Remember the days in the old school yard: from lectures to online learning

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VERIFIABLE CPD PAPER

IN BRIEF

- Gives an overview of the impact of e-learning on teaching practice and introduces themes which will be developed in the next five papers in the current series.
- Suggests that the impact of ICT systems and services has and will continue to transform teaching practice at all levels of education.
- Suggests that in some ways tertiary education, has been slow to grasp the opportunities that e-learning offers.

Claims have been made that the traditional classroom/lecture-room mode of teaching is under threat with the future being purely online-based. There is no doubt that the impact of ICT systems and services have and will continue to transform teaching practice. From PowerPoint slides introduced to enliven lectures to virtual reality models accessed remotely, technology is bringing about new educational paradigms. The result is the emergence of new forms of distance learning with terms such as flexible learning, blended learning and full online instruction. All are making major contributions to the student experience, allowing access to more information and greater resources as well as opportunities for learning in a manner and timescale that is more attuned to their aims, abilities and lifestyles. In dental education the transition is providing undergraduates, postgraduates and CPD students with a greater variety of courses, access to more expertise and the opportunity for lifetime learning.

E-LEARNING IN DENTISTRY

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Introduction

In recalling schooldays (and the pop songs), memories are of blackboard and chalk, together with a 'talking head' teacher standing in front of the class with material that had hardly changed, apparently, from Victorian times. It was a didactic method, learning by rote, and not very exciting, stimulating, enlightening or challenging. Nor was it designed for the student to assimilate whatever pearls of wisdom were emanating from the pedagogue. It hardly involved the student in the learning process, as it tended to be dry, unimaginative and text-book-based. It is a scenario that brings to mind the famous remark – *'Lectures are the process of transferring information from teacher's notes to*

students' notes without going through the minds of either.'

Sadly too much teaching is still conducted on these lines, though this is now mainly at a Higher Education (HE) level, as schools have generally been ahead of tertiary education establishments in adopting e-learning. The most important catalyst for this has been the emergence of an evidence base supporting e-learning and the use of information communications technology (ICT).

This development in HE can initially be seen as transforming delivery from lectures to online. The current series of articles has revealed that the systems and services are in place to effect this transformation; now the question should be asked: 'How does it impact on those in education whether as students or teachers?'

There is, of course, the risk that educationalists will see this as a panacea and a word of warning is appropriate. Technology does not turn a poor teacher into a good one. Style, commitment, love and knowledge of the subject, content and creativity, and concern for the students will always remain prerequisites. However, a good teacher will be a good teacher in any medium,¹ with an innate

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understanding of the needs of their students whatever the technology.

Technology should be seen as the enabler, with its various emanations – the Internet, CD-ROM, videoconferencing, webcasting, computers and, most recently, virtual reality – the enabling tools. At the simplest level such technologies can enhance the traditional lecture-based approach. The inclusion of PowerPoint slides may well add life to an otherwise dull, verbal address especially if the full range of the program's features are utilised.

Within PowerPoint² there are opportunities to add visuals including photographs, graphs and charts, line-drawings, and special text effects. The danger, of course, is that not everybody has graphic design skills and the resulting presentations can end up resembling a poor attempt at modern art rather than a teaching aid!

The first steps

PowerPoint is probably the most obvious example of the upgrading of the traditional lecture, but there are other methods. Previous articles in this series have covered videoconferencing³ and webcasting,⁴ both of which can be used to interleave external resources, such as an expert, or for involving students in another lecture. In addition they have permitted cross- and inter-campus links to promulgate the lectures and material to a wider student body, thereby saving teaching resources while providing a consistently high level of education. Planning a lecture becomes more crucial not just in terms of content, where thinking in pictures will be as important as thinking in words, but also in meshing all the various elements and feeds together into a coherent presentation.

In this scenario technology is being used as an addition to the existing classroom or lecture theatre setting. As has been said, *'Nowadays it appears fundamental to adopt a more integrated version where ICT is considered together with education strategies, content and activities the students engage in.'*⁵

The full impact of the technology and its concomitant services is realised when they are applied to distance learning.

Distance learning is not new. It can be traced it back to Gutenberg's invention of printing (from which emerged the 'independent learner'), through the radio and television to the Internet.⁶ From individual reading in the library, distance learning has progressed through correspondence courses to today's distributed classroom.

Distance learning was already being offered by London University 150 years ago and more recently, by the Open University (OU), which opened in 1969 and has blazed the trail for flexible methods of teaching and learning. The original OU courses were primarily based on printed material which was mailed to students. They soon became enhanced through the use of TV and radio and were (and are) often broadcast at night.

These media were essentially asynchronous (one-way), ie information and ideas were downloaded to the student without any opportunity for two-way dialogue and interaction. This sense of isolation amongst students was further exacerbated by the lack of many opportunities for collaboration with their peers or with tutors, despite the organisation of a number of tutorials and summer schools. The loneliness of the long distance learner was well known. Further, students, with few exceptions, could not enjoy the facilities common to traditional universities. Libraries and laboratories in particular were resources that, especially for research purposes, were difficult to access.

Defining distance learning

The definition of distance learning is sometimes confused with terms such as e-learning, online learning and flexible learning. It can be argued that these more recent terms are subsets of distance learning, or that all are subsets of flexible learning. It has been argued, for example, that 'Online education is a subcategory of distance learning which has been defined as the formal delivery of instruction in which time and geographic location separate students and instructor',⁷ while e-learning has been described as 'learning in a way that uses information and communication technologies'.⁸

The search and research functionality

of the Internet is a valuable resource that overcomes one of the major limitations of traditional distance learning. In addition, collaboration and contact, whether with teaching staff or fellow students, can be more frequent and easier through utilities such as chat rooms, email, and bulletin boards and videoconferencing – in fact, what is being described is e-learning.

In this new paradigm 'distance learning' represents a change in the fundamental orientation of the learning environment. Traditional, physically co-present classrooms and pedagogical practices involve face-to-face instructor-learner relationships. These physically and socially immediate instructional contexts are transformed in distance learning through, typically, the technological intermediation of communication between teacher and student. One observer believes that 'Basically it is distance learning being modernised... instead of letters and television being the instructional mediums, computers, modems and the internet are the means by which teachers and students connect'.⁹

e-Learning benefits

Through e-learning students can work at their own pace and learn 'flexibly' – anytime and anywhere. Course material and information can be accessed or downloaded via the Internet and a range of assessment techniques can be used. For teaching staff there is the benefit of being able to update courses quickly and of being removed from repetitive teaching tasks.

In what may seem a compromise, blended learning has emerged, a combination of 'face-to-face and online teaching. The two are complementary and synergistic and also allow greater flexibility in learning. This approach can also be used by the dental team to maintain lifelong learning'.¹⁰ A major advantage of blended learning is that it puts the student at the centre of education rather than the teacher. According to the UK Government's e-learning strategy consultative document, e-learning can help to deliver the means to empower learners, for example by enabling more active learning.¹¹ It also foresees an

Table 1 Ideal importance of media components in Open University Courses – by subject area

	Humanities	Science	Technology
Course programmes on TV	83.7	68.9	52.9
Computer disks, CD-ROMs etc sent to you	78.9	86.1	95.1
Online materials and resources you can access	69.2	75.7	81.3
Online courses, email, conferencing	58.4	71.9	81.3

(Base: percentage of respondents in each subject rating the component as either 'Very important' or 'Quite important')

Fig. 1 Screen shot of MCLinDent webpage

education system that is more flexible and responsive to individual needs.¹¹

The raft of new technologies that have appeared over the past 20 years and their amalgamation into e-learning have led some, at least, to question the continuing viability of classroom-based learning and its total replacement by online courses. There are many propagandists for this development. 'Today very little is needed in order to disseminate online training to a mass audience. With the web, at the simplest level, all that is needed is a server or a web host and access built with a language, like HTML or using a PowerPoint converter. Instantly you have "content" online and accessible by a pervasive audience.'¹² However, e-learning can offer far more profound opportunities in personalised and student-centred learning – the term 'technologically enhanced learning' has now been coined.¹³

A practical approach

Postgraduate students are often also in full-time work and find it difficult to travel to a central teaching location. For some, especially those based overseas, there is a lack of such courses in their own countries. In these cases the only solution is provided by distance learning, perhaps delivered as e-learning. However, it should not solely consist of downloading course material onto a distant computer, it is more than that. 'Possibilities for teaching with the Internet include using it as a source of information, a means of representing content, a means of communication, or a site for collaboration.'¹⁴

Learning online demands flexibility, with students taking more responsibility for the pace and structure of their studies, ie they can learn in their own time, their own workplace and continue the process to suit their own needs. It is

not the top-down, rigid structure of the classroom. As has been stated, 'With the current trend in pedagogy away from didactic, instrumental learning towards more constructivist and resource-based approaches, students are being encouraged to go beyond the supplied course material and research materials for themselves, often discussing their findings in computer conferences.'¹⁴

Just as teaching staff have to be *au fait* and confident with ICT, so must students be. Research undertaken by the Open University¹⁵ showed that amongst their students, TV programmes were more likely to be watched by humanities students than those on science and technology courses; the reverse was true for computer disks and CD-ROMs. Other ICT functions showed a similar pattern (Table 1).

It may not be surprising that Arts students are less likely to be technophiles than their science and technology counterparts, but there must be concern that 'students who are technologically illiterate tend to spend many hours trying to figure out how to use online technologies, communicate with instructors, submit online assignments, or download class-related material from the class website.'¹⁶ Nor must it be forgotten that those in the developing world, in particular, may not be able to benefit from e-learning which, for them, may remain an aspiration rather than a reality. One of the major responsibilities of the education world must, therefore, be to ensure that ICT infrastructure and systems are made available and accessible worldwide.

Innovative approaches

Through the partnership of educationalists and computer scientists, innovative educational tools and interactive new formats have evolved and virtual learning environments (VLEs) have been created as 'the guide on the side rather than sage on the stage.'¹⁷ This is best exemplified by the Masters in Clinical Dentistry, Fixed and Removable Prosthodontics¹⁸ course, which is now offered as an online course with annual residential components. Students are able to access course materials and submit assignments online and interact with tutors and other students through a VLE (Fig. 1).

Fig. 2 Using a PDA in the clinic

Fig. 3 The Simulife simulator

The two-week extensive residential study period for this course, involving lectures, clinical demonstrations, laboratory work, seminars and tutorials, is the only face-to-face teaching and learning component that students experience. Similarly, some of the Institute's undergraduate courses take this blended approach, with the online component enhancing practical classes.

On the move

The dramatic growth of mobile technologies, whether for voice, data or images, is one of the most noticeable features of ICT in the past few years. Given that students are more than familiar with the use of mobile phones and other wireless devices, it would appear that mobility can add another dimension to education and training.

Apart from the normal Global System for Mobile Communications (GSM) phone, which provides limited data facilities, there are the alternatives of general packet radio service (GPRS), which expands the data possibilities through its faster transmission speed, and the potential of using laptops either through a connection via a mobile phone, or via the latest wireless local area network (Wi-LAN) services or worldwide interoperability for microwave access (Wi-MAX). In addition the emerging availability of third generation (3G) services will possibly make the mobile phone a far more versatile mode of access to education. Whichever is used, students, especially

postgraduates and those in CPD, will be less tied to particular times and locations for their learning.

Undergraduates can also benefit from wireless developments. A recent trial investigated the use of personal digital assistants (PDAs) in dental teaching clinics⁹ (Fig. 2). The aim of the trial was to assess the potential educational benefits of using PDAs for networked learning data collection and information processing in a clinical dental learning environment, and to consider how this can be best exploited in similar medical and dental clinical environments. The students were able to access videos of clinical dental techniques immediately before undertaking patient treatment and also to have secure access to administrative details such as forthcoming appointments.

The students had encrypted wireless access to their virtual learning environment (VLE) through which they accessed a range of teaching resources including text-based documents featuring teaching notes, illustrative images and textual extracts; PowerPoint presentations; PDF documents; instructional images; simple animations on, for example, clinical technique; and viewable webcasts for demonstrations, lectures, conferences or seminars. Other facilities included email, posting notes to bulletin boards, and entering personal or clinical data. Within the VLE a database was established to record and assess student activity through online

questionnaires for the student to complete, and a logbook.

Although the students possessed a wide range of ICT skills, from novice to expert, their reaction was universally positive and the specific benefits included:

1. Being able to keep notes of their lectures and individual study
2. Being able to keep a diary of their commitments including their timetable
3. Having online access to support, particularly video material.

The PDA proved to be a highly acceptable mode of access to online education with a substantial proportion of the VLE available to students in a clinical environment.

The virtual world

Virtual reality (VR) is a human-computer interface that simulates reality. It is sometimes termed 'alternative reality'. However, it has the potential to make a significant contribution to medical training and education. Commenting on its role, one VR expert said it 'provides a unique resource for education about anatomical structure'.²⁰ He went on to highlight an important benefit of the application of the technology in medicine by commenting: 'One of the main problems for medical education and training is to provide a realistic sense of the inter-relation of anatomical structures in 3D space. With VR

the learner can repeatedly explore the structures of interest, take them apart, put them together, [and] view them from almost any perspective.²⁰ He continued by pointing out that another advantage 'is that demonstrations and exercises, or explorations can easily be combined.'²⁰

By utilising the multimedia properties of ICT, students are able to take a tour of the structure with an expert providing a commentary to explain and describe the model. A more-than-reasonable analogy is with the flight simulators that are vital in the training of pilots. A VR simulator would 'allow surgeons to practice difficult procedures under computer control.'²⁰ Through connections via broadband in particular, virtual reality has the potential to facilitate and speed up the training of surgeons and other medical staff.

At present, as far as dental education is concerned, VR is in a trial and development phase. At one dental school, for example, a trial is being run called 'Communication Manual Skills'. It analyses videos of students and tutors interacting at the chairside.²¹ Large simulators already exist, for example the DentSim™ (<http://www.denx.com>) described in the first paper in this series.²² They offer training in manual skills on mannequins and can incorporate a virtual handpiece (Fig. 3). Such virtual reality aids are also likely to be important for retraining, eg for those returning to work after a family, and for CPD.

Assessment

Students will always ask 'Do I have to do this, and does it count?' The latter is often considered the main motivator for

most students. Assessment can be undertaken online with little disadvantage to the student – in fact in many cases it is preferred as it can enable easier review of responses.²³ Students can prepare and submit assignments via email to the tutor or through a VLE. They are marked and returned with comments etc via the same method of communication. However, a range of other techniques can be included in a virtual learning environment including quizzes and short question and answer sessions to provide other opportunities for assessment and collaborative projects. In addition bulletin board messages can be assessed qualitatively. Results can be made available to students instantaneously and recorded in a global grade-book. Such capabilities have moved education a long way from the old school yard to a future that is truly bright.

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