An Introduction to e-Learning, Learning Technologies and Pedagogical Approaches

Graham McElearney, LDMU

The widely used phrases e-Learning and Learning Technology often appear together, and may appear interchangeable. They are in fact different, but complementary. This short article provides some basic definitions of these terms, and offers a brief summary of the pedagogical principles that underpin their use.

E-learning is a contraction of “technology enhanced learning”. The “e” represents “enhancement”, and so e-learning is often discussed in terms of the “e enhancement”. This enhancement factor might be genuinely pedagogical, whereby students able to engage with educational materials and learning resources simply not possible by other means. Often however this enhancement maybe purely pragmatic, for example as a means of providing distance-based students better communications facilities so as to try and replicate the kind of experience they would receive if studying on campus (Mayes and de Freitas 2004).

E-learning is a process experienced by students that is facilitated by the use of Learning Technology. E-learning is an inclusive phrase that implicitly puts the learner at the centre, rather than the technologies or the academic practitioners themselves – so it is not generally called “e-teaching”. Learning Technologies in contrast are a group of related technologies that provide certain affordances that allow e-learning to take place. The use of Learning Technologies can be defined as the systematic use of information and communications technologies that either facilitate or enhance the educational experience received by students. Not surprisingly, this covers a very diverse spectrum, both in terms of the student experience and the way it is achieved.

E-learning Pedagogies

Learning technologies and e-learning are not theoretically neutral, but are based on underlying assumptions and principles about how learning takes place. These need to be understood before they can be used effectively.

Traditional “instructivist” teaching methods used in Universities for generations are being increasingly discredited, for two main reasons. Firstly, they do not adequately scale up to meet the demands of widening access and increased diversity. Secondly, recent pedagogical thinking views this approach as inherently flawed (Mayes and de Freitas 2004).
Based on principles of behavioural psychology, the traditional instructivist paradigm is criticised for being reliant on the notion that academic learning can be instilled in students by the simple transmission of facts and “knowledge”. Learning is something that “happens” to students, and can be measured by their behaviour. Students have little interaction with the teacher or each other, and many activities where they exist at all, are so de-contextualised that they lead to knowledge that is ‘inert’ and effectively useless. Students come to think of concepts and facts as things to be memorised, and cease to explore them as tools to solve problems of their own needs (Grabinger and Dunlap, 2000). Opponents of instructivism would argue that their objections are not simply philosophical, but based on empirical observation (Mayes and de Freitas 2004).

During the last 20 years, this instructivist paradigm has become increasingly marginalised in favour of the “constructivist” approach. Based more on cognitive approaches to psychology, in constructivism, learning and understanding is constructed by the learner, rather than simply received from some external source. Concepts and facts now become tools of understanding that can be transferred from one context to another. Central to constructivism is the notion that learning should be active, through experimentation and observation, and that this activity should be directed towards the solving of realistic and relevant problems. Moreover, this active learning is not constrained to individuals, but takes place with an “activity system” – a group of people working towards a common goal via some sort of collaborative venture. In some earlier studies, instructivist and constructivist models were labelled as reception and discovery learning respectively (e.g. Castronova 2002, Gagne 1965, Novak 1980).

Following on from this, another important principle in constructivism is that learning is “situated”, i.e. that it has a social component that in part at least determines the learning outcomes for those participating. In a constructivist environment, the role of the teacher becomes one of facilitator and guide, who will ideally encourage dialogue with and between students, use a wide variety of teaching resources, guide students through open ended questions, and accommodate various subjective and individualistic learning styles (ibid, Tam 2000, Alessi and Trollip 2001). Inquiry Based Learning (IBL) forms an important part of constructivist teaching strategies, and is regarded as a means of strengthening links between teaching and research (Jenkins et al 2003).

It is important to note that whilst e-learning and Learning Technology are not theory neutral, there are no paradigms inherent to e-learning per se, but that the affordances of e-learning and Learning Technology can be mapped onto existing pedagogical models. This has always been the case, and uses of Learning Technology 20 years ago were just as instructivist as contemporary uses claim to be constructivist (Ravenscroft 2003).

Constructivism is a broad educational paradigm, and has been the subject of much educational research since the work of its founder, Lev Vygotsky, and some of its early proponents (e.g. Jean Piaget, John Dewey and Robert Gagne) in the 1960s and 70s. As the foundation of contemporary pedagogy, there has been a proliferation of models suggesting how e-learning can be deployed to achieve its aims, and these are well summarised by Mayes and de Freitas (2004). At many institutions such as the University of Sheffield, e-learning normally takes place within a paradigm of “blended” learning. This means the affordances of e-learning are realised within the broader...
curriculum of traditional “face to face” class based education (including seminars, field trips, lab classes etc). This is important because some of the more popular or high-profile strategies for e-learning have been specifically designed with distance based education in mind (e.g. Salmon 2000, 2002), and do not always map too well to the rather different requirements of conventional campus-based full-time students.

**A Taxonomy of Learning Technologies**

Learning Technologies provide a number of often-cited affordances that make them powerful tools within a constructivist framework. These are that they can

- allow students to work at their own pace and place
- provide access to rich and diverse multimedia/teaching materials
- simulate real world problems and test scenarios
- facilitate communication and collaboration
- encourage active learning through discovery
- provide feedback via self assessment

Learning Technology resources are often delivered as one or a combination of the following types (Laurillard 2002, Alessi and Trollip 2001)

**Tutorial Systems**

Although very diverse in scope, tutorial systems are basically designed to ‘teach something’, originating in the idea that the computer can emulate the role of the teacher or some other component of the educational experience (Laurillard 2002). Whilst employing a range of the interactive multimedia techniques, they may often follow a fairly prescribed linear narrative, and the bulk of this narrative is often conveyed by text. In pedagogical terms, they tend to be instructivist in nature.

**Simulations**

Simulations are a computer based abstracted model of the world that allow the learner to interact with it and control parameters that affect its behaviour or state. Typically embedded within tutorial systems, simulations are often used to replicate practical (e.g. lab based) procedures, but can equally be used in broader scenarios - for example, in archaeology, a simulation might enable students to explore how much of a site can be excavated within a given budget (see the BBC’s “Hunt the Ancestor” game for an excellent example of this, available at http://www.bbc.co.uk/history/games/ancestors/index.shtml). The utility of such interactivity can sometimes be questioned: the student can just sit there and manipulate parameters at random until they get the “right” result, rather than actively constructing alternative models and testing their validity (Sim et al 2004).
Structured Resources and Information Retrieval

Structured Resources are designed to allow random access, sequential browsing, and most importantly, effective searching of electronic data. Online bibliographic databases and journals are one classic example of these - as well as gaining skills in efficient searching and data retrieval, increasingly students can gain access to the actual article. The multimedia capabilities of on-line systems allow images, video clips and other types of data to be accessed in the same way, allowing access to 'virtual teaching collections' of materials that would otherwise be impossible to maintain (Mowat 2002).

Computer Mediated Communications (CMC) and Collaborative Learning

The principles of constructivist education have prompted an increasing interest in computer mediated communication and collaborative learning (McConnell 2000). It is of increasing relevance to campus as well as distance based students. CMC systems are described as either synchronous (enabling real time discussion) or asynchronous (where there is an inherent delay between sending, receiving and replying to messages). Asynchronous communications are not dependant on everyone being on-line at the same time, and are logistically more flexible. In addition, in many asynchronous CMC systems e.g. bulletin boards, past messages remain visible and accessible for future reference, and in this sense the students can be actively and collaboratively involved in creating their own educational resource.

Computer Aided Assessment (CAA)

CAA allows students the opportunity to perform formative, self assessment procedures, enabling them to evaluate their own learning (Sim et al 2004). Typically this is mediated through multiple choice questions - the computer presents a question with possible answers, the student makes a choice, and the computer provides some feedback. Ideally the computer is non-judgemental, and can allow the student as many goes through the test as they want. CAA is often used in tutorial packages as a means of maintaining student motivation. The normal MCQ type format is necessarily fairly "closed", and is arguably too prescriptive for some disciplines (Clarke et al 2004).

Virtual Learning Environments (VLEs)

A VLE is a piece of software specifically designed to facilitate e-Learning in a holistic manner, theoretically providing all the "tools" required to house a complete on-line course. A VLE will normally have tools for structuring and presenting "content" (which can be in any digital format supported by the browser configuration), providing facilities for CMC and other collaborative exercises, as well as housing more administrative information such as course timetables, module descriptions etc. They are unique in that they combine content provision with pedagogical process. Not themselves theory neutral, they encourage the structuring of content into small and discrete chunks that make them ideal vehicles for delivering Reusable Learning Objects.
An introduction to e-learning, learning technologies and pedagogical approaches

Current Developments in Learning Technology and e-learning

The burgeoning world of e-learning and learning technology now includes a growing body of research literature (Beetham 2005), new and emerging technologies, a bewildering array of definitions and acronyms, and a host of national bodies and initiatives with even more acronyms. The full diversity of interests represented in this eclectic discipline is beyond the scope of this study, but the following are illustrative of some of the current significant themes.

Research

Research into e-learning and Learning Technology has expanded enormously over the last 15 years, with Learning Technology emerging as a discipline within its own right (Conole 2004). Research is essential as the potential impact of e-learning and Learning Technology on institutions and individuals is massive, and the field is developing rapidly, both in technological and pedagogical terms. Historically, research interests have moved away from the more technical issues of content development, which dominated the early 1990s, towards more pedagogical issues, particularly those concerning communication and collaboration, integration within the curriculum, and organisational issues, such as the development of institutional strategies and frameworks for embedding the use of the technologies (Conole 2004, Squires et al 2000). The latter is important as Learning Technology is still considered a marginal interest in many quarters. With parallels in the history of GIS and Virtual Reality in Archaeology, Learning Technology has become a self-critically aware discipline, which seeks to situate itself within the broader context of contemporary pedagogical thought (Conole 2004).

Pragmatic Issues

Beyond the more theoretical considerations of pedagogy, there are practical and pragmatic issues regarding the development and use of e-learning materials. The following two examples are illustrative of these.

Reusable Learning Objects

One concern over the adoption of e-learning materials have been concerns over the cost of their development, which are arguably too high for any one institution to bare (Laurillard 2002). It has been argued that there are many areas within many subjects taught around the world that are effectively uniform, for example the sine function in trigonometry. If every lecturer in every institution that taught trigonometry created their own web resource to teach the sine function, the duplication of effort and cost would be frightening. Proponents of Reusable Learning Objects (RLO) would argue that there only needs to be one or a few well designed descriptions of the sine function, and using Internet technologies, these could be shared around the world (Downes 2001, Wiley 2001). The key here is that these are small bite-size pieces of learning resource that are shared, not entire courses, as the latter are too complex, unwieldy and often highly dependant on local factors.

Central to the success of this idea, is that each RLO should be adequately described using metadata (data about data) so as to enable efficient resource discovery, and that they should be
“interoperable”, which means their use should not be dependant on any specific delivery platform, medium or environment. A number of international standards exist to try and ensure this, for example the “Dublin Core” and IMS, for metadata and interoperability respectively. An RLO can be any digital object that can be shared (as is one of the video clips presented in the case study below), and it is envisaged that RLOs will be stored in content “repositories” such as JORUM, a project recently funded by JISC (see below), at http://www.jorum.ac.uk/.

Accessibility
In 2002, the SENDA legislation came into affect. Originating in EC legislation, it dictates that students with any physical or cognitive disabilities should not be disadvantaged with respect to accessing any educational experience, whether delivered via Learning Technology or not (Phipps et al 2002). With e-learning provision as being a major vehicle for widening access, the legislation is partly pragmatic, but has an ethical component as well. The ramifications for developers of e-learning materials are enormous, and many institutions are still only just coming to terms with its implications (see ALT-N online newsletter Issue 1 for some frank discussion about this amongst Learning Technology practitioners). An enormous subject in its own right, further information can be found at TechDIS (http://www.techdis.ac.uk), or at the Skills for Access website (http://www/skilsforaccess.org).

Affordances Offered by New Technologies
Many advances in technology are incremental, with existing technologies just doing the same but better or faster; but every so often a new set of technologies appear to have affordances that can facilitate change of practice at a paradigmatic level (Bonk 2004). One such area is that of mobile and ubiquitous computing, and the potentials they afford for mobile learning, or “m-learning” (Anderson 2005, Anderson and Blackwood 2004, de Freitas and Levene 2003, Wagner 2005). Ubiquitous computing implies not just mobile computing devices, such as laptops or Personal Digital Assistants (PDAs), but also the availability of network connectivity (usually wireless), which these devices can access. Mobile computing devices capable of connecting to the Internet now outstrip the number of desktop computers on many campuses, and the proliferation of wireless networks at many institutions means that a student can just as easily access their email and VLE delivered material from the Students Union bar as they can an IT centre. Learning can take place anywhere.

Of specific interest is the growth in functionality of PDAs over the last 10 years. No longer just glorified personal organisers, these devices are fully functional computers that can run the full range of “Office” software, as well as access the Internet. Importantly for Learning Technology developers, these devices can access an increasing range of multimedia, including interactive materials created with educational authoring software such as Macromedia Flash. Combined with GPS technology and digital cameras, these have exciting affordances for enhancing fieldwork, and indeed are already used for on-site excavation recording in a number of field units. Their potential has been acknowledged in educational applications such as medicine (Smordal and Gregory 2003), with their use being developed in other disciplines alongside archaeology (Dykes 2002, Kravcik et al 2004, Kukulska-Hulme and Traxler 2005).
National Bodies and Initiatives

The stakeholders involved in e-learning and Learning Technology include a number of national bodies, some of whose funding comes directly from central Government. Whilst being too many to list here, and subject to the occasional re-structuring, these are currently the major players:

Higher Education Funding Council for England – (HEFCE)

HEFCE are the central funding body for Universities in England, providing money to institutions for all aspects of their operations including capital expenditure and staffing costs. Much of this is directly related to student numbers, with a set amount payable for each “full time equivalent” (FTE) student. They also have an e-learning policy, but do not tend to fund individual development projects per se, but rather give money directly to institutions which can be ring fenced for teaching and learning activities.

Joint Information Systems Committee – JISC

Historically, JISC’s main area of responsibility was in the development and maintenance of IT infrastructures, both within and between Universities e.g. JANET. In recent years they have adopted a central support role in the areas of e-learning and learning technology, and via their website provide a wealth of information on everything from pedagogical theory to pragmatic advice on how to conduct a procurement exercise for a site-wide VLE installation. They fund a large number of projects and services, and are the main publicly funded stakeholder in e-learning in the UK HE sector.

The HE Academy - HEA

The HE Academy was formed in 2004 after a merger of the Learning and Teaching Support Network (LTSN), the Institute for Learning and Teaching (ILT), and the TQEF National Co-ordination Team (NCT). Its role is to support learning and teaching generally within HE, and although having specific interests in e-learning, its brief includes other areas such as accreditation for academic lecturers, and the maintenance of the 24 discipline specific “Subject Centres”. These Subject Centres were formerly part of LTSN, and the Computing in Teaching Initiative (CTI) before that. The Subject Centre for Archaeology can be found at http://www.hca.heacademy.ac.uk/archaeology/.

The Association for Learning Technology - ALT

The ALT is the professional body for Learning Technologists and academics interested in e-Learning in the UK. It publishes a peer reviewed Journal (ALT-J), an on-line newsletter (ALT-N at http://newsletter.alt.ac.uk), runs two annual conferences, a large number of courses, and has over 200 Institutional members. It represents the interests of over 1,000 professional Learning Technologists working in HE, FE, and an increasing number of corporate bodies. The focus of the research published in the Journal and the conferences is more on pedagogy than technology, and as
such is representative of research in the discipline as a whole. The association recently introduced an accreditation program to enable its members to gain professional recognition (CMALT), which will also lead to HEA accreditation.

The Maze of funding opportunities:
Some of these bodies give funding and others do not. Those that do, fund a number of services and initiatives at a national scale. Although this rapidly gets confusing, here are some examples:

TechDIS and CETIS are both examples of national services, funded by JISC. TechDIS has a brief to advise the academic community on matters pertaining to Accessibility and education, whilst CETIS work specifically on interoperability and metadata standards for RLOs. “Skills for Access” on the other hand, was a short-term development project funded by HEFCE to create an (excellent) online resource to advise Learning Technologists and developers on Accessibility issues specific to Learning Technology.

The Teaching Quality Enhancement Fund (TQEF) is central money from HEFCE, devolved to individual institutions to use as they see fit, but ring fenced for Learning and Teaching activities (so at The University Of Sheffield this money is used to fund a number of short-term development projects and cover some staffing costs within the Learning Development and Media Unit).

The Fund for Developing Teaching and Learning (FDTL) is administered by the HE Academy, and is allocated to projects on a subject-by-subject basis. Also administered by the HEA was the recent “Centres for Excellence in Teaching and Learning” (CETL) initiative, awarded to individual institutions. Again, consistent with broader themes, both the recent FDTL and CETL funding allocations have gone to projects focussing more on pedagogical process than subject specific content development.

Bibliography
An introduction to e-learning, learning technologies and pedagogical approaches


An introduction to e-learning, learning technologies and pedagogical approaches

