E-learning – Who? What? Where?

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E-LEARNING – WHO? WHAT? WHERE?

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1 Introduction

Just as the term e-commerce has entered the vocabulary, so e-learning is becoming accepted as a fast-growing extension to many conventional learning systems. Universities are trying to increase their student populations particularly attracting mature students, often those in full-time work who cannot follow traditional modes of attendance. Proposals for a UK e-university are of national concern (HEFCE, 2000) and are being actively considered by existing organisations (OU, 2000). A wide range of industries sees e-learning as a means to overcome skills shortages through the provision of faster and cheaper training. For example, IBM UK claims that in the two years since 1999, it has moved 70% of its training online, saving $200 million per year (Phillips, 2001). As always, with a rapidly developing 'killer application', it is necessary to question the fundamental premises and investigate the practicalities of obtaining the highly publicised, but sometimes unjustified benefits.

This paper considers case studies of experience in distance-learning environments from the UK's Open University, two having successfully utilised e-learning, and a third which is at the proposal stage, requiring e-learning facilities which are not yet well-developed. Some of the lessons learned are described and the potential role of the world-wide web briefly assessed. The paper also considers how a future strategy for collaboration amongst East and West European Universities and commercial organisations might be developed.

2 Distance learning enabled using information technology

Distance learning has long been established for undergraduate education and over 25 universities world-wide refer to themselves as 'Open' universities, in deference to the UK, Open University (OU) which pioneered distance learning since 1969. These and other universities have enhanced their delivery methods through the increasing use of information technology (IT), notably using internet communication throughout the 1990s and the world-wide web in the last five years. Notable technologies include internet-based conferencing using, for example, the FirstClass™ software, of a

type explained by Barnes (2000) and Berge (1996), available to all OU undergraduates. Conferencing software enables variable-sized groups of students and tutors to collaborate: in team activities; in exchanging information, and in giving moral support. McAlpine (2000) endorses the use of distributed collaboration (online) as being of great educational value. World-wide web facilities have extended the ability of distance-learners by making it easier to distribute and obtain information globally at minimal cost. Reports such as de Verneil and Berge (2000) and McNevin (2001) offer guidelines for the wider use of online communication.

At a more formal, organisational level, the concept of the e-university is being seriously progressed. European Community interest is far from being a recent phenomenon, as indicated by the Van den Brande (1993) account of research and development in the early 1990s. The Higher Education Funding Council for England report (HEFCE, 2000) proposes a business model for an e-university. In parallel, major industrial investment in IT-based training is taking place and, with the development of academic/industrial links, there is no technological impediment to the existence of e-business universities.

Much emphasis has been placed on the use of the world-wide web as a delivery mechanism for educational material, under the dubious assumption that education is solely the one-way process of pumping information from a supplier: university or institute, into 'empty' vessels: students. This perception is dangerous since it assumes that the process of learning is synonymous with the provision of information. As the saying goes: 'you can lead a horse to water but you cannot make it drink'. The economic benefits are not always clear-cut. Inglis (1999) for example, questions the economics of providing bulk material online rather than printing it. It is tempting to pass printing costs on to remote students. What are the needs of undergraduates and masters level students? Can they be satisfied through distance learning? Can the world-wide web enhance their learning activities? The three cases studies described below aim to provide a realistic view of where benefits currently lie and where future developments are keenly awaited. For the purposes of this paper, the following definition is assumed.

E-learning: *Learning, by means of an organised system, enabled through information technology*

3 Open University case studies in e-learning

3.1 Small population course on techniques for report writing

Since 1998 training has been carried out for the benefit of postgraduate students, with MPhil and PhD aspirations, who are writing dissertations of around 40-60,000 words and who need help in structuring and writing large reports. The rationale is that of a self-help group with the participation of experienced researchers and lecturers (the tutors), forming a community. Mostly students provide examples of their written work to be commented on; mostly tutors comment on the written work. There are however no rigid boundaries, nor is there a prescriptive syllabus or formal direction of events by a manager. Asynchronous conferencing is achieved using FirstClass™, supervised, or

'moderated' to ensure smooth running, give encouragement and stimulate ideas. Typical transactions that occur are shown in Figures 1, 2.

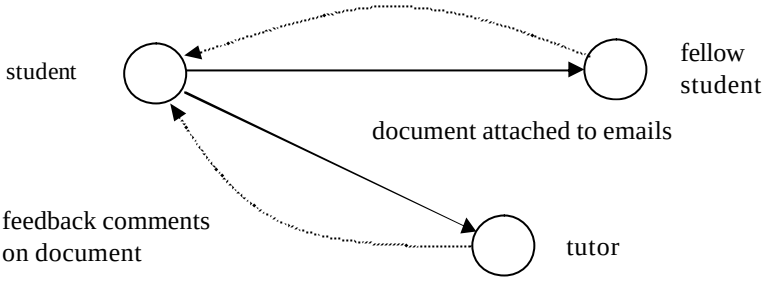

Figure1. feedback using email

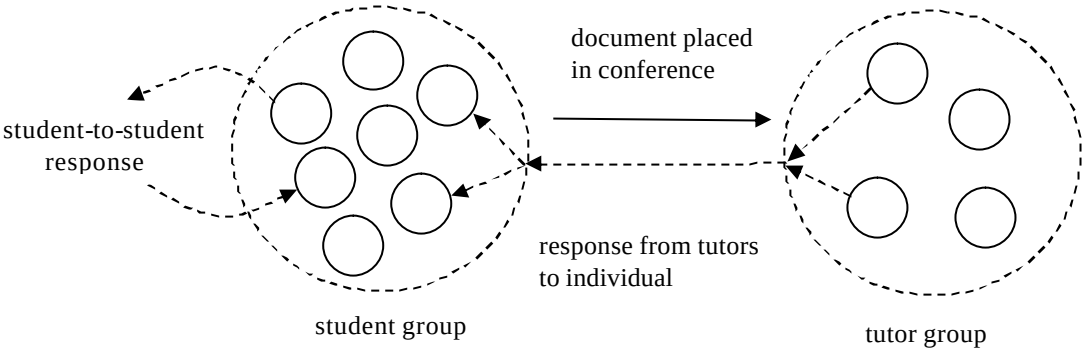

Figure 2. feedback using online conferencing

Following usage over a number of years, it has been concluded that:

- The method is effective if procedures are kept informal and the conference moderator encourages participants and makes suggestions, rather than directs the operation.
- Online conferencing provides a useful environment for co-operative learning with around twenty participants. There is no need for more sophisticated world-wide web facilities.

3.2 Large population course 'You, your computer and the net'

In strong contrast, the OU course 'You, your computer and the net' (T171) is based on a world-wide web environment and is almost entirely controlled using this electronic medium. Also in contrast, it is designed with scalability in mind, in order to accommodate large numbers of students, currently around 12,000 for each half-yearly presentation. It is intended for inexperienced users of personal computers, so that it is in the unusual position of being a course about a medium which uses that medium for teaching and learning purposes.

T171 uses minimal information on paper: some initial instruction material and two set books: Accidental Empires by Robert X. Cringely (1996) and Where Wizards Stay Up Late: the origins of the Internet by Katie Hafner and Matthew Lyon (1998). Students receive a CD-ROM for the purpose of establishing email connection and online conferencing with FirstClass™. The course web site contains a large amount of additional material, include study guides, links, resources and

assessment material. The course is taught entirely online, with no face-to-face tuition, though each student has a personal tutor available via email. Students work within tutorial groups of 20 and have the opportunity of working as individuals and within small groups, in distributed collaborative assignments. All assignments are marked online. For more details, see: www3.open.ac.uk/courses/subjects/computing.htm.

Because the course is university-based and can contribute to the gaining of a degree, its processes must follow accepted OU practices and standards, even though the method of delivery is unique. Assessment of students' assignments must be uniform and according to defined procedures. Tutors must be trained to provide appropriate, friendly feedback and their work independently monitored. Figure 3 shows the chain of communication that operates with a course population of 12,000 students.

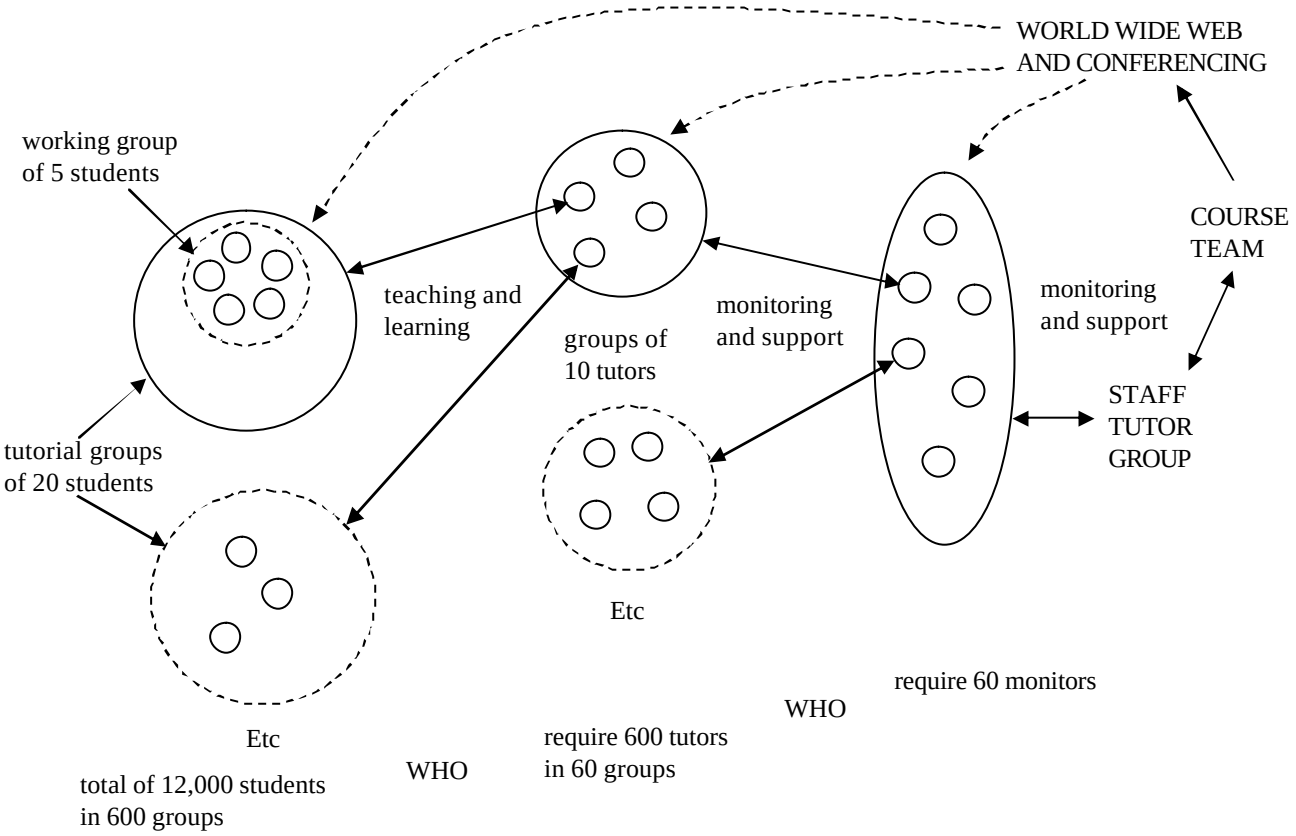

Figure 3. Arrangements for course T171: You, your computer and the net

T171 has been successful in attracting and retaining a large number of students. Whilst pioneering IT-based teaching methods to handle the large cohorts, it has managed to retain the personal contact necessary to support students through any difficulties. Although it was designed with scalability in mind, problems have arisen due to the large numbers of students and tutors involved. The course is still evolving so it is too early to reach final conclusions. However, a number of comments are worth making.

- Web material has to be carefully designed and then tested for usability and accuracy. Mistakes and misunderstanding can be on a very large scale and cause major disruption. In such circumstances, course teams need to take rapid, decisive action.

- Communication amongst participants, mainly between students and tutors, is solely screen-based. This is a considerable culture change, particularly for people unused to email and indeed unfamiliar with PC usage. Minimal use of paper-based information and recourse to telephone contact, can be a frustrating experience. Tutors found online marking a difficult skill to achieve.

- Just as students and tutors in a conventional course need to be disciplined in the way they store paper records, particularly if they relate to assessment, so they have to develop skills in maintaining electronic records for e-learning. It is easy, but disastrous to lose students' assignments, and procedures for keeping backup copies have to be developed.

- Support for tutors must be readily available. As T171 take-up increased, it was found useful to have regionally-based 'staff tutors', well established in the OU context, to act as a further level of support, taking pressure off the small course team.

- In spite of many difficulties experienced, it has been recognised that using the combination of online conferencing and web-based information does provide scalability. Similar courses could be available world-wide to large communities of students.

3.3 Remote-access autonomous system design laboratory for distance learning

Distance learning in technological subjects has been carried out by the OU for many years, using a range of techniques for information dissemination and for experimentation by students. Computer simulation, for example, has been used in the course 'Mechatronics, designing intelligent machines', to provide demonstration and experimentation with artificial intelligence techniques such as neural networks, pattern matching, rule-based and fuzzy control. Practical experience was gained using a 'home experimental kit' in the form of a small Lego™ four-wheeled vehicle, or 'buggy', whose movement was controlled via each student's PC. This proved highly successful as a learning environment, though the supply and maintenance of the vehicles was a large financial overhead. To achieve scalability in (a) the number of students who can follow such a course, and (b) the range of experimental environments that can be provided, radical methods must be adopted. Can e-learning provide an answer?

Remote control of physical artefacts in laboratories via the world-wide web has long been available, but has not been used extensively for teaching purposes. A remote-access autonomous system design laboratory, described in Lucas-Smith (1999), has been developed at the OU and is being used for experimentation. The aim is to provide e-learning experiences in engineering design, using the concept of the 'virtual design studio', in which design can be both co-operative and geographically distributed. Small communities of students would be able to pursue a shared goal, learning from each other in the process, (see Figure 4 below).

Consider the use of an experimental 'buggy', remotely accessible for e-learning.

- Information on all pedagogic aspects, both theory and practice, could be provided via a web site, added to and modified whenever necessary.
- Investigation of mathematical models could be used to explore the static and dynamic properties of the buggy and how it can be navigated and controlled to perform (artificially) intelligent operations. Simulations could be carried out and results compared with performance of the physical buggy.
- Physical environments could be replicated and therefore used by a number of students, located anywhere, at any time of the day, for a variety of experiments.

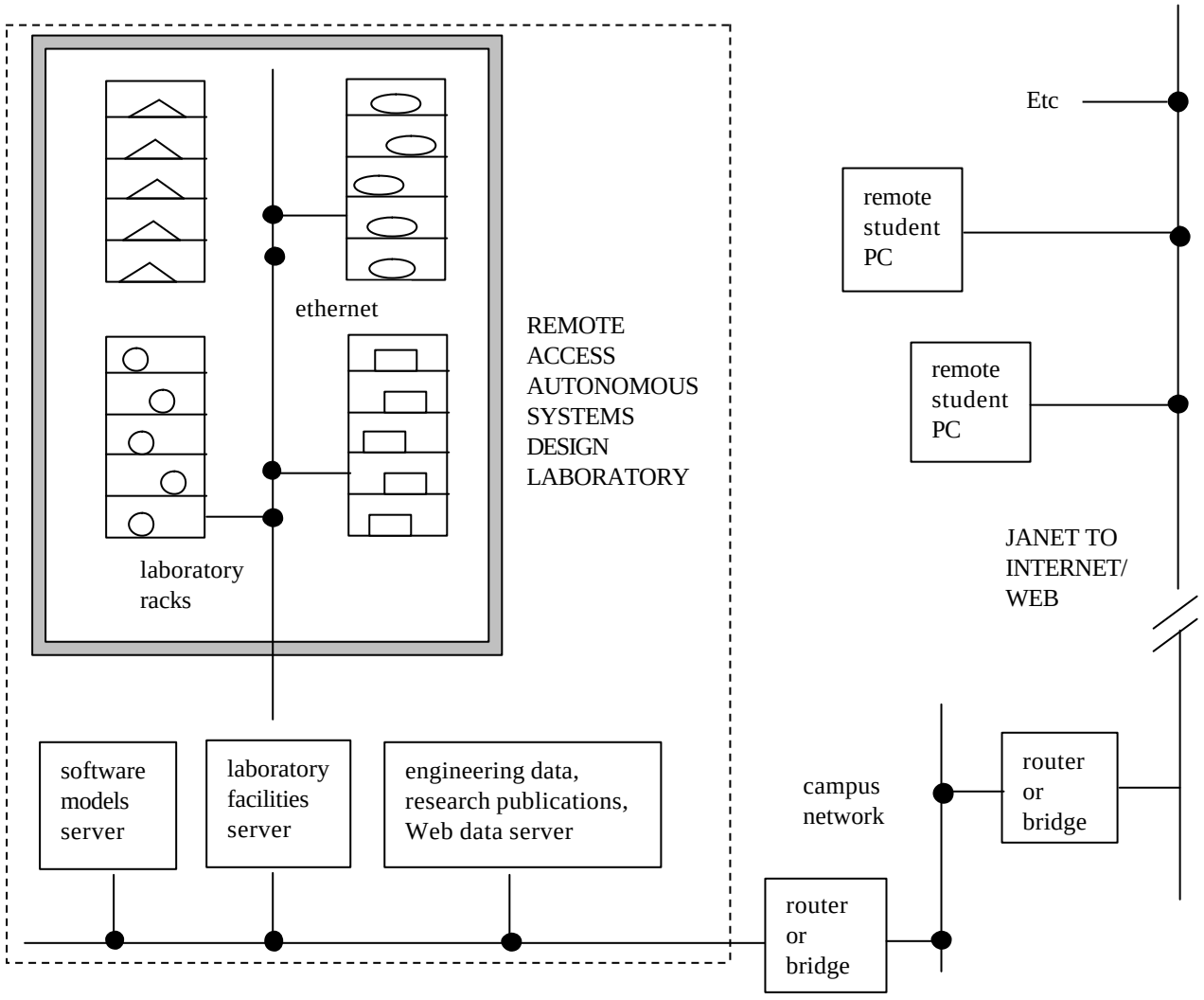

Figure 4. Outline view of a learning environment for design of autonomous systems

4 Discussion and conclusions

What can we learn from OU e-learning experience about the choice of technology?

A wide range of technology is available and can be applied to e-learning. In making appropriate choices, it is essential to consider the nature of the required learning experience; the size of the student population; the scalability required over the planned duration, and the technical ability of students and tutors. Where there is a simple requirement for the exchange of mainly written text, then world-wide web facilities combined with online conferencing provide a simple solution. The use of 'virtual design studios' is a growing phenomenon which needs further development before it becomes affordable and easily used by large groups of students.

In designing e-learning, what are the fundamental needs?
Any kind of learning must involve stimuli that engage students' participation. Students learn in many ways, so a variety of learning resources needs to be provided. Some learning is achieved through traditional instruction; some is more experiential as in the completion of collaborative activities; some learning is achieved through dialogue between students and tutors. The use of e-learning technology must reflect whatever mode of learning is intended. Although the above case studies relate to university-based courses, the same principles apply to a wide range of learning experiences, including industry-based courses.

What are the classic mistakes encountered in e-learning on offer?
1. Assumption that the provision of a large amount of information placed on a web server results in effective learning. This is not achieved by dumping large quantities of existing lecture notes onto web pages.
2. Assumption that all students learn in the same way.
3. Inadequate design of the student and tutor interfaces, including consideration of how students and tutors can communicate effectively.

Where do the costs lie in providing e-learning?
Clearly, the necessary technology costs money. However, it is important to recognise that an effective e-learning environment requires inspired design effort and sufficient time to develop and test it. This is where much of the cost lies.

What is the significance of e-learning in the European context?
E-learning technology reduces the problem of time and distance. Students can be based anywhere, as can tutors. There is no need to assume that a single organisation must be the sole provider of e-learning; a group of organisations could join forces in providing a range of learning experiences that draw upon their respective skills and interests. Universities, industrial and government organisations could participate. Artificial distinctions between east and west would diminish. E-learning can potentially reduce the cost of large-scale education.

What are the answers to the questions posed in the title of this paper?
Who? Anyone who needs to overcome the constraints of time and place in the learning process.
What? E-learning is the provision of an effective learning environment; more than just the assembly of a large amount of information.
Where? Throughout the world-wide web world.

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