

Multimedia in Distance Education

Implication of Using CD-ROM

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What is Multimedia?

The term 'multimedia' has become an educational 'buzz-word' of the mid-1990's. This year the EU has launched a large scale multimedia programme and most European countries are starting programmes of their own, aiming at a national development of multimedia and information technology. But what do we really understand by the term 'multimedia'.

A Danish dictionary from the 1960's gives the following definition:

Multimedia = combined use of educational radio or television on the one hand and printed material on the other.

This is a media mix which may look rather old fashion, but, nevertheless, still refers to an everyday situation for learners in most open universities. In the latest edition of EDEN's electronic newsletter *Andrea* (vol. 4, no. 5) Jack Koumi (former BBC Open University producer, now a private consultant) writes a position paper on appropriate educa-

tional technologies in which he refers to the present situation at the Open University:

The UK OU tries to select that medium which best benefits the nature of each topic or learning task. This results in a media mix in which UK OU students spend:

- 5% of their study-time working with television
- 15% working with audio (or audiovision)
- 80% working with printed materials.

As a hidden argument behind this emphasis on the right choice of media for different learning situations one recalls Tony Bates' rather well-known diagram from 1989 dealing with the differences in the symbolic systems between media (Diagram 1.) (Bates, 1989):

Bates' suggestion was to consider such parameters as voice, written language, colour, still pictures, animation, dramatic events and full movement when we make the choice between media such as lectures, audio (radio), print, computer and television (video).

Diagram 1.

Lecture	Audio	Print	Computer	Television
voice	voice	no	no	voice
written language	no	written language	written language	written language
colour	no	?	?	colour
still picture	no	still picture	still picture	still picture
no	no	no	animation	animation
?	events	events	no	events
no	no	no	no	full movement

? = usually at higher cost, or only occasionally, or with difficulty.

From a pedagogical point of view these considerations are still valid and the parameters still of the highest importance to consider when we design learning materials. The different symbolic systems do support different communicative actions and, in that way, stimulate different aspects of the learning process.

From a technological point of view the diagram is an illustration of how fast some technologies change. In relation to the computer all Bates' 'question marks' and 'no's' are outdated! At the moment the computer is able to support communication in voice, written language, colour, still picture, animation, dramatic events and full movement almost at the same level as television.

Furthermore, the computer offers the student an opportunity to interact physically with the learning material on a symbolic level, whereas the other media – at the physical level – only allow for browsing and repetition (turning the pages and winding-re-winding the tapes).

This possibility for interaction on the symbolic level is what makes the computer unique. The computer is no longer one option or one choice of media among others in a media mix as it was considered a few years back, when computers primarily were used for word-processing, e-mail, computer conferencing and running of CBT-programmes. The computer has other options because it relies on a new language using a binary code (0 and 1) which is able to handle both signs, visuals, sounds and other kinds of formal systems in approximately the same way as the alphabet supports print and written language (Finnemann 1996).

The computer is an integrated medium for

- production (paper, pencil, typewriter, brush, etc.)
- preparation (content, form, layout, etc.)
- storage (book, library, database, etc.)
- copying (printing, copy machine. etc.)
- search (index, catalogue, etc.)
- distribution (mail)
- communication (telephone, fax)

of knowledge or symbolic formulated content.

Due to this integration of previously disintegrated functions and operations the computer has become the vehicle for multimedia. But this development has not been supported so much by 'the computer as a machine' similar to the radio and television monitor as by 'the computer as a medium' using a digital communications system different from the analog system used in other media.

To clarify the term 'multimedia' further a recent Danish publication on 'multimedia and the development of technology' (Jensen, 1995) has drawn up a diagram with a separation between multimedia and non-multimedia on the one hand and interactivity (symbolic interaction) and non-interactivity on the other (Diagram 2).

Following this diagram it becomes obvious

- that not every application which runs on a computer is a multimedia, e.g. text-based programmes – hyperstructured or not,

Diagram 2.

		Non-Multimedia	Multimedia
Non-Interactivity		television, radio, film, print, books, dias, etc.	linear presentations, and demos, etc.
Interactivity	Non-Hyperstructure	wordprocessing, desk-top publishing, spread sheets, database, etc.	computer games, computer fiction, etc.
	Hyperstructure	hypertext	non-linear presentations, WWW, etc.

- that the term multimedia is used also for application which are non-interactive, e. g. linear presentations or demos which may run on computers,
- that within interactive multimedia there is a dividing line between hyperstructured and non-hyperstructured applications.

Learning Media for the Future

The advantage of the computer is the use of digital information processing, but this way of handling data is about to be integrated into other media. At the moment most telephone communication is digital – at least in the Western world, and television will become digital within a few years offering the users High Definition Television, a multiplication of available programmes and several interactive services. Especially, families connected to cable-television will have these new options and providers of cable-television are at the moment exploring the possibilities of offering telecommunication facilities as telephony, e-mail and internet access through the cables exchanging the remote-control with a small key-board.

From an educational point of view one of the important questions is: will the home-based PC and interactive television merge into one medium? In that case we – as providers of education and learning materials – would only have to develop for one platform: the digital interactive television with integrated two-way communication.

Some statistics on the penetration of communication hardware in Danish households may give an indication of the direction in which the development is moving. Denmark is in this matter on line with the other Scandinavian countries and in the upper end of Europe as a whole.

Communication Hardware
in Danish Households 1996 (percent)

Television	97
Text-tv	69
Video	66
Cable-tv	56
Satellite-receiver	11
Telephone	96
Mobil-telephone	43
Home based PC	47
Modem	9

The low penetration of modems put severe limitations on the use of computer-based communication

in learning and especially in distance learning. In practice it restricts the possibilities of using multimedia in home-based education to stand-alone systems like CD-ROM and excludes facilities like the WWW and e-mail – at least for the next years. Compared to the situation in the United States the amount of modems should have been doubled. Probably, the low penetration is caused by the relatively high level of local rates on telephony in Europe.

As a consequence of these limitations for computer networking the educational providers may place confidence in digital interactive television. Not least, because this development will be pushed forward by the apparently never declining market for entertainment. A small Danish co-operative company with interests in local television has launched its visions for this coming piece of hardware – a ‘TVPC 2005 Digital Standard’, which could be available on the market for Christmas year 2005 (AEM Invest, 1996). A selected list of the imagined specifications look like this:

TVPC 2005 Digital Standard

<i>Hardware:</i>	<i>Software:</i>
Sony Colour Monitor	MS Windows
Intel Processor	Electronic Programme Guide
Digital Video Drive (music, video, CD-ROM)	Children Safe
Remote Control	<i>Television:</i>
Nokia Digital Desk	10 National channels
Nokia Mobile Phone (hand-free)	20 European channels
Build in stereo speakers	
Sony Web (modem)	
<i>Extra equipment:</i>	<i>Extra programme packages:</i>
Key board	A European package
Multi-room server	An American package
Video phone recorder	A Global package
Phone exchange	<i>Pay television:</i>
Room surveillance	International News:
Heath and light regulation	Sport, Nature, Children
Surround sound link	and Music programmes
Colour printer	FilmNet
Scanner	SEGA (games)
Microphone	<i>On-line services:</i>
Joy stick	Alta Vista
Karaoke	Opasia
	Newspapers on-line
	National Information Service
	TicketNet
	<i>Home-shopping:</i>
	Banks, etc.

Certainly, this is an impressive piece of equipment – 100% digital, independent of cable-network for

interactive communication, instead, using mobile telephony and satellite desk receivers. On the software side the user will have a running on-line update of the latest version of any programmes he or she signs up for.

Nevertheless, I am skeptical towards this cloning of an interactive television set and a home-based computer as the sole educational medium for the future. No doubt, the TVPC will supersede the television set and extend the learning options for distance learners by supplying two-way communication. But in many homes we will also find the fully equipped home-computer with net-cards for high speed communication and a CD-ROM drive. The two pieces of hardware may even run on the same network – cables, satellites or mobile telephony.

My confidence in the survival of the home-based PC is based on the observations that we interact very differently with the computer and the television. The working distance towards the computer is 50–60 centimeters, towards the television screen the normal distance is 2–5 meters depending on the size of the screen. In front of the computer you sit in a upright position similar to the one at your desk, in front of the television you sit relaxed in an armchair. These differences has to be respected. Consequently, students following courses in their leisure time, but as a part of a career programme will prefer the home-based PC which opens up for integration with the workplace, whereas people participating in education out of pure personal interest will be more likely to use the TVPC already in the home.

My main point is that the TVPC and the home-based PC are two different media. They relate to each other in approximately the same way as films relate to television. Films may be shown on television, but the experiences of watching in the living room are very different from that of going to the cinema.

On television – and also on educational television – the presenter, normally, is photographed from an angle slightly below giving him or her authority. But try to present these images on a computer and you will have the feeling of the presenter speaking down to you. Educational material on the computer has to respect the equality between the learner and the learning material – the computer supports an anti-authoritarian mode of communication in learning.

The aesthetic principles applied in the production of learning materials for the computer (WWW

and CD-ROM) and the digital interactive television (CD-I and video) have to be different!

Learning via CD-ROM

The CD-ROM as a medium contains both signs, visuals and sound organised in a way open for interactive processing by the user/learner. At the same time the CD-ROM also is a medium for storage of huge amount of data (information) and for distribution via sales or mail of these data. In other words CD-ROM is a multimedia, but it is not the only one, CD-I is another which may soon merge with the CD-ROM, and WWW is a third option at the moment.

To illustrate the educational potentials of multimedia and especially the CD-ROM I have previously worked out the following diagram showing the different forms of educational interplay between the learner and the learning materials (Diagram 3).

The diagram focus on three levels of communication (media) specific interplay in learning, reflecting, at the same time, the different types of educational communication – synchronous and asynchronous (stored and delayed) communication.

Presentation, in this educational context, is referring to the level of discourse, viewing presentations as, basically, sender dominated one-way communication of information in one of two formats – didactic or narrative.

In a didactic presentation information is told by an expert, organised according to logic and displayed in a sort of ‘eternal’ tense with no clear separation of past, present and future. The competence of the presenter is never doubted and the receivers are offered the possibility of identification with the position from which the discourse is formulated.

In a narrative presentation the narrator takes up a profiled position as intermediary between the narrated and the receiver. The narrated is organized as a story according to time – out of the continuum of time a sequence of events is given direction by being presented with a beginning and an end. The interplay between the time of narration and the time of the narrated creates a ‘space’ of reflection in which the learner may reflect upon (contemplate) the narrated together with the narrator. The receivers are offered the possibilities of identification both with the narrator and the protagonists of the narrated story. Narration (storytelling) has become the medium – at least in Western civilization

Diagram 3.

Interplay in Media Supported Learning	Synchronous (contemporary communication)	Asynchronous (delayed & stored communication)
Presentation	'lectures', broadcast radio & TV	(stored communication) print, audio & video cassettes
Interaction	'role-plays' (?)	(stored communication) interactive video, CDI, CD-ROM, WWW, CBT-Programmes
Dialogue	'lectures' telephony, audio & video conferencing, audio graphics, CSCW	(delayed communication) telefax, e-mail, computer conferencing, voice mail, CSCW

since the beginning of modernity in the eighteenth century – for reflecting upon man's relation to past, present and future.

Interaction in educational communication is also, basically, dealing with presentation of information. Although, the learner has a possibility to interact with the learning material the communication is one-way. Interactive media are stand-alone systems in which all the information is stored before the interaction begins.

Interactive media are more suitable for presentation of information organized along logic-didactic lines than for presentation as narratives. The hierarchic and ramified structures which are used to present material in interactive media correspond more easily with logic. Both are speaking in a discourse of 'eternal' tense.

Interactive media may be ranked in four categories according to levels of possible interaction:

- browsing
- consultation
- games
- hypothesis testing

Interaction organized as browsing and consultation are primarily used in sender oriented presentations of information in which the user may choose between certain routes through the material. Con-

sultation allows for more sophisticated search options than browsing.

Interactive systems organized as games or built for hypothesis testing are more user oriented allowing the user to follow his own path through the material. Games create a closed world of its own in which the players move around following different paths according to the rules of the game. But in a perspective of learning this becomes problematic because the absorption in a game is contrary to reflection and contemplation which are the goals of learning.

Systems targeted at hypothesis testing have to be rather big, containing lots of information, to reduce the user's risk of meeting the limits of the system. When the learner is confronted with these limitations he or she is thrown back into a position similar to traditional didactic learning in which the sender (the author) becomes the authority.

Dialogue is not a learning mode in its own right – unless we follow a Socratic model – but an option to combine with any dissemination of information. Both didactic and narrated presentations as well as interactive materials may be integrated with dialogue – especially on the synchronous level, but through telematics also at the asynchronous level.

The possibilities for dialogue between learner and tutor/teacher and/or between learners themselves turn 'closed' learning situation based on stored material into 'open' settings in which the

learner in collaboration with a tutor/teacher or fellow learners may explore dimensions not already embedded in the learning material. At the same time dialogue improves learning by creating a situation in which the learner is encouraged to negotiate with the learning material as an aspect of the on-going discussion.

By integrating dialogue in the learning concept the learner may be placed in the center of attention – not overtaken or overwhelmed by the situation, but engaged, in control and ready to negotiate the concepts and ideas presented in the learning material. In this position he or she has command over the learning material, has time to reflect on the presented problems and the possibilities to reformulate or test the new knowledge in a dialogue with others.

At the moment it is not possible to integrate a communication dimension directly in interactive multimedia such as the CD-ROM and the WWW. References to educational material in these formats can only be circulated as quotations which puts rather heavy limitations on a possible (wanted) dialogue. Of course, this does not deprive the CD-ROM and other interactive multimedia of their excellent qualities when it comes to displaying data (information) in a format where it is easily retrieval.

CD-ROM and WWW are especially important for the transference of knowledge – learning – within subject areas in which the knowledge may be organized according to logical and hierarchic

principles. The hyper structure of these media supports the interaction between the learner and the learning material, while, at the same time, the learner remains in a position where he or she controls the learning process.

Although, interactive media offer learning options which we have never experienced before, they are not an answer to all educational problems. We have to use them with consideration for dissemination of information within subject areas for which they are suitable. From a hermeneutic point of view the most severe limitation of interactive media is the lack of immediate support for a narrative dimension. Without narrative presentations with a beginning and an end we may lose the possibility of reflecting time which will reduce the historical dimension of civilization to chronology. The relationship between past, present and future is integrated in the interplay between the time of narration and the time of the narrated. At the same time the narrative presentation creates a 'space' in which the learner may reflect together with the narrator – or guided by the narrator – upon the events and characters in the narrated story. This leaves the learner with an option for a virtual, but guided interaction with the story which from a learning perspective is comparable to the physical interaction in interactive media.

As providers of education and learning materials we have to remember that media are not neutral vehicles for dissemination of knowledge to the learners!

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This paper has been presented at the AECS congress in Oslo on 'New Markets and Opportunities for Distance Education' in the session dealing mainly with 'the opportunities' and referring to the conference sub-theme: 'New technologies and added value'.