



# E-learning: what the literature tells us about distance education

E-learning: an  
overview

## An overview

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### Abstract

**Purpose** – The CIBER group at University College London are currently evaluating a distance education initiative funded by the Department of Health, providing in-service training to NHS staff via DiTV and satellite to PC systems. This paper aims to provide the context for the project by outlining a short history of distance education, describing the media used in providing remote education, and to review research literature on achievement, attitude, barriers to learning and learner characteristics.

**Design/methodology/approach** – Literature review, with particular, although not exclusive, emphasis on health.

**Findings** – The literature shows little difference in achievement between distance and traditional learners, although using a variety of media, both to deliver pedagogic material and to facilitate communication, does seem to enhance learning. Similarly, attitudinal studies appear to show that the greater number of channels offered, the more positive students are about their experiences. With regard to barriers to completing courses, the main problems appear to be family or work obligations.

**Research limitations/implications** – The research work this review seeks to consider is examining “on-demand” showing of filmed lectures via a DiTV system. The literature on DiTV applications research, however, is dominated by studies of simultaneous viewing by on-site and remote students, rather than “on-demand”.

**Practical implications** – Current research being carried out by the authors should enhance the findings accrued by the literature, by exploring the impact of “on-demand” video material, delivered by DiTV – something no previous research appears to have examined.

**Originality/value** – Discusses different electronic systems and their exploitation for distance education, and cross-references these with several aspects evaluated in the literature: achievement, attitude, barriers to take-up or success, to provide a holistic picture hitherto missing from the literature.

**Keywords** Distance learning, Attitudes, Communication technologies

**Paper type** Literature review

### Introduction

The Department of Health (DoH) has commissioned University College’s Digital Health Research Unit (part of the CIBER group) and the University of Sheffield to evaluate a pilot digital interactive television (DiTV) learning initiative “NHS Learn”, which is about to be broadcast by Aston Media, to learners at various learning centres across the country. NHS Learn is the fifth DiTV pilot commissioned by the DoH and evaluated by the UCL-Sheffield team (see, e.g. Nicholas *et al.*, 2002a, b; Huntington *et al.*, 2002;



Williams *et al.*, 2003; Gunter *et al.*, 2001). The learners are either current NHS staff, undertaking continuing professional development, or prospective staff. Learning centres are a mix of hospital trust locations and academic institutions. In addition, a number of training/learning organisations open to the general public have expressed an interest in offering opportunities to individual learners. These include a number of libraries and organisations working under the banner of “The learning exchange”, who offer public access to learning from various locations in the Birmingham area.

The content of the educational package consists principally of the video recording of health and medical lectures and seminars for viewing either via PCs with a satellite link decoder, or DiTV. Many recordings are supplemented by course materials available electronically at the study centres. Aston are funded to produce the filmed material and do not take any payment either from the course providers, for having filmed the courses, or from the learning centres where the courses are run. The latter, which include, but are not exclusively, the course providers, are all linked to Primary Care Trusts (PCTs), Teaching PCTs and one Acute Trust, and will, if the project becomes a regular service, be the main clients for NHS Learn. Some of the courses are accessible from students’ workplaces and others at academic institutions which already run nursing/medical courses.

Transmission times are agreed with the course purchasers. One important aspect of the service is that the broadcasting times are not the times at which students view the programmes. They are stored locally and available for a period of approximately two weeks to allow for on-demand access. Learning centres can decide their own schedules, either allowing individual viewing or time-tabling in group sessions at specific times. The courses are of varied length, from one hour (e.g. “Introduction to risk assessment”) to 24 hours (e.g. “Healthcare, ethics and law”) and cover a wide range of topics and levels. Many of the courses are suitable, for example, to ancillary workers. Course assessment ranges from confirmation that a programme has been viewed and materials read, to a formal test or practical examination. At present, one course will go towards a Masters degree, and others form part of the NVQ award.

The project presents an opportunity for the UCL/Sheffield team, to evaluate the efficacy of one form of distance learning as an important development in the drive to provide training for NHS staff. In this regard, it will have important implications for future strategy and planning within the NHS for staff development and training. The project aims to provide comprehensive evaluative feedback from students attending the NHS Learn courses at all the sites to which they are being delivered. Continuing in the same vein as the earlier evaluation of the first four pilot DiTV health services, this project is exploring the potential benefits and costs of digital television as a delivery platform for training NHS personnel. The research will also make recommendations about how remote provision of training utilising television/video and Web support can most fruitfully evolve across the NHS. There may also be implications and lessons for such training applications for other government departments and agencies that have pressing training needs.

This paper attempts to provide the context for the project in terms of a short history of distance education, followed by an account of the media used in providing remote education currently, and research that has been undertaken, on achievement, attitude, barriers and learner characteristics.

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### Theories of distance education

Before discussing the history of “distance education”, or current research, it is, of course, necessary to define exactly what is meant by the term. McIsaac and Gunawardena (1996) summarise the characteristics of distance education from their own review of the literature as: education imparted where the learner is physically separated from the teacher (Rumble, 1986); as a planned and guided learning experience (Holmberg, 1986, 1989); and consists of a two-way structure distinct from traditional classroom instruction (Keegan, 1988). Many writers have looked at the higher level of independence or “learner control” (Holmberg, 1995) which is a feature of distance education. Baynton (1992) developed a model to examine this concept in terms of independence, competence and support. She notes that “control” is more than “independence”. It was also affected by competence (ability and skill), and support (both human and material).

Another concept, that of “transactional distance”, was advanced by Michael Moore (1990). Here, “distance” is determined by the amount of communication or interaction which occurs between learner and instructor, and the amount of structure which exists in the design of the course. Greater transactional distance occurs when a course has more structure and less communication (or interaction). A continuum of transactions might exist in this model, from less distant, where there is greater interaction and less structure, to more distant where there may be less interaction and more structure. There is, these days, the problem of conflating of distance learning with e-learning. It could be argued that e-learning provides such a high level of interaction that the “distance” is necessarily smaller.

### History of distance education

Distance education programmes date from the nineteenth century (Nasseh, 1999; McIsaac and Gunawardena, 1996), although it has been suggested that even St Paul spreading the Gospel, with his letters to early church groups, was a form of distance education (Demiray and Isman, 1999). This was on the basis that his “students” were remote and widely distributed and that his letters were a form of education. The first type of formal distance education course, in the nineteenth century, was also, of course, in the form of the written word. Issac Pitman, regarded as the first modern distance educator, began teaching shorthand by correspondence from the English City of Bath in 1840. The University of London founded its correspondence college at around this time, and other private correspondence colleges began in the late 1880s (Levenburg, n.d.). In the USA, correspondence courses had also taken off (Watkins and Wright, 1991), and by 1910 International Correspondence Schools in the USA already had around 184,000 students (Glatter and Wedell, 1971).

Newer technologies have been used since the start of the twentieth century. Instruction films appeared in 1910 (Reiser, 1987) and the State University of Iowa began experimenting with transmitting instructional courses as early as 1932, seven years before television was introduced at the New York World’s Fair (Jeffries, n.d.). By 1939 the university had broadcast almost 400 programmes (Moore and Kearsley, 1996). Wisconsin’s “School of the air”, another example, was broadcasting ten programmes per week to campuses in the 1930s, and continued on-air until the 1970s (Bianchi, 2002). Meanwhile, radio was also being exploited. In the mid-1920s, the Department of Education in the UK began to provide schools with radio based instruction, and soon

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10,000 schools were using BBC radio programmes to support classroom teachers (Demiray and Isman, 1999).

Television and, especially, radio were used to a greater degree after the war, though not, according to Cambre (1991), with too much success, owing to the unimaginative way in which lectures were filmed and presented. The University of Wisconsin, however again at the forefront of progress created the Articulated Instructional Media project (AIM), which attempted to be a complete system of distance education, including broadcast media, correspondence and telephone (Cook, 2000). In the UK, the Labour Government also looked to television to provide distance learning, and approved the setting up of the so-called “University of the air”, renamed the Open University (OU), based in Milton Keynes. It has become the UK’s largest university, with over 200,000 students (OU, 2003a). The Open University model has been adopted by many countries in both the developed and developing world (Keegan, 1986).

In the mid-1970s, satellites began to be used for television broadcasting and the idea of teleconferences began to emerge (Moore and Kearsley, 1996). Audio and video recordings, teleconferencing and interactive telecommunication increased rapidly throughout the 1980s (Moore, 1990). Personal computers enabled what has become known as “multimedia” applications to be developed and widely used. CD-ROMS enable large amounts of audio, images and moving pictures to be distributed to students at a reasonable price (Moore and Kearsley, 1996) and, latterly, the internet has become a central medium to facilitate remote learning. It has been embraced by major distance education providers such as the OU which claimed in 2003 that more than 180,000 students interacted with the OU online from home, and that “every week more than 30,000 students view their academic records online” (OU, 2003b). This apparently peaked at 65,000 users in the week that exam results were available.

### **Current media used in distance education**

The previous section showed how distance education has grown from an activity involving written communication only, to utilising TV and radio technology, to today’s vast array of platforms, formats and delivery mechanisms. These can be summarised as described below, starting with digital interactive television, as this is the principal medium being investigated in the present study.

#### *Digital interactive television (DiTV)*

Broadcast television continues to be an important and widely used medium for the delivery of distance education, and has been the subject of much research, as described later in this paper. However, Digital TV is fast becoming a mass medium in the UK. Satellite/digital/cable TV ownership has also increased dramatically over the past few years. A clear majority of UK homes now receive digital services (Higham, 2003). Some 28.2 million live in multi-channel homes against 27.2 million who still receive analogue services. The advantage of digital TV over the traditional analogue system is the better image quality and enhanced capacity (Niiranen *et al.*, 2002, p. 250), so that TV companies can provide additional personalised interactive services such as web access, banking and e-mail (Love and Banks, 2001). It is often overlooked in discussions on e-learning that learning via TV may be equally viable and significant, and encourages widening participation in a more effective way, perhaps, than e-learning.

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The present authors have been much involved in the evaluation of pilot DiTV services for the general public, or “health consumers” (see, e.g. Nicholas *et al.*, 2003; Huntington *et al.*, 2003; Williams *et al.*, 2003; Gunter *et al.*, 2001). Results suggested that the medium was well received by users with few usability problems being reported. Some services were not substantially used, but this may have been because of the small availability period. Also, tentative suggestions were made that different types of information might be more effectively disseminated by different media or platforms. For example, patient experiences were found to be ideally transmitted using video, but information concerning medicine dosages and effects may be presented more clearly as text, possibly in tabular form.

#### *Video-conferencing*

Video-conferencing is generally two-way and carries audio and video information, so that people at two or more sites can see and hear each other. Many medical studies have been undertaken using video-conferencing facilities. Brunk (2002), for example, describes an initiative to provide nutrition counselling for elderly people in Nevada. Similarly, Swindell and Mayhew (1996) provided 18 housebound elderly people with an eight-week tele-conference offering practical information in nutrition, health and social services. Education for health professionals has also been offered via this medium. Andrusyszyn *et al.* (2000) used a video-conferencing facility and asynchronous computer conferencing to enhance learning and promote international collaboration among graduate nursing students.

#### *Audio-conferencing*

Audio-teleconferencing may be described as two-way voice communication using standard telephone type technology (Kirby and Boak, 1987). While not as sophisticated as video-conferencing, audio-conferencing also facilitates interaction. Research into the use of audio-conferencing is rare. In one of the few studies to date, Cragg (1991) examined the experience, learning strategies, and reported learning of nurses taking a course either by audio-teleconference or correspondence. She found that the teleconferences encouraged group learning; although correspondence was more convenient.

#### *World wide web/internet*

The world wide web is becoming ever more exploited in education. According to Olson and Wisher (2002), Web-based education offers learners “unparalleled access to instructional resources, far surpassing the reach of the traditional classroom”. It also makes interaction possible to a much greater extent than traditional distance education (Newman and Scurry, 2001). The use of the web in learning is not problem-free, however. Pajo (2001) identified a number of barriers to uptake of web-technology by university staff. Chief among these were the time required in learning how to use web-based technology and develop appropriate courses, the lack of training, and monitoring web-based teaching.

#### *Video/audio tapes*

Audio cassettes are convenient because of their portability and because they can be used privately on headphones. This medium is used to a large extent in language

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training, where sound is of particular importance. One of the few studies of audio pedagogy was that by Beare (1989), who compared the effectiveness of six instructional formats which allowed differing levels of interaction, including audio assisted independent study. Results showed that neither individual instructional formats nor the degree of interaction had much effect on student achievement. Distant learners including those in the audio group found the course just as stimulating, were equally interested in the subject matter, and judged the instructor or narrator equally as skilled as did those receiving face-to-face instruction. Video instruction became popular during the 1980s when the price of video-recorders fell and they became a common feature in the home. Surprisingly, no work appears to have been undertaken on the use of video in terms of its use as an “on-demand” medium (i.e. on the benefits of instant replaying of material etc.) despite the fact that much learning – in particular, to learn a foreign language, takes place using this medium. More typically, Paulsen *et al.* (1998) compared student achievement and satisfaction with regard to course delivery via DiTV, broadcast TV and videotape, but without examining how the media were manipulated. Student achievement was not significantly different in any of the groups.

#### *Telephone/Fax*

The telephone is, of course, generally used for one-to-one contact, and forms only a minor part in distance education. Hobbs *et al.* (2000), cited in Finger and Rotolo (2001), examined the replacement of a radio service with telephone for on-air lessons at a distance education school in Queensland, Australia. The researchers found many benefits of the telephone over radio, including greater understanding of learning tasks, increased motivation, more participation, improved enjoyment, and a greater range of teaching strategies being utilised.

#### *CD-ROM*

CD-ROMs allow multimedia to be captured on to a laser disc and used with personal computers. Little research appears, surprisingly, to have looked at CD-ROM mediated learning. In one of the rare studies to have looked at this medium, Oviatt *et al.* (2000) found that the use of a CD-ROM with students undertaking a course in trans-national management was not associated with better examination performance. The rise of the Internet has made the use of CD-ROM somewhat dated.

### **Overview of distance education research**

Distance education research, as can be discerned from the brief citations above, encompasses a huge range of issues, as the references to research already outlined in this paper testify. Those that are of particular relevance to the current project are:

- achievement/outcomes;
- attitudes/opinions (e.g. level of satisfaction etc.); and
- accessibility/barriers (both to course participation and completion and delivery type).

These are discussed in turn below.

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*Achievement/outcomes*

As may be expected, a huge amount of research has gone into various aspects of distance education in terms of student achievement and outcomes. A useful starting point for a brief review is to look at results from meta-analyses. Such studies indicate little difference in achievement between traditional face-to-face and distance learning. Indeed, this finding was being reported as far back as the early 1960s, with particular regard to the use of television (e.g. Schramm, 1962). Dubin and Hedley's (1969) review of studies also found no significant difference between television and face-to-face instruction. Later meta-studies also tended to conclude that there was little difference (e.g. Cohen *et al.*, 1981; Moore *et al.*, 1990), although the latter cautioned that much of the published literature was either anecdotal or employed weak research designs. However, even the latest meta-studies (e.g. Machtmes and Asher, 2000) continue to show little difference in achievement between distance and traditional learners.

Navarro and Shoemaker (2000) contend that much distance education literature is based on "older" learning technologies, such as television. By contrast, they say, there are few studies that "rigorously compare distance learning in the newer, multimedia cyber-learning format with traditional learning" (Navarro and Shoemaker, 2000, p. 17). They attempted to rectify this with a study that looked at both performance and perception of traditional versus "cyberlearners". The latter were provided with lectures on CD-ROM, together with online quizzes, an electronic bulletin board (asynchronous communication), a "discussion room" (synchronous chat), and e-mail access to the course tutor. The traditional group were provided with face-to-face lectures, discussions and a standard textbook. Performance of the two groups was rated by comparison of final examination scores, and attitudinal measures (described later). Results showed that the cyberlearners performed significantly better, by gender, ethnicity or class level, than the traditional group.

*Attitudes/opinions (e.g. level of satisfaction)*

Again, a good starting point here is to look at meta-analyses. Allen *et al.* (2002), looked at studies comparing student satisfaction with distance education to traditional classrooms in higher education. Results indicate that: "students indicate a slightly higher level of satisfaction with live course setting than distance education formats" (Allen *et al.*, 2002, p. 89). The effects of communication channel were examined, which showed a preference for video to written formats. The authors point out that this is consistent with the hypothesis that greater information, including the ability to see the instructor, is preferred over more limited channels. Interaction was also examined. Not surprisingly, "full interactive audio/visual demonstrated the largest effect" (Allen *et al.*, 2002, p. 91). In sum, the authors conclude that students compare distance education favourably to other educational formats.

Navarro and Shoemaker's (2000) "cyber-learners" versus face-to-face student study has been outlined above, with regard to student performance. The authors also looked at student attitudes with regard to the course presentation. For this, an attitudinal survey was undertaken. One part of this concerning workload, reasons for taking the course, quality etc., was given to all students. A second part, however, was given to the cyber-learning group only. This focused on the evaluation of the technologies involved (CD-ROM, online bulletin board, etc.) Results showed that a desire to learn at one's own pace (28 per cent), and to not have to attend lectures (20 per cent) were significant

factors. Of those who chose the traditional course delivery mode 49 per cent indicated that they felt more comfortable in the familiar environment, 20 per cent felt they would not learn as much online, and 15 per cent were not aware that they had had the choice of options.

Much distance education research into perceptions, attitudes, etc. does not compare distance to face-to-face courses, or look at the interplay between online and offline environments, but instead examines the distance environment in itself. One such study is that undertaken by Daugherty and Funke (1998). The researchers surveyed staff and students involved in a web-based Masters degree course in education, which involved both using search engines to find information, and accessing a number of given health-related web sites. The course was well received, with the most cited benefit being the vast information store housed on the web. Interestingly, however, it was the technology-related knowledge, rather than subject-related, that were rated most highly (i.e. learning to navigate the web, using listservs etc.). Apart from some problems, such as perceived lack of staff support, and some student resistance, overall the course was considered a great success.

These positive findings were not mirrored by a study carried out by one of the present authors (Williams, 2001, 2002). Undergraduate psychology students were required to use web-CT for course notes, learning exercises and online discussions. In-depth interviews with both students and lecturers showed that the two groups differed markedly in their perception and evaluation of the system. Many of the advantages trumpeted by the former were dismissed by learners, who felt that online material gave them extra work, represented an abrogation of academics' teaching duties (i.e. by simply posting reading materials online without explaining it) and shifted printing costs from the institution to the student. The study concluded that more attention needs to be paid to user needs, from their own perspectives, user attitudes towards information provision, and to then tailoring material to take these factors into account.

Unlike the studies outlined above, Thurmond *et al.* (2002) attempted to evaluate student satisfaction with a web-based distance education course whilst controlling for student characteristics. The authors argue that although previous work has examined student satisfaction with web-based distance learning (e.g. Billings *et al.*, 2001) it is difficult to link student perceptions with purely environmental variables. In other words, it may be that, as the authors put it, "students . . . were more satisfied with web-based courses because of their computer skills or high level of knowledge regarding course content rather than as a result of . . . the web-based course" (Billings *et al.*, 2001, p. 86). In fact, results indicated that student characteristics did not influence reported levels of satisfaction.

#### *Accessibility/barriers*

A very important aspect of distance education is, of course, that of accessibility. Much of the work looking at this issue has approached it by studying the characteristics of students who either fail to enrol for or complete a particular course. As Powell *et al.* (1990) say:

Questions related to why some students succeed and others fail . . . are of both theoretical and practical importance, as distance education moves from a marginal to an integral role in overall educational provision (Powell *et al.*, 1990, p. 5).

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Typical of papers on this subject is that by Siquera de Freitas and Lynch (1986), who investigated drop-out rates at a remote university introductory course. Unsuccessful students tended to be older, be less likely to use the resources available, devote less time to the course, worked or had other study distractions, and found the materials more difficult to use.

Powell *et al.* (1990) went further than this kind of analysis, developing a conceptual framework of student success and persistence in distance education which concentrates on predisposing characteristics on student success. Powell classified the factors contributing to success and retention in distance education into three general categories. These are:

- (1) *Predisposing characteristics*: including prior education, socio-economic and demographic status, and motivational and other personal attributes.
- (2) *Life changes*: such as personal illness, relocation, altered employment status, and family problems.
- (3) *Institutional*: including quality and difficulty of instructional materials, access to and quality of tutorial support, and the administrative and other support service provided.

In their study of drop-outs from a Hellenic Open University course in education studies, Vergidis and Panagiotakopoulos (2002) found that the main problems stemmed from family or work obligations, rather than from factors intrinsic to the course or its delivery. It has long been known that such external factors were extremely important. Knox's (1977) developmental-stage orientation of adult life stresses the importance of understanding the context within which a person carries out their everyday activities, i.e. their family, work, health, condition, personality etc. These all affect adults' ability and willingness to participate in adult education. No single factor appears to cause non-participation; however, individual student characteristics and life circumstances appear to have the greatest impact on participation (Kerka, 1986). Other studies (Carr *et al.*, 1996; Goodman *et al.*, 1990; Lazin and Neumann, 1991) all indicate that demographic variables were less predictive of completing an educational programme than attitude and the degree of social support received.

Some work has been carried out with regard to barriers that prevent full participation in online courses, even for students who complete them. Howard (2002), for example, identified several barriers with regard to online interaction, the principle one of which was an "insurmountable social-psychological barrier". Technical problems were also blamed for a lack of interaction, with the sound often of poor quality and difficulties in manipulating cameras and microphones. Howard also noted a certain degree of alienation, brought about by the lack of physical presence and the reluctance to use the technology. The latter finding reflects earlier research by, for example, Comeaux (1995) and McHenry and Bozik (1995), which indicated low levels of interactivity often resulting from technological problems.

## Conclusion

This paper has outlined the history of distance education and the way in which information technology has been used to support the practice. Research literature has

offered a number of insights into different aspects of the topic. Most research shows little difference in achievement between distance and traditional learners (e.g. Machtmes and Asher, 2000), although using a variety of media, both to deliver pedagogic material and to allow effective communication between learners and tutors does seem to enhance learning to the extent that distance learners can out-perform face-to-face colleagues (e.g. Navarro and Shoemaker, 2000). Similarly, attitudinal studies appear to show that the greater number of channels offered, the more positive students are about their experiences (e.g. Allen *et al.*, 2002).

With regard to barriers to completing courses, the main problems appear to be family or work obligations, rather than from factors intrinsic to the course or its delivery (Vergidis and Panagiotakopoulos, 2002). Many studies (Carr *et al.*, 1996; Kerka, 1986; Lazin and Neumann, 1991) indicate that demographic variables are less predictive of completing an educational programme than life circumstances, attitude and the degree of social support received. Barriers have also been identified to the full participation of students, such as technical problems (Williams, 2002; Comeaux, 1995) or ability and social factors inhibiting interaction (Howard, 2002).

The research being carried out by UCL/Sheffield universities should enhance these findings, by exploring the impact of “on-demand” video material, delivered by DiTV something no previous research has, apparently, examined. It might be particularly needed in the current climate where distance education is often subsumed into e-learning and this is seen as the panacea for everything, whereas actually these other mechanisms may be as viable.

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