

MODULE: 4a) History of DE Media Usage
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This section introduces the fourth Module in the series, which focuses on the selection, design, production and evaluation of media materials in distance education (DE). The section discusses the media technologies of DE, and their evolution from the early correspondence models to the automated online delivery systems of the present day.

The *educational technology* field, and the media it uses, have been vigorously studied and evaluated for over fifty years. Thousands of research studies have been published on which the selection and usage media uses in distance education (DE) and open and distance learning (ODL) can be based. Much of this literature cannot be found in the literature of DE or ODL, however, since these fields have only emerged since the 1990s, without extensive reference to the previous educational media literature. From the 1970s, however, the literature of educational broadcasting, educational video and audio, print design, computer-based instruction, multimedia, programmed learning, and communication studies have provided numerous insights into 'best practices' for today's teachers and students. The long tradition of educational media research and evaluation is of value in both distance- and campus-based education. Even though today's educational systems use new technologies (e.g. Internet and cell-phone methods), the demands they seek to satisfy are relatively constant in all educational situations. This Module section focuses on the particular needs of DE media to overcome students' constraints of time, geographical location, and study pace, and the need for effective interaction with the teacher.

Evolution of DE hardware

As new media technologies have emerged, they have been adopted for educational use with varying degrees of success. With its special dependence on technology platforms, DE has seen intensive uses of all media technologies. Taylor (2000) described the range of DE technologies in terms of five evolutionary stages:

1. *The correspondence model.* This approach is associated with the modern DE initiatives of the 1970s. By sending the students print materials in the mail, teachers aimed to solve the problems of other commitments (time), geographical distance (place), and preferred speed of learning (pace) that many students face. The disadvantage of these methods, however, is the lack of direct interaction between the teacher and student.
2. *The multimedia model.* In the 1970s and '80s, combinations of print, audio-visual, and computer-assisted methods were developed. These enriched the learning experience, though direct interaction with the teacher was still restricted to, e.g., the mail and telephone.
3. *The tele-learning model.* This model involves methods of synchronous interaction (e.g. audio/video-conferencing) between teachers and distant students. In its original form, the approach combined audio-visual media with telephone conferencing, though with a loss of flexibility in relation to time, place and pace.
4. *The flexible learning model.* The previous models are combined in this model with particular support from the Internet and World-Wide Web (WWW). Teacher-student and student-student interaction can be created by methods including e-mail and synchronous and asynchronous online conferencing. A

wide range of solutions to the problems of time, place and pace can be applied without losing the advantages of synchronous interaction.

5. *The intelligent flexible learning model.* The only major difference between this model and the previous one is the use of online technologies including databases and automated response systems to reduce the costs of educational administration.

Table 1, taken from Taylor (2000), compares the advantages of these five generations in terms of their ability to deal flexibly with students' problems of time, place and pace. His classification system helps to advise the appropriate selection of media for DE purposes. It must be stressed, however, that Taylor's analysis, as the international literature of educational technology in general, is primarily based on an understanding of conditions in western-style education. In North America, Europe and Australia, most media are more universally accessible and more reliable than in Asia. Taylor's summary is useful as an introduction to the range of technologies for consideration in Asian DE institutions; but no medium can be assumed to be appropriate in a new regional context without testing. Internet-based e-learning, for example, offers solutions to all of the traditional educational obstacles of time, place and pace, but it needs careful evaluation before being adopted in a new geographical area and culture.

Table 1. The five generations of DE technology (Taylor, 2000).

Models of Distance Education and Associated Delivery Technologies	Characteristics of Delivery Technologies				Institutional Variable Costs Approaching Zero	
	Flexibility			Advanced Interactive Delivery		
	Time	Place	Pace			
First Generation - The Correspondence Model • Print	Yes	Yes	Yes	No	No	
Second Generation - The Multimedia Model • Print • Audiotape • Videotape • Computer-based learning (e.g. CML/CAL) • Interactive video (disk and tape)	Yes Yes Yes Yes Yes	Yes Yes Yes Yes Yes	Yes Yes Yes Yes Yes	No No No Yes Yes	No No No No No	
Third Generation - The Tele-learning Model • Audio-teleconferencing • Videoconferencing • Audiographic Communication • Broadcast TV/Radio and Audio-teleconferencing	No No No No	No No No No	No No No No	Yes Yes Yes Yes	No No No No	
Fourth Generation – The Flexible Learning Model • Interactive multimedia (IMM) • Internet-based access to WWW resources • Computer-mediated communication	Yes Yes Yes	Yes Yes Yes	Yes Yes Yes	Yes Yes Yes	Yes Yes No	
Fifth Generation – The Intelligent Flexible Learning Model • Interactive multimedia (IMM) • Internet-based access to WWW resources • Computer mediated communication, using automated response systems	Yes Yes Yes	Yes Yes Yes	Yes Yes Yes	Yes Yes Yes	Yes Yes Yes	

As the Table shows, the first generation of DE media was used in *correspondence education*, an independent study system using printed materials as the main learning medium (e.g. study guides sent by the instructor by mail, and student assignments returned by mail for grading). The second generation was characterised by the use of audio and video technology (*multimedia model*), and by interactive computer-based technologies such as interactive video. The United Kingdom Open University (UKOU) was established during this generation in 1969. The UKOU was the world's first open university, and gave birth to the third generation of DE media characterised by the use of broadcasting and recording techniques (*tele-learning model*). This evolutionary period developed educational delivery systems using TV, radio, and audio/video cassettes, together with audio/video-conferencing and audio-graphic methods.

Textbooks and media such as TV and radio have wide coverage but are still not effective in facilitating interaction between teachers and students. On the other hand, audio/video-conferencing has provides two-way communication, but its coverage is limited by the complex and expensive equipment required (Bates, 1995). An important priority in planning DE, therefore, is to choose educational media capable of increasing the intensity and interaction qualities of the teaching/learning situation, without forfeiting the educational programme's need to have wide coverage. The fourth generation of educational media (*flexible learning model*) satisfied, for the first time, all of these needs simultaneously. Emerging in the early 1990s, it is based on extensive usage of the Internet, notably for the interactive functions which Taylor (2000) referred to as computer-mediated communication. The fourth generation has developed rapidly, and has combined the capabilities of all of previous media generations to cope with the needs for flexibility of time, place, and pace, and for choices between synchronous (real-time) and asynchronous interaction as appropriate.

The fifth generation (*intelligent flexible learning model*) differs little from the fourth, though has added useful automated facilities (databases, response systems, interactive web sites, etc.) to increase student access to resources and learning support services. It is within the fourth and fifth generations of ODL that the popular jargon terms *e-learning*, *mobile learning*, and *open educational resources* have been generated. The fifth generation of educational media is rapidly gaining ground in DE and ODL, owing to the significant costs reductions it offers for DE implementation. Earlier approaches involving the pre-production of print materials required institutions to make substantial monetary investments, and ODL could only be cost-effective if economies of scale could be achieved - by the production of a sufficiently large amount of teaching/ learning materials, for example (see section 2b). In the fifth generation of ODL, however, ODL systems can be implemented with minimal investment and without restrictive economies of scale.

Media convergence

In the first few years of the 21st century, the rapid developments of media technology are generating innovative combinations of the media (*convergences*) with significant implications for educational users. These include hybrid combinations of wireless technology, mobile computing methods, and cell-phone-based short messages services (SMS) and multimedia message services (MMS). Mobile devices including the smart phone, personal digital assistant (PDA), and other handheld gadgets have generated the *mobile learning* or *m-learning* era (Mobile Learning Group, 2004). Alexander (2004) has described the mobile media are ideal for 'just in time' education, another term for the need of students to acquire information with maximal convenience, whenever and from wherever they wish, as from the Internet and automated response systems.

A more traditional form of convergence takes place whenever different media are combined in the same curriculum. In many DE and ODL institutions, the five generations of DE media technology exist side by side, and a single curriculum may have all of the following components:

- learning materials (print; non-print multimedia; online);
- learning support (face-to-face; telephone; fax; online; radio and TV); and
- student assessment (supervised and self-assessment; face-to-face and at a distance).

In North America and Europe, however, many of the traditional media have now been abandoned in favour of online methods. This process began in the mid-1990s as educational TV and radio studios closed their educational TV and radio studios in the belief that the WWW is now all their teachers and students need. E-learning in these parts of the world has come to be defined in the narrow terms of education via the World-Wide Web (WWW) exclusively, and educational convergence is actually being prevented. In developing countries, however, WWW materials are inaccessible to substantial majorities of the population, and educators must avoid interpreting e-learning in the narrow, WWW-oriented terms of western DE. In such countries, the traditional media permit ‘electronic learning’ to occur more openly, reliably, and democratically than may ever be possible by Internet-based methods. E-learning in Asia can now evolve in more imaginative terms, as a convergence of traditional media such as TV and radio, and new online media as appropriate.

Creative media convergences of this type have been practised in India, for example, with the use of the railways for broadening educational access. Government-sponsored educational trains including Vigyan Rail (2003-04) and the ‘freedom train’ (2007-08) have carried multimedia information and education to millions of people throughout the nation. The term ‘online’ in India also has a broader meaning than in the west, for its represents the convergence of all media, not just WWW-based, via Internet connections. The value of delivering all media over the Internet is only now beginning to be appreciated in the west with the introduction of streaming TV devices to the domestic market; whereas the China Radio & TV Universities are using such techniques in education already (Chen Li, 2007). In Russia and Ukraine, the convergence of new media and the railway system for education and social development dates back to Lenin’s development of ‘film trains’ in 1919 (James, 1996a, b). In Mongolia it is pointed out that Chinggis Khan created a mobile information and communication system when he sent his horsemen across the steppes to deliver the mail 800 years ago!

Open educational software

The rapid convergence of old and new media is also being facilitated by the increasing availability of media materials, downloadable from the Internet free of charge. A new form of course materials sharing has evolved, known as open content, open courseware, or open educational resources (OER). The OER term was coined at a UNESCO meeting (2002) on the use of OER in Developing Countries, and refers to:

- *learning content* (full courses, courseware, content modules, learning objects, collections, journals);
- *software tools* (development, use, re-use and delivery of learning content; searching and organisation of content; content development tools and learning management systems; and online learning communities); and
- *implementation resources* (e.g. intellectual property licenses to promote open publishing of materials, design and best practices, and content localisation). A major proponent of OER is the Massachusetts Institute of Technology (MIT), which has made its course content freely available to the general public since 2001 (ocw.mit.edu/).

Six years later, countless repositories offer free learning content. (Entering “open educational resources” into the Google search engine in late 2007 yields 314,000 entries/ websites.) Wiley (2006) has listed active OER initiatives including:

- over 150 universities in China participating in the China Open Resources for Education initiative, with over 450 courses online (www.core.org.cn/cn/jpkc/index_en.html);
- 11 universities in France under the ParisTech OCW project, with over 130 courses (graduateschool.paristech.org/);
- 7 universities in Japan under the Japanese OCW Alliance offering over 140 courses (www.jocw.jp/);
- 6 universities with OER projects in the United States, at MIT (ocw.mit.edu/); Rice (cnx.rice.edu/); Johns Hopkins (ocw.jhsph.edu/); Tufts (ocw.tufts.edu/); Carnegie Mellon (www.cmu.edu/oli/); and Utah State University (ocw.usu.edu/), offering total of over 1400 courses.

Wiley also reports important translation efforts that will broaden the impact of OER initiatives, including:

- Universia's Spanish and Portuguese translations (mit.ocw.universia.net/ and www.universiabrasil.net/mit/index.jsp);
- CORE's simplified Chinese translations (www.core.org.cn/OcwWeb/Global/all-courses.htm); and
- the OOPS traditional Chinese translation community (www.cocw.net/).

In addition to these course-based OER facilities, numerous non-course OERs include:

- Rice University's Connexions Project, which currently hosts over 2,700 open learning objects (cnx.rice.edu/);
- the Textbook Revolution (textbookrevolution.org/) containing links to hundreds of freely available, copyright-clean textbooks;
- Math World (mathworld.wolfram.com/); and
- freely available (though not quality-controlled) encyclopedias such as Wikipedia (wikipedia.org/).

This explosion of materials publishing and sharing has been made possible by the development of easy-to-use authoring software and learning management systems (LMS). Online publishing is now possible for anyone with internet access, without the need for software programming skills. This software has become widely available as non-commercial programmers have successfully created LMS products rivaling proprietary packages costing \$20,000. The open-source software (OSS) movement is revolutionising institutional software production, and techniques such as 'blogging' and 'podcasting' are providing teachers and students with facilities for instant online publication.

Digital learning objects

The individual units of course material are known as 'learning objects' (LOs). Wiley (2000) defines a LO as "any entity, digital or non-digital, which can be used, re-used or referenced during technology supported learning". To enable efficient object sharing, numerous LO repositories have been developed.

- The Library and Information System (LIS) based in Singapore is a repository enabling teachers and students to share syllabi, lesson plans, LOs and teaching materials (Chaudhry & Khoo, 2006).
- Educators in Thailand have developed a digital objects library in order to share learning resources among K-12 teachers and students (Hasan, 2007).
- Indonesia, through one of the Ministry of National Education's centres (Pustekkom), has developed online content for K-12 education through its Edukasi.net portal. This initiative is providing teachers and K-12 students with enriched learning materials and help in the preparation of lesson plans.
- A Japanese initiative (Shimizu, 2006) has developed a 'Gateways to Learning for Ability Development' portal at the National Institute for Multimedia Education (NIME-Glad). This system provides learners with links to all LOs accessible through the Internet. The function of GLAD are searching and retrieving information, providing learning and course management functions, a course authoring system, learner registration, and enabling international collaboration.

To this point, however, relatively few Asian educational institutions have been able to develop their own LO repositories, or to take advantage of existing English-based LOs available worldwide. In an effort to assist Asian educational institutions in developing appropriate DE media in general, the 2005-07 PANDora studies across Asia have evaluated a wide range of LOM methods, OSS software, cell-phone techniques, and old/new media convergences (*see sections 4d and 4e*).

Software localisation

A major hurdle to the widespread use of open courseware and digital objects is the lack of software localisation. The problem does not merely refer to the need for software translation into local languages. The Localisation Industry Standards Association (LISA) defines localisation as "...taking a product and making it linguistically, technically, and culturally appropriate to the target locale where it will be used and sold. Esselink (2003) describes the following localization activities, not necessarily a part of traditional translation:

- Multilingual project management;
- Software and online help engineering and testing;
- conversion of translated documents to other formats;
- translation memory alignment and management;
- multilingual product support; and
- translation strategy consulting.

'Localisation' is often referred to as 'L10n', a short form in which 10 is the number of letters between 'l' and 'n'. The IDRC-sponsored 'PANL10n' initiative (2004-2010), is a major research and development activity involving teams in Afghanistan, Bangladesh, Bhutan, Cambodia, China, Laos, Mongolia, Nepal, and Sri Lanka. In addition to developing local language content and software, PANL10n is assisting in the development of localisation policy, outreach and training in the partner countries,

Conclusions

The section has discussed the evolution of DE media through the five generations described by Taylor (2000), and the ways in which different media can combine to form new (convergent) media. New technological forms are contrasted with equally imaginative convergences using old media. For example, mobile learning, commonly associated with modern portable technologies, can be seen as a new manifestation of mobile educational principles developed a century ago. Many of the traditional media and methods have far greater potential in developing countries owing to the widespread inaccessibility of the new Internet-based methods. The open educational resources, open source software, learning objects sharing, and software localisation movements are taking rapid steps towards making educational media and materials freely available. If such technologies become widely accessible, the liberating and enhancing process of lifelong education for all may at last be a reality.

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