

Is On-Line education the future for universities?

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<Outline>

The growth in access to the Internet and to electronic resources in general has changed higher education. Not only has it changed not only the student experience but appears to offer for the future a new environment for learning. Students could, potentially, study for a degree anywhere in the world and study without leaving their homes. There are profound implications in this for higher education: there are advantages and there are risks. In this paper we look at the potential of On-Line education and assess the benefits and risks for both the distance education and conventional university sectors. We consider the financial implications for students and for universities and assess the access issues that are raised by the use of On-Line teaching. Finally, we consider the implications of globalisation of Higher Education. We conclude that the developments in technology are a powerful driver for the development of On-Line education and that On-Line has a role to play but we express doubts about the wisdom of planning for the complete presentation of entire degree programmes On-Line.

1. Introduction

Change is the main feature of university education today. The concept of a 'learning society' has now been embraced by governments, for exam-

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ple by the labour government in the UK (DfEE, 1998), with the avowed aim of freeing education from the traditional boundaries of school, college or university and making it available to all through the use of information and communications technology (ICT). However, the wholesale adoption of ICT within education could change the role and nature of a university substantially. The attractions of ICT are obvious, the risks to educational values less so. Neither the perceived advantages nor the apparent risks are well researched. Should universities be investing in On-Line courses and how far should they go in replacing traditional methods of teaching? We review here the potential for On-Line education and attempt to answer this question.

1.1 Recent developments

Internet-based learning has enormous potential for automating education and this has raised concerns amongst the academic community about the breakdown of the academic links between staff and students. These concerns have been articulated by Noble (1998), in an oft-cited paper, who links the process of automation to commercialisation, with the familiar drivers of mass-production, standardization and commercial imperatives. Certainly there are large commercial firms involved in the delivery of educational material and WebCT, for example, has links with publishers who provide pre-packed course content for sale. On the other hand, MIT has recently announced that it is to make course materials available, free of charge, to any user anywhere in the world through its OpenCourseWare initiative. So, the prospects for the commercial exploitation of On-Line educational material look less certain now.

The term ‘virtual university’ has an anomalous meaning, at least in historical terms. A university is a physical place devoted to education and scholarship and much of the value that members of the university get from its physical existence is the intellectual environment that is created and the direct contact with others that sparks ideas and provides inspiration. Virtual universities can only prosper if they can reproduce these features. Indeed, using the name ‘university’ is only valid if the features

that define a university are present. The issue of what the culture of higher education should be in the new, technological world is reviewed by DeLong (1997), who outlines the three parts required to form a convincing structure for a university in the new age. These can be summarised as:

1. developing both the pedagogy and the means to produce quality material;
2. developing the institutional policy and practice such that students are enabled to study on-line and the academic staff are properly rewarded;
3. developing collaborations with other institutions to 'scale-up' access to expensive resources.

All of these imply fundamental shifts in the way higher education institutions provide for their students and a failure to recognise the technological trends and adapt is seen by DeLong (1997) as opening the door to others. He probably had commercial publishers, media companies and software houses in mind. Certainly these newcomers are unlikely to preserve the educational values that universities have cherished for hundreds of years.

2. What is On-Line education?

On-Line education is teaching and learning delivered via a network, which could be a local network on a university campus, but increasingly it is taken to mean education via the internet. The internet is a very versatile medium and while it can be used to deliver teaching material to students, it can also be a source of information or a means of communication. As it is a relatively new educational medium, there is little experience to build on and useable models are still being developed. With the possible exception of WebCT, which is increasingly a standard in web-

based courses, robust educational models have yet to be properly developed and validated. The idea that the internet is, by its nature, educationally effective, has been taken as a truth by some educators, leading to the idea that simply transferring material directly from paper-based to web-based delivery is an educational advance. This is inherently unlikely. Each medium has different requirements and different strengths and the web is no exception .

We have yet to develop fundamental principles for designing On-Line courses, but there is already a body of experience and there are examples of good practice. The use of the internet for education is well reviewed by Ryan et al. (2000) and a handbook on On-Line learning has been produced for educators, promoted by a leading educational journal, the Times Higher Education Supplement (Jolliffe, Ritter, & Stevens, 2001).

The web and its content can be accessed from most parts of the world and the value of the web is often seen purely as a way of providing distance education. That this concept is flawed has been argued by Davies (1999) who distinguishes between the distance learning (outreach) model in which a central group of teachers use the internet to make available central resources to students and the distributed learning model which has students and teachers at the centre using the internet to access distributed resources. Davies (1999) has developed a further model, the collaborative one, in which geographically separate centres of distributed learning combine to form a web of distributed collaboration. The Virtual School of Biodiversity at the University of Hong Kong is an example of this. So On-Line education is not just a tool for distance educators. It has very real uses in the conventional university setting. However, the techniques of distance education are increasingly relevant to academic staff who are teaching students at conventional universities - a student in a computer laboratory can actually be learning 'at-a-distance'. Clearly there is a blurring of the distinction between distance and conventional university teaching and it is probably more helpful to regard all students

using ICT as independent learners, regardless of the place in which they are learning.

The key to using ICT effectively in education is to embrace the concept of resource-based learning (RBL). This is far from being a new idea since it is merely a modern articulation of a traditional role of a university - providing students with the resources necessary to 'read' for a degree. When reading for a degree, in the traditional sense, students would have had 8 or 9 contact hours in a week and would have spent the rest of their time reading, studying, using the library and, in practical subjects, working in laboratories.

RBL is now so prominent because it describes the way in which the information and communication facilities of the internet can be best harnessed to enhance the educational effectiveness of courses. In its modern form, RBL is more focused on the independent learner than on the traditional relationship between a lecturer and the students. However, high quality RBL must include support from a teacher, for example by computer mediated conferencing (CMC) or face-to-face contact. The advantages and disadvantages of RBL are reviewed by Rowntree (1990) and Ryan et al. (2000) and it is interesting that some of the main disadvantages of RBL are to do with cost to the institution (see Section 4).

On-Line teaching and learning can enhance existing courses or, at the other end of the educational spectrum, it can be used to deliver a complete degree course from a virtual university, for example the University of Phoenix and Kentucky Virtual University. The delivery of a complete degree electronically challenges our view of what a university education is. The Open University in the UK, which was one of the pioneers of distance education, went to great lengths to offer a university education, rather than a correspondence course. The University built up a network of local tutors, a residential schools programme and student self-help groups to ensure that the atmosphere of university learning was created for distance education. Creating this atmosphere is the greatest chal-

lenge that faces the virtual universities and there are certainly doubts about whether electronic communications can ever substitute for the social interactions with teachers and students that have been central to university education over many centuries.

3. Influencing the costs of education for students

On-Line education has a high capital cost for students, particularly if they work off-campus. A computer is essential, together with access to phone lines. The costs of maintenance and software are also significant, but a student who selected a virtual university to register with might have lower fees and would have no additional residential costs or travel costs. Additionally, they might also be able to fit their study periods around part-time work. From a student point of view the chief attraction of a virtual universities might well be the lower cost.

Students in some countries are able to transfer credit from one institution to another. In Europe, the European Credit Transfer System (ECTIS) is being adopted by universities in many countries and in the UK the Credit Accumulation and Transfer System (CATS) has been operating for some time. So, students could with advantage use a credit transfer system to mix and match courses, making up a degree from, say one year at a residential campus and two years On-Line from home with a virtual university. This may well be an attractive option and it might be one that a single university might offer its students, as a way of keeping down both student costs and institution costs.

4. Influencing the costs of education for higher education institutions

For a conventional Higher Education Institution (HEI) there could be advantages in investing in On-Line courses, even though the students are on campus. For first year (freshman) courses, which are by their nature large population courses, providing a substantial number of On-

Line modules could free staff time to provide more face-to-face small group tutorials. Providing the courses via the local network in student residences, or via a dial-in service, could reduce the amount of space needed on campus for computer laboratories and reduce the number of lecture theatres required. Furthermore the investment in these On-Line models might generate Intellectual Property Rights (IPR) for the institution, in that modules produced for internal use could be marketed through external publishers, which could provide a new revenue stream. On-Line courses can be expensive to produce but when used for large classes, generate savings overall through economy of scale. It has to be said, however, that lectures to large classes also show economy of scale.

In the provision of On-Line modules, universities have to manage expectations of both teachers and students. In conventional courses the lecturer is not available all the time and students do not expect anything different. However, experience with On-Line has shown that in the virtual world students expect that queries will be answered instantly and that 'office hours' will not apply. Teaching staff, on the other hand, expect to engage in teaching and do not, quite properly, see themselves as either managers or administrators of a virtual education. The problems of expectations are well reviewed by Brabazon (Brabazon, 2001).

The use of ICT has been seen as a way of expanding higher education while making efficiency savings. The UK Committee of Enquiry into Higher Education, The Dearing Committee, advocated the use of ICT to provide resource-based learning as both an alternative to existing methods and as an enhancer of the educational experience. The report provides a possible scenario for the future (Table 1) in which resource-based learning, with a substantial ICT component, forms the major component of a course.

The time taken to prepare study material and present it is difficult to estimate. There will be large differences that are dependant upon the subject area and the degree to which the subject lends itself to the use

of highly graphical media. In Table 2, some typical figures are given and these have been used to make the estimates of the costs for the different models in Table 1. These costs are shown in Table 3.

Table 1 Changes in proportion of teaching time for four methods, following from the increased use of ICT (based on Dearing (1997)).

Methods	Traditional course study time/hours	Current course study time/hrs	Possible future course study Time/hrs
Lectures	30	60	10
Group work	50	5	30
RBL (resources purchased from outside suppliers)	15	15	50
RBL (produced in-house)	5	20	10

Table 2. Comparative costs of different teaching methods (partly based on Dearing (Dearing, 1997). Laboratory work in Science, Technology and Engineering is not included in group work, but the staff time would be substantially greater.

Method	Estimate of staff time required to produce one hour of student study time
Lectures	3 hours preparation + 1 hour presentation = 4 hours
Groups	1/2 hour preparation + 1 hour presentation = 1.5 hours
RBL (external)	2 hours preparation for use of existing resources
RBL (in-house)	20 hours for developing in-house
Interactive media	50 - 200 hours for developing in-house

Table 3 Changes in cost as student numbers double, for each of the models shown in Table 1. (Figures from Dearing (1997)).

Student numbers	Traditional course staff time/hours	Current course staff time/hrs	Possible future course staff time/hrs
50	700	820	600
100	1100	980	790

These figures are at best an indication of the real costs, but they do highlight the possible savings in staff time that might accrue from the introduction of On-Line modules to a course. For universities with an eye on their research output, the possible savings in staff time might well look attractive. However, adding interactive media to the resources for a course is very expensive in staff time. If done in-house, this may well be only a realistic option if a suitable software shell is available (Hall, Robinson, Tucknott, & Carlton, 1998) or the production is a collaborative effort, for example with a group of institutions or a publisher.

5. Access to education - access to technology

There are two distinctive types of inequality of access to technology (Gorard, Selwyn, & Williams, 2000; Toulouse, 1997). Individuals or groups may not have access at all. Amongst those who do have access, there is a hierarchy that depends on the quality of the access that they do have. A further source of inequality is derived from the pace of technological development and therefore the ability individuals or groups have to retain access despite change. At the World Technology Summit in 2001 (WTN, 2001), speakers reviewed the state of their area of technological specialisation. Many recognised that Moore's law (Moore, 1965) still influenced their area of technology, that is the number of transistors that can be placed on a silicon chip still doubles every 18 months. This indicates that the pace of technological advance has not changed. A consequence that eudactionalists have to keep constantly in mind is that the replacement cycle for computers is short and it is possible for software applications to be designed for the latest machines, thus denying access to those unable to keep pace. So, as Gorard et al. (2000) argue, the ability to connect to the internet is not a measure of access. From the point of view of education, this is certainly true. Resource based learning requires students to have access to resources, which may often mean mixed media that require fast connections to view or download. Access to libraries and to their holdings of journals is easy using the internet, but it comes at a very high cost to universities as licences for student

access to electronic journals are not cheap and often only available if a paper copy subscription is paid for as well. Furthermore, access may be restricted to on-campus networks.

It is worth noting an obvious further limitation to access: the telephone system. It is possible in many parts of both the developed and under-developed world to have the equipment to access the internet, but to live in an area where the telephone network does not support connection. The technological limitations on access militate against the spread of On-Line education to the very people who both need it and would be most anxious to benefit from it. But, conventional educational institutions may not be able to meet demand. For example, India is unable to educate the growing population through its college system. Distance education mediated with ICT would be one solution and this has been pursued energetically in the Indian state of Andhra Pradesh (Overland, 2000) where fibre-optic cables already link 90% of towns and will shortly link all villages too. Every village will shortly have at least one computer. Exciting though this development is, it demonstrates the gulf that still separates the idea of virtual universities and global education, from reality.

On the positive side, if technology is available, then On-Line education widens access and brings study 'any time, any place' to people who cannot easily study conventionally. For example, many muslim women live in seclusion (purdah) and cannot attend traditional education because they cannot mix with men. In some places, of which India is again an example, On-Line and distance education are now providing educational opportunities for them that were not there before (Overland, 2000).

6. Can Higher Education be globalized?

The G8 group has established a Digital Opportunity Task Force to foster access to, and use of ICT. In a paper to the group, the Global Knowledge Partnership (2001) refer to the advantages of generating local

content for education and distance learning, seeing this as more relevant than material created in developed countries and re-packaged for the developing countries. This highlights the problems posed by global education. The internet has the potential to deliver educational material to any part of the world but much of the teaching material currently available or planned for On-Line delivery is English language, western culture and northern hemisphere. The problem is not simply one of language, solvable by translation. It is a problem of differing educational methods, differing cultures and differing environments. In the related subjects of biology and health, for example, case studies and data used to illustrate teaching material must be relevant to the students. The ecology of an English oak wood is not the best example to use for students in tropical countries.

On-Line education available globally has to contend with the apparently trivial problem of time. If a virtual university is to make its courses available globally, then synchronous interactions between students and teachers cannot be part of its On-Line teaching package because different time zones provide a barrier. Furthermore, asynchronous interactions between students and tutors may have an intrinsic delay built in as a consequence of a time-shift between student and tutor. These time problems become significant if a virtual university wants to offer interactive lectures, for example those piloted by the Knowledge Media Institute in the UK, or real-time question and answer sessions. It is ironic, but probably inevitable, that virtual universities offering global courses will have to have regional centres.

Globalisation raises two further, inter-related issues, those of standardisation and uniformity. The UK has assessment of teaching quality for university courses. Japan is introducing quality assessment (Lewis, Ikeda, & Dundar, 2001) with performance indicators, but it will be some years before it is in place. If courses are to be offered globally by existing universities, or virtual universities offer global degrees, who validates the awards, sets the standards and monitors the quality? At present these

are rhetorical questions for there are no answers. Nor have HEIs yet formed a view on whether it is advantageous to have uniformity developing in education across the globe. Is not the strength of the education systems in many countries the diversity of the offerings available? These are very large, high-level questions, but they urgently need consideration as at present the concentration is on the technology and the content of On-Line courses, rather than the educational philosophy that should be guiding their development.

7. The future of On-Line education

It is difficult to predict the future for On-Line education and the virtual universities. The decision by MIT to make On-Line materials freely available is one route that On-Line education might take - the open source route. The 'e-University' initiative in the UK is another. Corporate e-colleges are developing, for example the British Aerospace virtual university. However, the present financial gloom over internet companies does not bode well for the immediate future of commercially viable education on the internet. This may, however, be a good thing from the educators point of view, since the risks to educational values that commercialisation threatens (DeLong, 1997) would be diminished.

The future for On-Line incorporated into existing educational models is brighter. It looks set to enhance teaching and learning and give greater access to scarce resources. There are hidden costs in On-Line that we have yet to understand, including staff development for a new teaching environment. There are highly complex rights issues to resolve as high quality On-Line education requires large amounts of illustrative media, little of which is freely available. Solutions to these problems will undoubtedly emerge. It is becoming clear that no one model for higher education is going to sweep the board in the future. The prediction that 'most communicating and learning will be done at a distance' (Stallings, 2001) is unlikely to be fulfilled. Instead, universities will become increasingly diverse, education will become more widely available and On-Line

will be embedded in higher education as a major, but far from the only, method of teaching and learning.

On balance, the future looks good for the quality and variety of education in the existing university system. The new ideas of e-universities look less promising as a long-term alternative to the present pattern - as a component of a varied and highly flexible education system they undoubtedly have a role to play. However, delivering a protected educational environment that is the exact equivalent of a campus university is something that a virtual university may never be able to do. In the end, learning is not dependent upon any one technology or, indeed any technology at all. Throughout the history of universities, learning has taken place in an invigorating atmosphere of scholarship, debate, commitment and collegiality. Technology may not be able to deliver that same atmosphere. It has a place in education; it may transform education; it will not take over education totally.

8. Summary

It is clear that there is a revolution in education that is being driven by technological advance. This revolution is bringing the ideas of independent learning and resource-based learning education into conventional universities, driven by the increasing use of ICT. The revolution is also spawning new models of global education.

The technological solutions that would enable virtual colleges and universities to deliver their degrees and courses to students anywhere in the world at any time now exist. There are two principal barriers to be overcome. The first is the need for a technological infrastructure that will enable potential students to connect to their virtual educational institutions. The second barrier is the incomplete nature of the educational philosophy that should inform the development of On-Line education. We do not know yet whether in the virtual world we can re-create the atmosphere of learning that a conventional university creates. If we can't re-

create that atmosphere, then virtual universities may be second-best and the future of On-Line education lies in the addition of RBL and other ICT models to campus universities, together with the development of a mixed economy where students study partly On-Line course and partly at local centres.

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