

Reflections of the Benefits of the Use of the New Learning Technologies in Higher Distance Education through the Prism of a Case Study

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Abstract

Many arguments have been made for and against the use of the new learning technologies in third-level education. This paper will start by briefly reviewing some of the rationales put forward for using the new teaching and learning technologies in higher education and some of the lessons which can be learnt from such a review.

The paper will then outline the approach to implementing new learning technologies taken by one specific third level distance education institution i.e. the approach taken by Oscail – the National Distance Education Centre in Ireland. For over thirty years, Oscail has presented traditional distance education programmes. However, over the past four years it has been converting a number of these programmes to online programmes. One of the features of Oscail's online implementation strategy is the development of different methods of teaching online to suit different subject areas. The paper will take as a case study a number of the methods used on one of its larger programmes.

The paper will finish by looking at the real as distinct from theoretical benefits of using the new teaching and learning technologies in higher distance education and attempt to abstract from Oscail's experience some likely directions for the implementation of new learning technologies in this area.

Introduction

Many arguments have been advanced for and against the use of the new teaching and learning technologies in higher education. The aim of this article is to review a number of these arguments – in particular those arguments that have stood the test of time. The article will then go on to look at the implementation of new technologies in one specific context i.e. in the conversion of a traditional distance education programme into an online programme. The background, objectives, implementation strategies and initial outcomes of this conversion will be discussed. Finally, the arguments for implementing new technologies in higher education will be reviewed in the light of the experience of the programme conversion and an attempt will be made to abstract some generalisable lessons.

Before we can start to review the arguments for using new technologies in higher education, it is necessary to be clear on what we mean by the new technologies. Therefore the next section will briefly outline the main technologies.

The New Teaching and Learning Technologies

The new teaching and learning technologies can be classified in two broad categories - those technologies which are primarily used for communication between *people* (human-human interaction) and those which are primarily used by individuals on their own (human-computer interaction)¹. The first category will be referred to as the communication technologies and the second category will be called the learning resources technologies. In what follows, the concentration will be on online versions of the new technologies but it should be noted that most have precursors in non-online implementations that are still widely used (especially in distance education at the tertiary level).

The communication technologies are usually broken down into synchronous or asynchronous. Synchronous technologies are those which require the individuals communicating to be using the technology at the same time. The computer based synchronous technologies include online chat, audiographics, whiteboard, online video-conferencing and live web-casting. Asynchronous technologies allow for a period of time to elapse between message and response. The computer-based asynchronous technologies include e-mail, bulletin boards, list serves and computer conferencing.

The learning resources technologies can be viewed on a continuum from those resources that were not produced primarily for teaching and learning purposes through those that were explicitly produced for teaching and learning purposes and onto those which are used essentially as learning aids.

The first level of online resources technologies would include websites (with relevant information!), computer databases and online (possibly full-text) academic journals. The second level of online resources would be material put online (often by individual teachers) for their students (such as notes, syllabi, learning objectives, references, key questions, etc.). Often, the aim of this material is simply to provide a framework for

¹ This categorisation is broadly based on Peter Goodyear's taxonomy - see Goodyear 2001, pgs 12-14. It should also be noted that the two categories given above follow the two elements of, what are known collectively as, the Information and Communication Technologies (ICTs).

students and to help guide them through course content. At other times, this material can be quite extensive with substantial amounts of content put online. The third level of online learning resources are Web-based training (WBT) and Web-based education courseware packages, also called instructional software or tutorial programs. These instruct students (usually acting alone) in a particular subject matter. Courseware packages are usually multimedia i.e. they include text, graphics, stills, animation, audio and video. The predominant format is for content to be broken into small 'blocks' or 'chunks' (sometimes called learning objects) which build on each other. Students proceed through the learning objects interacting with the material in the way pre-determined by the designer. The fourth level of online resources technologies is a disparate group which have, at various times, been used in teaching and learning environments. They include intelligent tutoring systems; expert systems; online simulations; modelling or analysis tools; educationally-oriented microworlds and virtual reality environments.

Table 1: Schematic Classification of Online Teaching and Learning Technologies with Examples of Each Category

Communication Technologies	Resource Technologies
Synchronous: - Online Chat - 'White Board' - Online Video Conferencing	Level 4: - Intelligent Tutoring Systems - On-line Simulations - Micro-Worlds - Online Modelling Systems
	Level 3: - Online (Multi-media) Courseware
Asynchronous: - E-mail - Newsgroups - Computer Conferencing	Level 2: - Tutor Created Web-pages - Institution Created Online Materials
	Level 1: - Public Access Web-pages - Online Abstracts and Citation Indexes - Online (full-text) Journals - Online Databases

Because of their prevalence, it is useful to examine where Virtual Learning Environments (VLEs) such as WebCT, Blackboard, Moodle, etc. fit into this classification of learning technologies. Essentially, what VLEs do is bring together, in one online environment, a number of the technologies mentioned above. These usually including e-mail, computer conferencing, online chat, whiteboard and the capability to put multi-media resource material online with relative ease. In addition, they include a number of other facilities such as the capability to restrict access to particular groups of students, manage groups of students online, and they also provide some online assessment facilities.

Arguments for Using New Technologies in Higher Education

A number of prominent scholars have made very optimistic predictions about the potential of the new teaching and learning technologies. For example, Howard Gardner has said that technology will allow for the delivery of individualised

instruction, “we have in our grasp today technology that will allow a quantum leap in the delivery of individualized services for both students and teachers. ... In the past, it might have been possible to argue that personalized or individualized instruction, though desirable, was simply not possible. That argument is no longer tenable.” (Gardner 1999, pg 88). While writers such as Gardner do show awareness of the potential downsides of using technologies for teaching and learning, one is left with the overall impression that use of the new technologies will *ipso facto* lead to improved quality in teaching and learning at reduced cost. And it is not just individual scholars. As MacKeogh has pointed out various international agencies, including UNESCO, the World Bank and the European Union, have played a key role in promoting the use of the new teaching and learning technologies (MacKeogh 2001). She also states that "In recent years, a largely uncritical consensus appears to have developed among policy makers about the benefits of technology in education." (MacKeogh 2001, pg 224).

One of the most detailed cases for using new technologies in higher education was given by Bates who identified the following six rationales

- Provide information technology skills
- Responding to the technological imperative
- Widening access and increasing flexibility
- Reducing costs
- Improving the cost-effectiveness of education
- Improve quality of teaching (Bates 2000, pgs 16-34)

Space does not permit a detailed review of these arguments. However, for an in-depth discussion, readers are referred to a paper given by the author to the EdTech2002 conference called “*Arguments For and Against the Use of the New Teaching and Learning Technologies in Higher Education: What do They Tell Us?*” which is available here: http://webpages.dcu.ie/~foxs/publications_available_online.htm

The following conclusions can be drawn from the in-depth review:

- ✓ All uses of new learning technologies in higher education – especially higher distance education – must be based on the sure knowledge that students have reasonable access to the new technologies and are competent in their use
- ✓ Providing information technologies skills is not a strong argument for using new learning technologies in higher education
- ✓ While responding to the technological imperative may sound superficial, it has a number of aspects which give it weight (one of these will be discussed below)
- ✓ Increasing flexibility is undoubtedly one of the strengths of particular new learning technologies. In particular, the computer-based communication technologies have the potential to increase the flexibility with which tutorial support can be delivered to dispersed distance education students
- ✓ New learning technologies can aid the widening of access to third level education – however, if not used in a way that is appropriate to the target audience, they can lead to *decreasing* access.
- ✓ The issue of costing the use of new technologies in higher education is very complex and highly situation dependent. However, the following can reasonably be stated:

- In general, the introduction of new technologies is likely to lead to an *increase* in overall costs rather than a reduction in costs.
- In some instances, there may be an increase in cost effectiveness, that is "more students can be taught to the same standard for the same level of investment" (Bates 2000, pg 19).
- The various learning technologies have major differences in their cost structure. On the one hand, the major cost of using online communication technologies to provide flexible tutorial support is frequently the cost of tutors' wages as the number of hours which tutors can spend online is potentially very substantial. On the other hand, the major cost element in the use of online resource technologies is frequently the initial cost of producing the resources² (especially as one goes up the levels of these resources).
- ✓ The new teaching and learning technologies are highly flexible and tailored applications can be devised for a wide range of circumstances. The major issue is whether a suitable application with a reasonable cost structure can be devised which delivers a programme at an appropriate level of pedagogical quality to a specific target group.
- ✓ The highly flexible and inventive ways in which online asynchronous communication technologies can be used has meant that it is the technology which has received most interest from those researchers and practitioners who are interested in using technology to improve the quality of student learning. However, as noted above, the use of this technology can be expensive. This has led some researchers to investigate ways in which the technology can be used to improve student learning while keeping costs moderate. (This issue will be returned to below.)

Having briefly reviewed these arguments for the use of new technologies and some of the lessons that can be drawn from this review, we will now proceed to look at these rationales in practice in one distance education programme.

Oscail's BSc in Information Technology Programme

Oscail is Ireland's National Distance Education Centre. It is a faculty of Dublin City University (DCU) which is one of the seven universities in Ireland. Oscail works co-operatively with the other universities in the development and delivery of its programmes. Oscail provides three undergraduate and three post-graduate programmes.

One of Oscail's undergraduate programmes is the BSc in Information Technology. This programme consists of four subject areas – Computing (C), Communications Technology (CT), Management Science (MS) and Human Sciences (HS). Each of these subject areas have four modules – two modules presented at diploma level and two presented at degree level – see Figure 2.

² In other words, the cost structure of the use of communications technologies is analogous to the cost structure of conventional on-campus education while the cost structure of the use of resource technologies is closer to the cost structure of traditional distance education (Curran and Fox 1999). However, it should also be noted that different levels of resource technologies have widely different cost structures (Rumble 2001, pg 80). In general, they require substantial numbers of students to offset their initial costs of production.

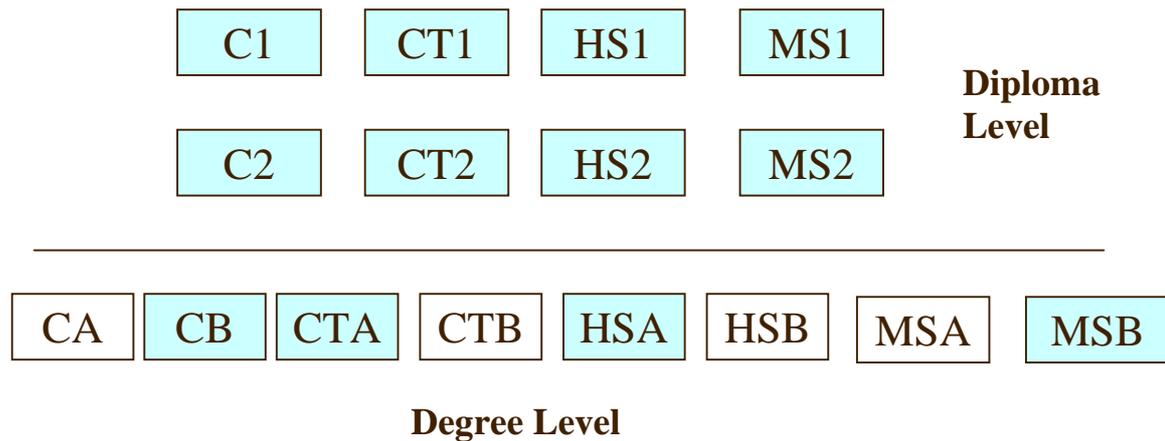


Figure 2 – Modular Structure of Oscail’s BSc in Information Technology

In order to obtain a degree, students must successfully complete all eight diploma level modules, four specified degree level modules (CB, CTA, HSA and MSB) and two of the remaining four degree level modules i.e. fourteen modules in all. (Taking four modules is roughly equivalent to the workload of one year of full time study.)

Until 2003, students undertaking the BSc in Information Technology studied in classic ‘second generation’³ distance education mode i.e. it had the following elements:

- Students took 1 to 4 modules per year (with most students taking 5 to 6 years to graduate)
- For each module undertaken, students received a specially written Module Text
- For each module undertaken, students obtained 1 to 3 textbooks
- Tutorial support was via tutorials presented at local study centres (8 two-hour tutorials per academic year per module) supplemented by telephone support
- Library support provided in local study centres (but, in practice, rarely used)
- Assessment of each module consisted of continuous assessment and a 3 hour exam – each of these two elements contributing 50% of final module mark
- Continuous assessment consisted of three assignments per Module
- Students accumulated module credits towards the award of a degree.

Going Online

Starting in 2003, Oscail decided to convert the BSc in Information Technology (IT) from traditional distance education to online delivery. This decision was made for a variety of reasons but it did not emerge fully formed and it may be instructive to review what was happening in the years before this decision was made.

During the 1990’s, Oscail had tracked the access to microcomputers (at work, home, etc) of its BSc in IT students. Access increased steadily over the 1990s to a point where by the late 1990s, all students had access to microcomputers, even if it was not

³ For the definition of ‘second generation’ distance education, see Nipper 1989.

home access⁴. Internet access lagged behind by about a year or two but from the late 1990s, Oscail started to use the Internet in an ancillary fashion, for example, by providing assignments and past exam papers online. While these were still available to students by post on request, within a few years, these postal requests practically disappeared.

A critical change was the provision of individual DCU e-mail addresses and personal portal pages by DCU in 2002 to its students. This allowed the people responsible for the administration of the programme to provide individualised information to students and move the extensive use of the postal system for communicating with students to online communication. For example, all communication to students regarding areas such as registration, allocation of students to tutors, scheduling of tutorials at local study centres, etc. was moved online. This change had two major consequences (1) it resulted in a substantially more cost-effective administration of the programme and (2) students got used to going online to obtain information.

Another critical change happened in 2002, the survey of students indicated that home access to the Internet had reached almost 100%. This co-incident with the regular re-accreditation review through which every DCU programme has to go through every four or five years. This review allowed Oscail to investigate the potential of the online delivery of the programme to improve delivery and to meet the other revised quality objectives identified by the review process. It should be stressed that a pragmatic approach was adopted from the beginning, i.e. the potential of online delivery to meet specific objectives was investigated and then an implementation strategy adopted which would allow the programme co-ordinators to evaluate whether the online delivery met these objectives. This implementation strategy was usually tentative and experimental. These experiments were evaluated and, if the evaluation proved satisfactory, they would be expanded to other parts of the programme.

It should also be pointed out that considerable pressure came from students to increase the use of online technologies and frequently feedback from students indicated they thought that Oscail's implementation of the use of new technologies was too slow⁵. When probed, students would frequently say that they considered the traditional methods of distance education delivery were 'old fashioned' and 'out-of-date'. Perhaps, not too much should be read into these comments as, when Oscail did implement various online technologies, other students would complain and say that they preferred the traditional methods. Obviously, new technologies should only be implemented if there are sound pedagogical or other rationales. Nevertheless, course providers do have to be cognisant of student perceptions of their programmes.

Scheduled Online Instruction

In 2003, the first major change occurred when students undertaking the degree level modules were given online as well as study centre tutorial support for the modules they were undertaking. The objectives were mainly pragmatic. In the preceding two

⁴ Oscail provided access to microcomputers to students on particular modules of the IT programme at local study centres from the inception of the programme in 1986. However, from the early 1990s, the demand for this access started to decline and by the late 1990s, students no longer attended the access sessions provided.

⁵ A frequent comment took the form of "This is an IT programme, why is Oscail not making more use of IT?"

years, due to the number of students involved and the availability of local expertise, the number of local study centres for these modules was reduced to two study centres (in Dublin and Cork – Ireland’s two main cities). This meant that some students had to travel substantial distances to attend tutorials with the consequence that the number of students attending tutorials fell dramatically. (As is normal, attendance at tutorials on the programme is not mandatory but it does correlate with persistence on the programme and attainment of good assessments.) It was for this reason that students on these modules were offered online tutorial support.

The method of online delivery adopted was termed Scheduled Online Instruction. In this method, the academic year was broken up into four periods, three periods that corresponded to the periods before the three assignments and one period leading up to the examination. For each of these periods, a number of computer conferences/forums are set up by the tutor in which students could communicate with their tutor and fellow students⁶. The tutor may also carry out functions as would happen in a face-to-face tutorial such as offer resources, synopses, ask and answer questions, etc.

The forums are open for fixed periods – usually for three weeks - during which time the material to be covered for the next assignment can be discussed. At the end of the period, the forums are closed and no further contributions can be added. The fixed time performs two important functions: (1) it limits the topics which students can discuss during a particular period⁷ and (2) it limits the time during which a tutor has to check the online forums and answer student queries. Both of these act to restrict the tutor time required to monitor and moderate the online discussion. As noted above, unless measures are introduced to limit the time requirement of the tutor, then tutor costs can escalate. In addition, the time limits on the online discussion, act to focus the online discussion i.e. students are aware that, if they have queries or wish to discuss a particular topic, then they must do it during a particular time period. This has the effect of ‘lock-stepping’ the discussion and means, for example, that a student cannot initiate a topic that was discussed by the rest of the group some five or six weeks previously.

Student evaluation of the modules using the SOI method indicated that most students were appreciative of this more flexible method of getting tutorial support. (As could be predicted, the level of satisfaction rose for those students who would have found it either difficult or impossible to attend face-to-face tutorials.) However, tutors (and some students) expressed disappointment at the low level of usage of the online forums. While there was many ‘lurkers’, it was a minority of students who actively engaged online. A number of tutors were of the opinion that this was primarily due to the novelty of the system i.e. students were still not sure of the best way to use it for their own benefit. Tutors also expressed a desire for more training in tutoring online. For this reason, substantial training was given to tutors working online in the following year.

⁶ All computer conferences/forums are asynchronous as experiments working with online synchronous chat rooms showed that the level of discussion was mostly of a low-level. Some tutors continue to use synchronous chat but not many. The forums were set up in a VLE called Moodle.

⁷ There is a period, prior to the examinations, when students can ask questions on any topic in the module.

Task-Oriented Online Learning

In many ways, Scheduled Online Instruction (SOI) meets logistical rather than pedagogical objectives. That is, it structures the online tutoring in such a way as to provide a form of flexible tutorial support that students who, due to geographical, family, work or other reasons, would not be able to attend face-to-face tutorials (or find it very difficult to attend such tutorials). However, like face-to-face tutorials, the quality of the online tutorial support provided by SOI is highly dependent on the quality of the tutor and the quality of the engagement of the students.

There were a number of specifically pedagogical objectives that Oscail wishes to attain via online learning. One of the key pedagogical objectives was the introduction of group work into the programme. In common with many 'second generation' distance education programmes, Oscail's BSc in IT programme did not **require** students to engage in group work at any point during their participation in the programme⁸. Given the pedagogical benefits of groupwork⁹, this was considered to a weakness in the programme.

To bring group work into the programme, Task Oriented Online Learning (TOOL) was introduced for two degree level modules in 2004¹⁰. In this form of learning, students were required to engage online with their fellow students in order to complete specified tasks. Three different pedagogical techniques were used in the three assignment periods.

In the first assignment period, a number of relevant topics were posted online along with a number of resources (articles, chapters, websites, etc). Students were given a short period to prepare and then (over a two week period) had to engage with their fellow students in discussion/debate of these topics. Each student had to make a minimum number of postings. This technique was called Online Debates/Resources.

In the second assignment period, students were broken into groups of three. Each group was given a relevant topic along with resources and given two weeks to prepare a synopsis of their topic. At the end of the two weeks, each group had to post their synopsis online and, for the following three weeks, had to 'tutor' their fellow students on their topic. That is, students could ask questions on the topic of any of the other groups and it was up to the members of each group to answer questions on their topic. At the end of the three week period, each group posted a revised synopsis, clarifying any points raised in the discussion. This technique was called Online Peer Tutoring.

In the third assignment period, students were broken into groups of five or six and asked to prepare a group report on a relevant topic. Students were given seven weeks to prepare the report. Students were given standard guidelines for involvement in group projects such as division of tasks, appointment of chair, secretary, etc. It was left up to each group as to how they wished to communicate among themselves but

⁸ The majority of the students on the programme did form study groups and this is encouraged by Oscail. However, up to 2004, at no point during the programme were students required to engage in group work.

⁹ See, for example, O'Malley 1995 and Dillenbourg 1999. Also, a number of educationalists have drawn attention to the need for group work as part of the formation of graduates given the importance of having the ability to work in groups in the workplace – see for example Barnet 1992.

¹⁰ This built on work carried out in 2002 and 2003 on ways of incorporating different pedagogical techniques into online learning – see Fox and MacKeogh 2003

many used the online chat and conferencing facilities provided. Each group had to provide regular short reports on the progress of their work. In this way, tutors could monitor if any groups were not functioning properly.

One key difference between SOI and TOOL was that marks were awarded for engaging in the TOOL tasks while it is left up to student whether they wished to engage online in the SOI modules.

It should be pointed out that the move to online tutorial support (particularly the use of TOOL) was greatly facilitated by the provision of off-campus access to the Online Journal Databases in 2003. DCU Library had, for a number of years, provided online access to the full-text of the articles in a wide range of academic journals. However, one had to be on the DCU campus to access these databases. This changed in the autumn of 2003 when all registered students of DCU could access the databases from home. As is well known, access to academic library material is a perennial problem for distance education students. With off-campus access to the full-text Online Journal Databases, course writers and designers could provide reference to further reading material in the sure knowledge that students would be able to access it with relative ease.

It should also be noted that the pedagogical techniques used in TOOL are more likely to be useful for the teaching and learning of discursive subject areas rather than more fact and theory driven subjects (Fox and MacKeogh 2003).

In the evaluation of the TOOL delivered modules, most students acknowledged that they learnt the material in the modules more systematically and at greater depth than they had other modules. (This was corroborated by the tutors and tutor monitor¹¹.) However, they almost universally complained about the additional time it took in comparison with the study time required for other degree level modules¹². Some students estimated that they had spent three to four times the amount of time on the TOOL module as compared with other degree level modules with an average estimate of approximately twice the amount of time. This finding is, of course, an instance of the standard issue of quality versus time in studying. On the one hand, as teachers and course designers, we wish our students to engage meaningfully with the material in our courses. It is recognised that this type of deep learning takes time and effort from our students. On the other hand, our students are often less concerned with meaningful engagement and more concerned with obtaining a good mark for the course while not expending too much effort! It is obvious that the online delivery of the modules using the TOOL method did succeed in getting students to engage with the material in the modules. (This is not surprising given that it combined the award

¹¹ The tutor monitor is a senior academic who reviews a selection of the assignments marked by each tutor working on a particular module. The use of a tutor monitor is one of the key methods that Oscail ensures different tutors are marking to a common standard and it also ensures that tutors provide students with an appropriate level of feedback.

¹² Another student complaint, albeit not as frequent, was that the TOOL method of online tutoring entails less flexibility for students as to their timing of study. Of course, any method that introduced group work has to entail that the groups be 'present' at the same time (even if the 'presence' is online presence). This cannot be put forward as a reason for not having group work as part of a programme of study but it does indicate that, in a distance education programme which students undertake because of its flexibility, the use of group work is probably going to have to be quite circumscribed.

of marks for the engagement and also involved the support of a social group¹³.) However, as course designers, it is also incumbent on us to ensure that student effort meets with a proportionate award. This led to a major change in the way that the TOOL modules were assessed. In 2005, the TOOL delivered module is being assessed by continuous assessment only (i.e. students undertaking this module do not have to do an examination¹⁴.) Preliminary evaluation would indicate that this change has led to even greater engagement from students.

Because the pedagogical structure of the TOOL modules is devised in advance (and reified in the form of an instructional schedule for students and tutors) then the tasks to be performed by the tutors are limited to monitoring the activities of the students. These tasks have proved to be not too onerous and do not take a disproportionate amount of the tutors' time.

Online Resources Aimed at Increasing Retention

In the two methods of teaching online described above - SOI and TOOL - the objectives were, respectively, providing more flexible tutorial support and improving the quality of teaching and learning.

The advent of going online also gave an opportunity to the programme co-ordinators to investigate if online delivery could be used to assist in increasing student retention. In common with most distance education systems, Oscail programmes have a lower retention rate than comparable on-campus programmes¹⁵.

In the BSc in IT programme, the low retention rate is concentrated in the Level 1 modules (equivalent to first year in an on-campus academic programme¹⁶). More specifically, it is concentrated in two Level 1 modules – Management Science 1 and Communications Technology 1. Management Science 1 is a mathematics and statistics module and, while most students have encountered the majority of the material in this module before, a substantial number of students would not have studied this material for a considerable time. The Communications Technology 1 module is a foundation module in the basic physics of relevance to communications technology and a review of communications networks. While this module does not assume prior knowledge, it does present material in a rapid fashion as it aimed to bring students to the level attained by similar courses at first year in university.

The approach taken for both these modules was to make available online to the students a substantial number of additional resources. Practically all of these resources were of a background/introductory nature – the idea being that if a student encountered difficulty when studying any section of the module text then he or she would be able to go online and access additional resources which would bring them through the same material but at a slower pace. Sometimes the material repeated the

¹³ Anecdotal evidence would suggest that students formed close social bonds from participating in the online group activity.

¹⁴ It should be noted that students still have to undertake three assignments, as is normal, as well as the online and group work. Also, the amount of online and group work within the TOOL method was increased as compared to 2004.

¹⁵ Kember 1995

¹⁶ Students who are over 23 years of age can enter Oscail's programmes without any previous qualifications. This means that the entering cohort of students had very high variance in their previous educational attainment.

material given in the module text but from a different perspective and using different examples.

This online material came from a number of sources. Some material came from Oscail. For example, Oscail had a text-based Preparatory Mathematics module of some 500 pages. This was mined for relevant sections and placed online in an easily accessible way. Other resources came from public websites (which proved particularly fruitful for animated clips of processes in basic physics). Still other resources were purchased by Oscail¹⁷.

Another element has been added to the resources for the Management Science 1 module. Oscail has developed a bank of online questions relevant to sections of this module. These questions have varying levels of difficulty. (For example, the bank of questions on Logarithms has five levels with approximately ten questions per level.) Students can undertake the questions at each level and depending on their answers to the questions, they are directed to different resources. Students who cannot answer the questions at the first level are directed to basic-level resources for the topic. Students who can answer the questions at the intermediate levels are directed to higher-level resources while students who can answer the questions at the highest level are recommended to go directly to the assessment questions for the topic.

While a small number of additional resources were made available in 2004, this year (2005) is the first time that a substantial number of resources have been made available to the students of both modules. It is therefore too early to make judgements as to the success of this initiative. It will be subject to a full evaluation at the end of this academic year. Judged solely by the number hits on the site so far, what can be said is that a substantial number of students are accessing the online resources. Just under half the students assessed the mathematical resources at least once in the first six weeks with about 10% of the students making regular use of the resources in this time period. However, only time will tell if they are making good use of them.

If the evaluation of the use of the online resources turns out to be positive, then it is the intention to extend the range of resources available to students and add online resources to other problematical modules.

Conclusions

This paper began by reviewing some of the lessons, which can be learnt from a review of the rationales for implementing new technologies in higher education. It then went on to look at the use of new technologies in one of Oscail's distance education programmes. Can any generalisable lessons be learnt from Oscail's experience?

One very broad lesson is that the uses to which the new technologies can be put in higher education are highly flexible. The key issues are to devise tailored adaptations of the new technologies which (a) are appropriate for the target audience; (b) have a reasonable cost structure and (c) meet the pedagogical objectives of the programme.

¹⁷ Recently Oscail (and DCU) has joined with all the other Irish universities in a large-scale project which aims to develop a digital depository of learning objects. It is envisaged that this will be another source of online resources in the future.

More specifically, the use of the online communication technologies provide many ways in which distance educators can provide flexible tutorial support to particular groups of their students. The challenge is to provide this support in pedagogically rich ways that are not cost prohibitive.

Finally, the use of online resources which aim to increase student retention (mentioned above) is indicative of the many ways that the online delivery of programmes is likely to open up new avenues for distance educators. When Oscail started to move its programmes online, it did not envisage such a use. It is highly likely that, as we gain more experience with the online delivery of programmes, many new ways of delivering online learning will emerge. The key to advancement in this area will be grounded experimentation and the sharing of knowledge and experience gained.

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