet, not just Translation. *Journal of Engineering Education,* 423-432 (1998)

[2] Application of Presentation Technologies Project. See: *www.umist.ac.uk/isd/lwt/apt/*

[3] Tomes N. and Higgison C., *Executive Summary of Training Needs Analysis.* (1998) See: *www.talisman.hw.ac.uk/tna/*

[4] SCAITS see: *www.uea.ac.uk/csed/scaits/*

[5] National Co-ordination Team for the Enhancement of Learning and Teaching. see: *www.ncteam.ac.uk/*

[6] Teaching and Learning Using Network Technologies. See: *www.le.ac.uk/TALENT/*

[7] *JTAP Guide to Online Teaching: Existing Tools and Projects* See: *www.jtap.ac.uk/reports/htm/jtap-028.html*

[8] Nielson J., *Multimedia and Hypertext: The Internet and Beyond.* See: *www.useit.com/books/hyperbooks.html*

[9] CTI, *Authoring for the Web. See: www.ilt.ac.uk /public/cti/ActiveLearning/primers/webauth.pdf*

[10] TALENT, *Teaching and Learning on the Web.* (2000) See: *www.le.ac.uk/TALENT/book/c4p8.htm*

[11] Maier P. and Warren A., *Integrating Technology in Learning and Teaching.* Kogan Page (2000)

[12] TALENT. See: *www.le.ac.uk/TALENT/case/case.htm*

[13] FOCUS. See: *www.focus.ac.uk/*

[14] Online Tutoring Skills Project: See *otis.scotcit.ac.uk/*

[15] Salmon G., *E-moderating: The key to Teaching and Learning online.* Kogan Page (2000) See also: *oubs.open.ac.uk/e-moderating/*

[16] QuestionMark. See: *www.qmark.com/*

[17] CASTLE. See: *www.le.ac.uk/castle/*

[18] Computer Assisted Assessment Centre. See: *www.caacentre.ac.uk/onlres101.shtml*

[19] See: *www.ilt.ac.uk/resources/index.htm*

[20] See: *www.jisc.ac.uk/mle/plagiarism*

[21] JISC information pack on MLEs. See: *www.jisc.ac.uk/mle/*

[22] Becta introduction to VLEs and MLEs. See: *ferl.becta.org.uk/resource.cfm?lngLoc=6*

[23] WebCT. See: *www.webct.com/*

[24] Blackboard. See: www.*blackboard.com/*

[25] Lotus. See: *www.lotus.com/*

[26] JTAP, *A framework for pedagogical evaluation of Virtual Learning Environments.* See: *www.jtap.ac.uk/reports/htm/jtap-041.html*

[27] See: *www.imsproject.org.uk*

[28] JTAP Project: *Virtual Seminars for Teaching Literature.* See: *info.ox.ac.uk/jtap/*

[29] Macromedia Director. See: *www.macromedia.com/*

[30] Visual Basic. See: *msdn.microsoft.com/vbasic/*

[31] Learning Technology Dissemination Initiative. See: *www.icbl.hw.ac.uk/ltdi/*

[32] JISC Technology Applications Program. See: *www.jtap.ac.uk/*

SECTION FOUR

Key issues and developments in the learning technology field

In the previous sections of this booklet we presented an overview of the history and current status of Learning Technology in the UK, identified communities within the tertiary sector that play a role in its current practice and further development, and provided an overview of the different types of learning technology tools that are available. In this section we turn to the major issues around the use, support and development of learning technology in tertiary education.

4.1 Pedagogic issues

The current climate in tertiary education is challenging teachers and lecturers to be flexible in the way they think about learning objectives and outcomes as well as the kind of learning opportunities they wish to offer their students. The way that learning technologies have been applied and implemented has tended to reflect a social view of learning where knowledge is seen as socially constructed and distributed. Within this social learning framework collaboration and participation are important principles.

4.1.1 Collaboration

Collaboration is at the heart of social constructivist approaches to learning. By engaging in collaborative activities learners take part in the shared experience of dialogue, inquiry and mutual knowledge creation that enable shared resolutions to problems to be identified. Learning Technologies such as Virtual Learning Environments have the potential to offer learners collaborative activities through which its members create new collective knowledge. Grabinger and Dunlap outline the constructivist principles that underlie Rich Environments for Active Learning (REALs). A REAL is a learning community that includes the content taught, the pedagogical methods employed, the sequencing of learning activities and the sociology of learning. At the heart of their definition of a REAL is the notion of collaboration:

> Rich Environments for Active Learning (REALs) provide learning activities that, instead of transferring knowledge to students, engage students in a continuous collaborative process of building and reshaping understanding as a natural consequence of their experiences and authentic interactions with the world.

In an update on their thoughts Grabinger and Dunlap[1] link the notion of interaction to collaboration and argue that interaction is a critical component of constructivist learning environments, because learning occurs in a social context through collaboration, negotiation, debate, peer review and mentoring. For interaction to occur in Web-based environments, Grabinger and Dunlap argue that three critical components are required:

- ***Academic component:*** *Students have access to online materials and receive task-orientated feedback;*
- ***Collaborative component:*** *Students engage in discourse, problem-solving, and product building using Web-mediated communication and collaboration tools;*
- ***Interpersonal/social component:*** *Students receive feedback from the facilitator or peers in the form of personal encouragement and motivational assistance.*

The process by which students collaborate and therefore construct new knowledge has received a lot of attention. For example, Fowler and Mayes argue that dialogue facilitates the transition from conceptualization to re-conceptualization. Dialogue or learning conversations can facilitate clarification and confirmation at the conceptualization stage and co-operation and collaboration at the construction stage[2]. The Computer-Based Collaborative Group Work Project at Sheffield University is one example

of how the use of learning technologies to encourage collaboration is being explored within tertiary education[3].

4.1.2 Participation

Wenger also views learning as a social process, but rather than focusing on collaboration, he focuses on belonging and participation where student motivation is influenced through identification with the practices of communities[4]. According to Wenger, participating in a community is both a kind of action and a form of belonging, therefore participation is more than collaboration. Participation goes beyond direct engagement in specific activities because our engagement with tasks is social even where it does not directly involve any kind of explicit dialogue. Meaning is therefore given both to the situated activities and to the process of social identification. For Wenger there are three stages of coming to belong to a community of practice:

- *Imagination – through orientation and exploration learners identify with a community practice;*
- *Engagement – through participating in a community that learners value, they come to belong to the community;*
- *Alignment: learners connect to a new framework of convergence.*

With this framework learners need places of engagement, materials and experiences with which to build an identity and ways of making their actions matter. Some academics have attempted to operationalize this framework. For example, Putz and Arnold used Wenger's concept of communities of practice to underpin the design of their online seminars. In order to give students the experience of operating in a scientific community they used a Web-based groupware tool to run online seminars whereby students, guest experts and the facilitator engaged themselves in the presentation and discussion of scientific texts[5].

For those learning technology researchers and practitioners who emphasise the role of collaboration, the focus is on interaction and dialogue. Through collaboration the learner discovers the concepts of others and uses these concepts to create new knowledge and understanding (re-conceptualization). For those learning technology researchers and practitioners who emphasise the role of participation, the focus is on engagement (personal meaning) and belonging. Through participation the learner discovers the boundaries of the practice community.

4.1.3 The changing role of the tutor

The current approaches to teaching and learning have challenged academics and learning technologists to be flexible in the way that learning technologies are designed and applied. These challenges also require us to be flexible in the way we view the roles and responsibilities of the tutor. According to the arguments outlined in the previous section, a tutor who is implementing a collaborative approach to teaching and learning will need to contribute to the interpersonal and social component of the learning experience by providing feedback, 'personal encouragement and motivational assistance'. A tutor who implements a participatory approach will need to 'engage as both a peer and an expert'. Both roles represent quite a shift in the status and responsibilities of the tutor.

Chris Jones highlights this shift in the title of his article, 'From the sage on the stage to what exactly?' For those of us who are used to lecturing from a stage, it may be difficult to change our roles to a more personal or intimate one whereby we operate as peers or personal motivators[6]. This may be even more of a challenge depending on the institutional environment in which tutors and students operate. As Jones points out in his study of computer conferencing, institutional requirements and systems can mean that the orientations of the tutor are heavily inclined towards the demands of the assessment. This may mean that tutors see their role as judging individual or group performance or making students contribute because it is compulsory to do so. Within these circumstances the opportunities for acting as a successful and effective peer or motivator are perhaps limited.

The increase in the amount of learning resources that are being placed on the Web is also requiring tutors to make a shift from being the main deliverer of information to that of being a resource investigator, problem setter and general task facilitator.

SECTION FOUR

4.2 Staff and educational development issues

The Dearing Report expressed in recommendation nine:

> that all institutions should, over the medium term, review the changing role of staff as a result of Communications and Information Technology, and ensure that staff and students receive appropriate training and support to enable them to realise its full potential.[7]

More recently, a HEFCE document entitled *Rewarding and developing staff in higher education*[8], recognises the need to:

> meet specific staff development and training objectives that not only equip staff to meet their current needs but also prepare them for future changes, such as using new technologies for learning and teaching.

But how this is to be achieved is less clear. A recent study of the roles and functions of learning technology staff[9] defines the role of the Learning Technology educational developer as involving the following typical tasks:

- ☐ *Supporting staff in adapting their practice to incorporate learning technologies;*
- ☐ *Increasing awareness of best practice;*
- ☐ *Enabling exchange of ideas and experience in technology-based learning and teaching;*
- ☐ *Evaluating the outcomes of integrating learning technologies into the curriculum;*
- ☐ *Establishing procedures and protocols for evaluating the impact of learning technologies.*

The same study also points out that educational development in the (appropriate) use of learning technologies was 'felt to be clearly distinct from the provision of technical skills'.

In practice, most institutions provide a regular IT skills training programme, generally delivered by Computing Services, covering the basic applications: word processing, email, spreadsheets, Internet searching, presentation tools, use of databases and perhaps some HTML. But the way tertiary institutions approach staff development in the field of learning technology varies widely. It is often delivered through the combined effort of various central services: Library and Learning Resources for information retrieval and management, Computing Services for technical support and development and Educational or Learning and Teaching Services for educational and curriculum development. A few institutions have combined the three areas of expertise into a dedicated Learning Technology Unit or service[10].

4.2.1 Staff and educational development initiatives

Up until recently institutions offered opportunities for staff to develop their experience and understanding of the application of learning technologies in an unstructured manner. But increasingly institutions are looking at structuring these activities into accredited programmes of study that staff can take as part of their Continuous Professional Development (CPD) requirements. The EFFECTS project (Effective Frameworks for Embedding C&IT with Targeted Support) has encouraged the development of accredited programmes of staff development in learning technologies for tertiary education[11]. The project has developed a framework based on seven generic learning outcomes:

1. Conduct a review of C&IT in learning and teaching and show an understanding of the underlying educational processes;
2. Analyse opportunities and constraints in using C&IT and selected C&IT appropriate to the learning situation;
3. Design and plan a strategy for integrating appropriate C&IT;
4. Implement a developed strategy;
5. Evaluate impact of the interventions;
6. Disseminate the findings of the evaluation;
7. Review, plan and undertake appropriate actions related to own CPD.

This framework can be flexibly integrated into institutional programmes, according to the institution's own structures and culture. The EFFECTS framework has now been recognised under the Staff and Educational Development Association's (SEDA) Professional Development in Higher Education Scheme as an Award in Embedding Learning Technologies[1]. Other accreditation efforts include the accreditation of basic IT skills through initiatives such as the European Computer Driving Licence (ECDL)[12].

Table 4: Some sources of information and materials for staff and educational developers

ALT	Association for Learning Technology	www.alt.ac.uk
Becta	British Educational Communications and Technology Agency	www.becta.org.uk/index.cfm
CSALT	Centre for Studies in Advanced Learning Technology	csalt.lancs.ac.uk/csalt/
FOCUS	Framework for Optimising C&IT Uptake and Support	www.focus.ac.uk/
ILT	Institute for Learning and Teaching	www.ilt.ac.uk
JTAP	JISC Technology Applications Program	www.jtap.ac.uk/reports/
LTDI	Learning Technology Dissemination Initiative	www.icbl.hw.ac.uk/ltdi/
NILTA	National Information and Learning Technology Association	www.nilta.org.uk/
NLN	National Learning Network	www.nln.ac.uk
NGfL	National Grid for Learning	www.ngfl.ac.uk/
NCTeam	National Coordination Team for FDTL and TLTP projects	www.ncteam.ac.uk/
TALENT	Teaching and Learning using Network Technologies	www.le.ac.uk/TALENT

ILT (Institute for Learning and Teaching) accreditation is also being integrated into the staff development plans of many tertiary institutions[13].

Resources, such as case studies, introductory guides and other materials, are freely available online and can be used to develop understanding and knowledge of the field (see Table 4).

4.3 Library and information issues

The demand for online resources has caused libraries to embark upon major changes that will significantly affect tertiary education. Libraries are being required to develop partnerships as well as re-think the nature of their stock and the roles of their staff. In addition there are changes to the community of users that libraries are serving. Increasingly, users are remote as the number of distance learning students rises. User expectations are also increasing in terms of how much information can be delivered to the desktop at any time and place, and the extent to which services can be personalized. Libraries need to tackle these issues in order to remain competitive.

4.3.1 A closer partnership between national, regional and academic libraries

In December 2000 Lynne Brindley, Chief Executive of the British Library, addressed the issue of national and academic libraries working together. Her particular focus was on thinking about closer collaboration and partnership on collection development. This led her to discuss collaboration on access (metadata). She states:

> Partnership in collection development can only be successful if we can be creative about access. An obvious pre-requisite is an effective system to help users find out what items exist, where they are, and whether they can borrow or consult them.[14]

Brindley goes on to cite one example of a partnership that is attempting to move in this direction. She describes a project called *zetoc,* which is a partnership between JISC, Mimas and the British Library, that provides free access to the whole of the UK academic community to the journal content database of the British Library. Brindley claims that this and other projects that seek to develop more sophisticated searching methods represent a major commitment by the British Library to contribute and be part of the DNER. There are also regional co-operatives between libraries to provide services to users. One example is the Milton Keynes Learning Cities Libraries Network set up to extend admission to all major libraries in the areas to anyone who lives, works or studies in Milton Keynes.

Projects such as ANGEL (Authenticated Networked Guided Learning Environment) and INSPIRAL (Investigating Portals for Information Resources and Learning) illustrate the growing partnership between libraries and academia.[15,16]

4.3.2 The changing nature of library stock

Libraries have traditionally been organised around the acquisition and management of physical items. The increased publication of electronic publications such as e-books, e-journals, e-newspapers and subject specific databases means that the nature of library stocks are changing and senior managers are increasingly required to

SECTION FOUR

address how libraries will manage their electronic content and services.

Sarah Orme discusses the benefits and disadvantages of e-books for libraries and highlights a number of management issues[17]. According to Orme, some of the benefits include the potential to make long-term considerable savings, provide distant users with instant access to their stock and expand its collection with little impact on shelving space. While some of the possible disadvantages include:

- ☐ *Integration into services will be time-consuming and resource-intensive;*
- ☐ *Fragility of agreed* one loan at any one time *model;*
- ☐ *Potential for increased automation and resulting staff cuts;*
- ☐ *Staff and library users may be resistant to change.*

Although the long-term cost savings will have to be balanced against the short-term costs of integrating e-books into existing library systems, staff cuts are perhaps not inevitable as staff may be re-deployed from issuing to integrating e-books into existing library databases.

How libraries choose to manage their digitised resources will largely depend on the chosen storage media. Neil Beagrie outlines the two main storage options: magnetic media or optical storage media[18]. Magnetic media such as Digital Linear Tape is frequently recommended for archival storage because of its high storage capacity and good data transfer speeds, but faults in manufacture can occur. Optical storage media such as CD-ROM, CD-R and DVD are an increasingly popular method of storage but smaller storage capacity and slower data transfer rates can be issues to consider. The nature of the storage media chosen by libraries will also influence how they choose to deliver the digital resources to users. Beagrie considers that Web delivery is likely to be a key consideration for many digitisation projects because it offers the potential for integration and cross searching of digital resources.

Perhaps the greatest challenge to senior managers in libraries is how to sustain access to and preserve the digital resources that are being created. Traditionally, libraries are well used to preserving their physical stock in order to enable continuing access to the information that the books contain.

Sustaining access and preservation of digital resources is concerned with preserving information regardless of the storage media used. The Cedars Project is a Higher Education initiative funded by the Joint Information Systems Committee through the eLib programme[19]. The Cedars Project gives the following definition of digital preservation:

> Digital preservation is a process by which digital data is preserved in digital form in order to ensure the usability, durability and intellectual integrity of the information contained therein. A more precise definition is: the storage, maintenance, and accessibility of a digital object over the long term, usually as a consequence of applying one or more digital preservation strategies. These strategies may include technology preservation, technology emulation or data migration.

In a keynote speech given at the Preservation 2000 conference Lynne Brindley argues for the establishment of a UK Digital Preservation Coalition that comprises a high level strategic group of stakeholders and does not see digital preservation as a separate activity, distinct from general preservation activities[20].

4.3.3 The changing nature of the librarian role

With the increasing role of the Internet and networked services within libraries and the convergence of library and computing services the traditional image of the academic librarian is perhaps shifting from that of a scholarly librarian towards one of professional with high levels of IT skills. This shift can potentially to cause tension as staff struggle with the cultural changes that will emerge as a result. But there is also great potential for librarians to provide vital support. For example, Mulvaney describes the TAPin (Training and Awareness Programme in Networks) project at the University of Birmingham where librarians became involved in 'enhancing the expertise of academic staff in the appropriate exploitation of networked information resources'. In describing the experience of the project, Mulvaney concluded that supporting networked learning could be seen as extending the librarian's traditional role of offering training and support on printed information resources[21]. In addition, librarians may also become teaching staff

– a fact that is reflected in the option for university librarians to achieve ILT accreditation.

4.4 Research issues

In an article exploring the researching of IT in Further Education, Howard argued that the current research agenda needs to integrate an exploration of what learning technologies 'work' with an exploration of the underlying issues behind why certain learning technologies work[22]. In discussing how to exploit new technologies she makes a distinction between the 'technology' side of research and the 'people' side of research:

> The technology side of the work will investigate the features offered by existing and forecast mobile devices and communications networks, and their feasibility for contributing to lifelong learning. On the "people side", the work will look at motivation, preferences and behaviour of young adults who currently use mobile phones and hand-held electronic games.

Current research in tertiary education would seem to reflect this distinction. An example of the 'technology' side of research would be the LTRI ARTyFACTS project, which has extensively researched two fine art objects, one pre-twentieth century and one from the last twenty years[23]. The research material has been used to develop a prototype interactive Web-based learning environment. The project has involved testing different ways of re-exhibiting these art objects virtually. This will ultimately help the remote scholar in their studies, the disabled person who cannot access the work itself, or the art historian/lover who cannot travel to see the work.

An example of the 'people side' of research would be the CSALT Networked Learning in Higher Education project[24]. This is designed to create a coherent picture of students' experiences of networked learning in UK higher education, and to provide an analysis of relationships between students' approaches to networked learning, salient features of networked learning environments, and learning outcomes. In order to 'get inside' students' learning experiences phenomenographic methods were used involving interviewing of students, observation of their work and debriefing sessions.

4.4.1 Research methodologies

Traditionally, evidence from controlled scientific experiments has been used to try and prove the effectiveness of learning technologies. However, there is evidence to suggest that in a bid to gain scientific acceptability some learning technology research has used scientific methods inappropriately. For example Mitchell argues that inaccurate design and inappropriate analysis means that some research is 'pseudo-scientific'[25]. There is also recognition that in the field of learning technology 'scientific experiments' are problematic. For example, Gunn argues that a common problem with such approaches is that they cannot identify the individual and contextual factors that influence learning[26]. In a commentary on research conducted in the 1980s and 1990s she notes:

> It was clear that prior knowledge, approaches to learning, provision of appropriate scaffolding, complementary combinations of resources and various contextual factors all influenced the quality of learning outcomes. It was concluded that evaluations must be designed to account for these factors, rather than to balance or disregard them as was previously the norm.

Research in the twenty-first century reflects a desire to combine the 'people' and the 'technology' side of research and to take into account the individual and contextual factors that influence the effectiveness of learning technologies. In doing so, it embraces the research traditions and skills of a number of different disciplines. Common research methods include action research[27], phenomenography[28], case studies[29], surveys[30] and experimental designs[31].

4.4.2 Different options for disseminating learning technology research

There are a number of different ways that researchers in the field of learning technology choose to disseminate their research findings. The options chosen will depend on the target audience and the desired impact.

Unsurprisingly, the Web is a common forum for dissemination. Research Centres often publish brief descriptions of the projects they are currently working on along with an overview of the findings of the project. There are also an increasing number

of online newsletters and electronic journals, which offer a forum for presenting and summarising research findings. Individual researchers may also choose to publish their work (e.g. conference papers) on their personal home pages. Online dissemination is an extremely attractive option because it can increase the accessibility of research material and thus increase the potential impact of the research. This method of dissemination is problematic however. The fact that a lot of the material published on the Web has not been through an observable review process means that the quality of the work reported can be perceived to be of a lower standard. Peer reviewed electronic journals such as Educational Technology & Society are moving some way towards altering this perception, but for some, the trustworthiness and acceptability of research is still linked to paper-based publications.

Paper-based dissemination methods such as newsletters and journals are still a common and useful means of dissemination. Newsletters such as ALT-N present brief summaries or overviews of research projects while journals such as ALT-J present a more in-depth review and critique of research projects and their findings.

Finally, there are a large number of conferences in the field of learning technology that present researchers with useful opportunities to disseminate and publicise their work. Some conferences are subject specific such as the Computer Assisted Assessment Conference[32], the Symposium on Human Computer Interaction[33] or the International Conference of Asynchronous Learning Networks[34]. Other conferences such as ALT-C[35] and FERL are more generic in nature[36].

In the Lecture Theatre at the ALT VLE Conference 2001
Ian M Spooner

4.4.3 Getting published

In an ALT workshop in December 2000 entitled "What's it all about, LT?" a paper by Professor Gabriel Jacobs, Executive Editor of ALT-J, was presented which contained some practical tips on getting work published in a journal, which included:

- ☐ *ensure that relevant searches in the literature have been carried out before writing the paper;*
- ☐ *position the paper carefully within current research activity;*
- ☐ *analyse and debate, do not simply describe;*
- ☐ *aim at the right journal and then conform to house preferences and styles;*
- ☐ *spend time on constructing a good abstract, as this is the first thing a referee reads;*
- ☐ *take great care over the introduction to the paper and construct a proper conclusion which should be more than a summary of what you have said;*
- ☐ *take great care over the structure of the paper, ensuring that each point leads naturally to the next;*
- ☐ *write in plain English and avoid using jargon if possible;*
- ☐ *learn the art of paragraphing;*
- ☐ *make the best use of illustrations and figures (which may mean leaving them out);*
- ☐ *learn the mechanics of acknowledging sources, which can be very revealing about an author's knowledge of the subject.*

A lot of the points in this list refer to the mechanics of good writing style, but it is perhaps worth dwelling on the fourth point that Jacobs lists, which suggests that a certain amount of strategy is involved in publishing. You may be able to increase your chances of getting your work published if you submit your article to a journal that has a focus and speciality that best matches your work. In addition, editors and referees have to take into account the readership of the journal. For example, a number of journals in the learning technology field have a wide readership base that is drawn from higher, further, primary, secondary and special education. If you submit an article that focuses on just one of those areas, the editor may look (particularly in the introduction and discussion) to see if you have any results or ideas that could inform the practice of

Table 5: Roles and activities within the field of learning technology

Journal Details	Brief Description
Association for Learning Technology Journal www.alt.ac.uk	Published three times yearly and contains articles, review articles, reviews and short notes
British Journal of Educational Technology www.blackwellpublishers.co.uk/journals/BJET	Published five times a year. Concentrates on the theory, applications and development of educational technology
Computers and Education www.elsevier.com/inca/publications/store/3/4/7/	Published eight times a year. Has a technically based, interdisciplinary focus.
Innovations in Education and Teaching International www.journals.routledge.com/	Published four times a year. Targets teaching staff, staff developers and managers.
Journal of Computer Assisted Learning www.blacksci.co.uk/	Published four times a year, Topic areas include: collaborative learning, distance and networked learning.
Journal of Computer Mediated Communication www.ascusc.org/jcmc/	An online journal publication. Emphasis is placed on joining theoretical analysis with empirical investigation
Educational Technology & Society ifets.ieee.org/periodical/	An online quarterly. Discusses the development and implementation of educational systems.
Journal of Education Multimedia and Hypermedia www.aace.org/pubs/jemh/default.htm	Multi-disciplinary forum to present and discuss research and development of multimedia and hypermedia.

those in who work in areas other than your own. It may be wise to signal these points clearly in your article, rather than make editors and referees search for them. In this instance it would also be important not to include language or jargon that is too field specific. Finally, a large number of journals have an international readership, so it may be important when writing for these journals not to assume too much knowledge about the UK education system and to attempt to consider the implications of your findings for practitioners outside of the UK. Not everyone will automatically know what HEFCE, JISC and Dearing are all about!

In his paper Gabriel Jacobs presented a list of about a hundred peer-reviewed journals. Some of these journals cover all disciplines while others are more specialised. Here we will present a small sample of journals that cover all disciplines to give you a feel for the scope of publications in the general field of learning technology (See Table 5).

4.5 References

[1] Grabinger R.S. and Dunlap J.C., Rich environments for active learning: a definition. In Squires D., Conole G. and Jacobs G. (eds), *The Changing Face of Learning Technology.* University of Wales Press, Cardiff. (2000)

[2] Fowler C.J.H. and Mayes J.T., Learning relationships from theory to design. In Squires D, Conole G and Jacobs G (eds), *The Changing Face of Learning Technology.* University of Wales Press, Cardiff. (2000)

[3] Computer Based Collaborative Group Work Project. See: *collaborate.shef.ac.uk/*

[4] Wenger, *Communities of practice: Learning, Meaning and Identity.* Cambridge University Press (1998)

[5] Putz P. and Arnold P., Engagement via dialogue- "communities of practice" as a design framework for an online seminar. *Paper presented at ALT-C 2000*

[6] Jones C., From the sage on the stage to what exactly? Description and place of the moderator

SECTION FOUR

in co-operative and collaborative learning. *ALT-J,* **7(2),** 27-36 (1999)
[7] Dearing R., *Higher Education in the Learning Society: Report of the National Committee of Inquiry into Higher Education.* DfEE (1997)
[8] HEFCE, Rewarding and Developing Staff in Higher Education. (2001) See: *www.hefce.ac.uk /pubs/hefce/2001/01_16.htm*
[9] The National Audit of Learning Technologies Staff. See: *sh.plym.ac.uk/eds/effects/jcalt-project/*
[10] Armitage S., Rothery J. and Jenkins M., *Report of a UCISA survey of support provided in Universities and Colleges for the use of technology in teaching and learning.* Universities and Colleges Information Systems Association Teaching, Learning and Information Group (1999)
[11] EFFECTS, See: *sh.plym.ac.uk/eds/effects/*
[12] European Computer Driving Licence, see: *www.ecdl.co.uk/*
[13] Institute for Learning and Teaching. See *www.ilt.ac.uk*
[14] Brindley L., National Libraries and Academic Libraries Working Together. (2000) See: *www.bl.uk/concord/otherpubs_speeches 02.html*
[15] ANGEL. See: *www.angel.ac.uk*
[16] INSPIRAL. See i*nspiral.cdlr.strath.ac.uk/*
[17] Orme S., *An E-book Primer.* An issue paper from the Networked Services Policy Taskgroup. See: *www.earl.org.uk/policy/issuepapers/ebook.htm*
[18] Beagrie N., *Going Digital: issues in digitisation for public libraries.* An issue paper from the Networked Services Policy Taskgroup. See: *www.earl.org.uk/policy/issuepapers/digitisation.htm*
[19] CEDARS, see: *www.curl.ac.uk/cedarsinfo.shtml*
[20] Brindley L., Preservation 2000: Keynote Speech (2000) See: *www.bl.uk/concord/otherpubs_speeches04.html*
[21] Mulvaney T. K., The TAPin Electronic Libraries Project and the experience at the University of Birmingham. *Paper presented at 2nd International Symposium on Networked Learner Support (1997)* See: *www.netskills.ac.uk/reports/conferences/netlinks97/mulvaney.htm*
[22] Howard U., Learning with IT: towards a research agenda-questions and issues. *ALT-J,* **8(3),** 31-40 (2000)
[23] LTRI ArtyFACTS Project, see: *www.unl.ac.uk/ltri/*
[24] CSALT. See: *csalt.lancs.ac.uk/csalt/*
[25] Mitchell, D.P, The impact of educational technology: a radical reappraisal of research methods. In Squires D., Conole G. and Jacobs G. (eds), *The Changing Face of Learning Technology.* University of Wales Press, Cardiff. (2000)
[26] Gunn C., CAL evaluation: future directions. In Squires D., Conole G. and Jacobs G. (eds), *The Changing Face of Learning Technology.* University of Wales Press, Cardiff. (2000)
[27] Henderson and Doughty, Applying an action research approach to the evolution of evaluation methods. *Paper presented at ALT-C 2000.*
[28] Jones C., Asensio M. and Goodyear P., Networked learning in higher education: practitioners' perspectives. *ALT-J,* **8(2),** 18-28 (2000)
[29] Brown S., Hardaker C.H.M. and Higget N.P., Designs on the Web: a case study of online learning for design students. *ALT-J,* **8(1),** 30-40 (2000)
[30] Brooksbank D.J., Clark A., Hamilton R. and Pickernell D.G., A critical appraisal of WinEcon and its use in a first year undergraduate Economics programme. *ALT-J,* **6(3),** 47-53 (1998)
[31] Hiltz et al, Measuring the importance of collaborative learning for the effectiveness of ALN: A Multi-Measure, Multi-Method Approach. (2000) See: *www.aln.org/journal/Vol14_issue2/le/hiltz/le-hiltz.htm*
[32] Computer Assisted Assessment Conference. See: *www.lboro.ac.uk/service/fli/flicaa/conf2001/index.html*
[33] Symposium on Human Computer Interaction. See: *www.acm.org/chapters/sigchi_nz/symposium2001.html*
[34] International Conference of Asynchronous Learning Networks. See: *md2000.vuse.vanderbilt.edu/alnconf2001.*
[35] ALT-C. See: *www.alt.ac.uk*
[36] Ferl. See: *ferl.becta.org.uk*

Implementing learning technologies

SECTION FIVE

In the previous four sections we have presented an overview of the field. You are now more familiar with the history of Learning Technology in the UK and some national support initiatives currently available; the kind of people involved and their roles and interests in the technology, and the sort of tools and resources available at the moment. It is time to get your hands dirty and try out some of this for yourself. How do you go about it? In this section, we intend to take you through five basic steps that will help you implement a learning technology project: defining, planning, designing and implementing, evaluating and disseminating the results of your project. We will also address two important factors that can influence successful implementation of learning technologies by individuals and by institutions: widening access and participation, and changing institutional culture.

5.1 Defining your project

First of all you need to think very carefully what it is you want to do, why you wish to use learning technology, and how you plan to achieve your goals. This may involve identifying an aspect or aspects of the course you want to improve (what need you want to cater for) and trying to define who will benefit from it and how. Projects can vary in scope, ambition or size but examples of what could constitute a project include:

- ☐ *making a course or part of a course more flexibly accessible by placing course information, support materials and other resources online;*
- ☐ *enhancing communication, student participation or feedback by using a bulletin board;*
- ☐ *creating a self-learning tutorial for a particularly complex part of a course or concept;*
- ☐ *integrating a CBT package as part of a course to reinforce student learning or make learning more fun;*
- ☐ *providing self-testing materials or convert some paper-based tests to online assessed tests.*

It is important that you identify the pedagogical underpinning of your project from the start and it is this that drives your project and the use of technology, and not the other way around. Linked to this will be defining your learning goals and outcomes. You will need to return to these when you come to evaluate the effectiveness of your activity. It is also important to involve both colleagues and support services in your institution by discussing your ideas with them from the beginning. It can save you a lot of time and wasted effort![1,2,3]. When you have defined your project clearly in terms of educational purpose and the tools you intend to use, you are ready to start planning your project.

5.2 Planning your project

You have now defined your project in terms of educational goals and particular tools; you know what you want to do and why, so the next step would be to start defining in detail what the project entails. You may wish to divide your project planning in two phases. A first phase to analyse the feasibility of your project in terms of pedagogy, technology and financial resources; and a second phase to design your project and complete your project plan with time scales and deadlines (see next item on design and implementation). In the first phase you will need to carry out a detailed analysis of your learners' needs and requirements and how the project will answer to those, a review of existing resources and support and likely costs of development and maintenance.

You may find it helpful to work through a checklist during this first phase of the process. The following is an example of what such list may contain, but there are many other examples in the literature[4].

SECTION FIVE

- ☐ ***Resources:*** *What have you already available within your own institution or through your own professional networks?*
- ☐ ***Infrastructure:*** *What is the availability of hardware and software, bandwidth issues and technical support?*
- ☐ ***Stakeholders:*** *Who are they, who needs to (or has to) be involved in the project? How are they involved and what are their needs?*
- ☐ ***Staff:*** *What training and support will teaching staff require, do they all have the skills needed?*
- ☐ ***Access:*** *How much access to computers and/or other equipment will be required?*
- ☐ ***Students:*** *What support and guidance (technical and educational) will they need?*
- ☐ ***Institutions:*** *Does the project require institutional approval? Are there any other administrative requirements?*
- ☐ ***Time:*** *How long will be required for development and maintenance?*
- ☐ ***Costs:*** *What will be the cost of licences, development and maintenance?*

In considering cost issues it may be helpful to find out if you can obtain funding for your project either internally within your institution or from an external funding body. Internal initiatives may be part of Staff Development, Teaching Innovation or Teaching Quality Enhancement Funds and may be available for projects that link to the strategic plans of the institution. Contact your Educational Development or Learning Technology units for information on such initiatives. External funding may be available from a variety of sources including the different research councils and educational funding bodies of England, Wales, Scotland and Northern Ireland, as well as many private sector initiatives such as the BT awards. After completing the feasibility study, you should have enough information to start designing your project specification[4].

5.3 Design and implementation

In the design stage, subject expertise is combined with curriculum design and technological skills to create and design course materials, learning activities, assessment methods etc. This process is similar to that of instructional design in that it involves analysis of learning needs and goals and the development of a delivery system to meet those needs[5].

Depending on your project, you will need to decide how to organise or present materials or learning activities; how to interact with students or facilitate group interaction and how to structure and assess student tasks. The Centre for Studies in Advanced Learning Technology (CSALT) have produced a particularly helpful set of guidelines entitled *Effective Networked Learning in Higher Education*[4]. In this they advise those responsible for designing and implementing a learning technology project to start with the learning context in which the learning technology innovation will take place and define the educational model (is it problem-based, reflection and discussion or, resource-based learning). The design will then need to support that particular educational approach, defining, at the same time, the role of the tutor in the learning process, which is very likely to take a facilitating function. You will also need to take into account issues of usability and accessibility of your materials. Initiatives such as DisinHE[6] and Bobby[7], for example, provide useful guidance. (See Section 5.6 for more details).

An important part of this phase will concern deciding how you are going to manage the development of the project, test it with real users (preferably students), support participating students and evaluate the results. By the end of this phase you should be able to draw a detailed plan for your project including estimated costs and time planning for development, implementation, testing and evaluation. Remember that the project must be sustainable, that is, on-going maintenance will need to be taken into account. It is advisable to start with a simple, scalable project that you can support and maintain, than aiming too high and not being able to see the project through or maintain it after completion.

5.4 Evaluation

Evaluation is an important part of the project if you want to find out how effective or successful the project has been. If you have obtained funding for your project, whether from an internal or external source or initiative, it is very likely that the funding bodies will want to know if it has been successful and how effective in terms of enhancing the learning process.

You need to decide what it is you need to evaluate and for *whom* you are evaluating. CSALT[4] proposes the following dichotomies inevaluation:

- ☐ ***Intrinsic/pay off:*** *depending on whether the evaluation looks at the quality of the innovation or at its benefits in terms of improved learning or reduced costs;*
- ☐ ***Quantitative/Qualitative:*** *depending on the nature of data gathered; numerical or qualitative (opinions, perceptions);*
- ☐ ***Formative/Summative:*** *depending on whether evaluation takes place during the project's development, thus informing and contributing to it, or whether evaluation is carried out at the end of the project, after implementation, to assess it's success or effectiveness;*
- ☐ ***Internal/External:*** *according to the relationship of the evaluator with the project team;*
- ☐ ***Diagnostic/Justificatory:*** *depending on whether its function is to solve a problem or to support further development or evidence the project's success or effectiveness.*

Once you define the object, purpose and audience of your evaluation, you need to select an appropriate evaluation method and strategy that will be integrated in your project plan. Just as there is no single right way to teach or assess, there is no *correct way* to carry out an evaluation, Instead there is a wide array of approaches that can be adopted, from questionnaires to focus groups through to controlled experimental testing. Although most people will have had experience of one or two of these methods, far fewer are confident enough to use a range of them. There are currently many resources and publications that provide guidance and practical advice in planning and implementing an evaluation strategy for a learning technology project including the *LTDI Evaluation Cookbook,*[8], *the ILRT Online Evaluation Toolkit*[9] and *An Evaluation of Information Technology Projects for University Learning* written by the Australian Committee for University Teaching and Staff Development[10].

5.5 Disseminating your results

Whether your project is successful or not, it may contain valuable lessons for other colleagues, and thus it is important that you disseminate the

Using meeting support software at Henley Management College, ALT ACE workshop, July 1999 *Rhonda Riachi*

SECTION FIVE

findings, outcomes and lessons learnt through your project. For example, Seale and Cann[11] report on their efforts to use communication technologies to promote reflective learning. Their efforts were not entirely successful and, in reflecting on why this might be, the authors highlight lessons that can be learned for future projects. Your experiences may also contribute to the growing field of learning technology research, and you could use dissemination of a project's results to get further funding for other projects or recognition for your work. Section 4.4.2 gives more details on how you can go about disseminating your results. Current initiatives such as the National Teaching Fellowship[12] also provide a nationwide forum for the dissemination of teaching and learning innovation practice, and some institutions are offering a similar scheme internally.

5.6 Widening participation and increasing accessibility

Whilst developments in the design and application of learning technologies might be encouraging flexible approaches to teaching and learning, students still need to be able to access the curriculum and the resources. A strong message from the Dearing Report was that access to education must be widened and provision made for lifelong learning[13]. Widening participation in tertiary education is broadly concerned with increasing the number of students entering degree courses who might previously have been disadvantaged because of their socio-economic status, gender, ability level, ethnic background, geographic location or special educational needs.

In terms of widening participation, learning technology has the potential to allow those students with *non-standard* academic backgrounds access to learning resources without necessarily stepping foot on *academic soil*. With the Internet, email and other networked resources, learners can access learning material at any time they wish. This means they can juggle family, work and economics commitments and still benefit from a quality education. Widening access and promoting lifelong learning can produce some interesting partnerships and collaborations. For example, Hatzipanagos and Lockwood describe 'The Unicafe' project developed by the University of Surrey. Open access courses were delivered via the Web within a variety of locations, including non-traditional educational settings such as a major supermarket, two local libraries, and company premises as well as direct into people's homes[14]. Whilst such courses offer a large number of advantages, they are not without their challenges. Students who study *off-campus* using networked technologies can feel isolated and often require skilled tutorial support to enable them to make effective use of the online material they are being given access to.

In terms of increasing accessibility, access technologies can support students learning experiences in a number of different ways. For example, Caroline Davies describes the efforts made in the University of North London to install software for blind and visually impaired students on networked machines. These are often attached to specialist machines in units managed by student support services[15]. Similarly, Everett describes how East Surrey College have set up an Adaptive Technology Learning Centre for students who have a specific need for specialised technology such as software that pairs words to symbols for those students who have general difficulties with reading. Everett notes that the Adaptive Learning Centre has made a marked improvement in the students' use of computers[16]. The Southern Higher Education Consortium has produced a discussion paper on technology and learning resources for disabled students[17]. In this paper they outline the different kinds of access and support technologies available. These include: scanners/OCR systems, synthetic speech, speech recognition and special input devices and utilities. Although access technologies and other supportive application have the potential to increase accessibility for students with disabilities, other developments within tertiary education are threatening to jeopardise this access. A large number of university Web sites are not available in an accessible format and those using specialist scanning and input devices cannot access most of the popular VLEs. Part III of the 1999 Disability Discrimination Act means that public information on university Web sites regarding courses and facilities must be in an accessible format. It is less clear whether universities will be required by law to make the VLEs that they are using accessible[18].

5.7 Changing institutional culture

Learning technology can help to address some of the current challenges faced by tertiary education: shifting to student-centred learning, supporting flexible and lifelong learning and widening access. But for tertiary education institutions to be able to adapt and function in this new educational climate a profound change in their organisational culture is required. Learning Technology practitioners and support staff have been at the forefront of such cultural change by taking the lead in innovative and development projects from the ground. Staff involved in learning technology projects have played a key role in supporting and disseminating institutional initiatives where top-down policies and strategies meet bottom-up innovative practices. Experience obtained from institutional projects show that vision, leadership and support from senior management is vital for the development and integration of learning technologies into an institution[19]. Oliver and Kemp[20] and Carter and Mistry[21] describe JISC funded projects which are trialling an American methodology called Roundtables, which facilitates the focussing on the varying perspectives and issues relating to Learning Technologies within the institution.

5.8 References

[1] LTDI, Implementing IT. See: *www.icbl.hw.ac.uk/ltdi-pub.htm*

[2] Maier P. and Warren A., *Integrating Technology in Learning and Teaching, a practical guide for educators.* Kogan Page (2000). This book is accompanied by a Web-based active guide available from: *www.clt.ac.uk/activeguide*

[3] Warren, A. et al, *Technology in Teaching and Learning, An Introductory Guide*. Kogan Page (1997).

[4] *Effective Networked Learning in Higher Education: notes and guidelines.* CSALT (2000) See: *csalt.lancs.ac.uk/jisc/advice.htm*

[5] Gagne, R.M. Briggs, L.J. and Wager, W.W. (1992) *Principles of instructional design.* Harcourt Brace College. Fort Worth.

[6] DISINHE, see: *www.disinhe.ac.uk/*

[7] Bobby, see: *www.cast.org/bobby*

[8] LTDI Evaluation Cookbook, see: *www.icbl.hw.ac.uk/ltdi/*

[9] Evaluation Toolkit, see: *www.ilrt.bris.ac.uk/projects/*

[10] Alexander, S. *An evaluation of Information Technology Projects for University Learning,* Committee for University Teaching and Staff Development (CUTSD), National Capital Printing. Canberra (1998).

[11] Seale, J.K. and Cann, A.J., Reflection online or offline: the role of learning technologies in encouraging students to reflect. *Computers and Education,* 34, 309-320 (2000)

[12] National Teaching Fellowship, see: *www.ilt.ac.uk/archives/ntfs_approved.htm*

[13] Dearing, R. (1997) *Higher Education in the Learning Society: Report of the National Committee of Inquiry into Higher Education.* Sheffield. DfEE

[14] Hatzipanagos, S. and Lockwood, A. The Unicafe Project: An Approach to Lifelong Learning in Surrey. *ALT-N,* **28,** 5 (2000)

[15] Davies, C., Making learning technologies accessible to disabled students. *ALT-N,* **28,** 3 (2000)

[16] Everett, K., Adaptive Technology for all at East Surrey College: Case Study. (2001) See: *ferl.becta.org.uk/frames/cstudies/*

[17] Southern Higher & Further Education Collaboration, see: *www.soton.ac.uk/~shec/shfechome.htm*

[18] Webb, I., The Disability and Information System in Higher Education Centre. *ALT-N,* **28,** 3 (2000)

[19] See: JISC-JCALT draft briefing paper for senior managers at *www.ilt.ac.uk/resources/ index.htm*

[20] Oliver, O. and Kemp, C., Roundtables: Realising the myth? *ALT-N,* **34,** 4 (2001)

[21] Carter B. and Mistry V., Changing Technological Management, *ALT-N,* **34,** 5 (2001)

SECTION SIX

Further resources

6.1 Web sites of cited organisations and projects

ALT	Association for Learning Technology	www.alt.ac.uk
ASCILITE	Australian Society for Computers in Learning in Tertiary Education	www.ascilite.org.au
Becta	British Educational Communications and Technology Agency	www.becta.org.uk
CSALT	Centre for the Study of Advanced Learning Technologies	csalt.lancs.ac.uk
CTI	Computers in Teaching Initiative	www.hefce.ac.uk/initiat/cti/cti.htm
CURL	Consortium of University Research Libraries	www.curl.ac.uk
DENI	Department of Education in Northern Ireland	www.deni.gov.uk
DfES	Department for Education and Skills (formerly DfEE)	www.dfes.gov.uk
DISinHE	Disability and Information System in Higher Education	www.disinhe.ac.uk
DNER	Distributed National Electronic Resource	www.jisc.ac.uk/pub99/dner_vision.html
EASA	European Academic Software Awards	www.easa-award.net
EDUCAUSE		www.educause.edu
EFFECTS	Effective Frameworks for Embedding C&IT with Targeted Support	sh.plym.ac.uk/eds/effects/
EUNIS	European University Information Systems	www.eunis.org/index.html
FERL	Further Education Resources for Learning	ferl.becta.org.uk
FOCUS	Framework for Optimising C&IT Uptake and Support	www.focus.ac.uk
HEFCE	Higher Education Funding Council for England	www.hefce.ac.uk
HEFCW	Higher Education Funding Council for Wales	www.wfc.ac.uk/hefcw/index.html
HESDA	Higher Education Staff Development Agency	www.hesda.org.uk
ILT	Institute for Learning and Teaching	www.ilt.ac.uk
JANET	Joint Academic Network	www.ja.net
JCALT	JISC Committee for Awareness, Liaison and Training	www.jisc.ac.uk/jcalt/
JISC	Joint Information Systems Committee	www.jisc.ac.uk
JTAP	JISC Technology Applications Program	
NICTRC	The National ICT Research Centre	www.learninglab.org.uk
LSC	Learning & Skills Council (formerly FEFC)	www.lsc.gov.uk
LSDA	Learning & Skills Development Agency (formerly FEDA)	www.lsda.org.uk
LTDI	Learning Technology Dissemination Initiative	www.icbl.hw.ac.uk/ltdi/
LTSN	Learning and Teaching Support Network	www.ltsn.ac.uk
LTRI	Learning Technology Research Institute	www.unl.ac.uk/ltri/

NLN	National Learning Network	www.nln.ac.uk
NILTA	National Information and Learning Technology Association	www.nilta.org.uk
SEDA	Staff and Educational Development Association	www.seda.demon.co.uk
SHEC	Southern Higher & Further Education Collaboration	www.soton.ac.uk/~shec/shfechome.htm
SHEFC	Scottish Higher Education Funding Council	www.shefc.ac.uk
TALENT	Teaching and Learning Using Network Technologies	www.le.ac.uk/TALENT/
TLTP	Teaching and Learning Technology Programme	www.hefce.ac.uk/initiat/tltp/tltp.htm
UCISA-TLIG	Universities and Colleges Information System Association – Teaching and Learning Information Group	www.ucisa.ac.uk/TLIG/
UfI	University for Industry	www.ufiltd.co.uk
UKERNA	United Kingdom Education and Research Networking Association	www.ukerna.ac.uk

6.2 Glossary of Terms

Asynchronous communication	Generally text based communication where exchanges can takeplace on the same system at different times (see bulletin board and synchronous communication).
Broadband	High bandwidth network, capable of supporting multimedia applications such as video-conferencing. Usually implies a speed greater than 1.544Mbps (see narrowband)
Bandwidth	Measure of capacity for network data transmission (high or low).The higher the bandwidth, the faster the transmission of data
Bulletin Board	Also called discussion boards or fora, they facilitate the exchange of information (generally text and images) via the WWW
Browser	Software application with graphical interactive interface for searching, finding, and viewing information on the Web
CAA	Computer Assisted Assessment
Chat	Term used to describe synchronous text-based communication over the network (see Web-based conferencing).
C&IT	Communications and Information Technology
CMC	Computer-mediated communication (see also bulletin board)
Desktop videoconferencing	Videoconferencing on a personal computer for individuals or small groups
Download	Transfer data files or programmes from a network computer (server) on to a personal computer (client) (see upload)
FTP	File transfer protocol, a system that allows movement of files between two computers via the Internet
HTML	HyperText Markup Language, used to create documents for use on the Web. It enables hypertext links to be created within and between documents over Internet.
ICT	Information and Communications Technology
ILT	Information and Learning Technology

SECTION SIX

ISDN	Integrated Services Digital Network. A faster form of connectivity for data and voice communications than standard telephone lines, used in videoconferencing
ISP	Internet Service Provider. Generally commercial services offering individual access to the Internet
LAN	Local area network Mbps Megabytes per second. Unit used to measure network speed of data transfer.
Mailing lists	A group communication system based on email where messages are posted to the mailing list address and automatically distributed to all members of the group or list
MAN	Metropolitan area network
MIS	Management information systems (typically student records, finance systems, personnel etc.)
Metadata	Data describing an information resource, generally in the form of keywords
MLE	Managed learning environment
Multi-Point videoconference	Videoconference between more than two locations (see also point-to-point videoconference.)
Narrowband	Low bandwidth (slow) network, usually 56Kbps (kilobytes per second) or less (see broadband network). Usually not appropriate for multi-media applications such as video-conferencing (see broadband)
Newsgroups	A group communication system also known as Usenet, based on email where messages are posted to a particular area or address (newsgroup) on the Internet, rather than to users email addresses.
Offline	Not connected to the Internet or a computer network (see online)
Online	Connected to the Internet or a computer network (see offline)
Point-to-Point videoconference	Videoconference between two locations only (see also multi-point videoconference)
Server	Network application (or the computer running the application) allowing other computers on the network to access data and services from computers on the server's local network
Simulation	The modelling of a real or imaginary system on a computer, susceptible of being modified or controlled by the user
Synchronous communication	Computer-mediated communication where exchanges of information between users takes place simultaneously at a particular moment in time (see asynchronous communication)
Upload	Transfer data files or programmes from a personal computer (client) to a network computer (server)
VLE	Virtual Learning Environment
WAN	Wide area network
W3C	World Wide Web Consortium, a group working on common standards for the development of the World Wide Web
Web-based	Use of Web-based bulletin or discussion tools for computer-conferencing mediated communication