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MULTIMEDIA FOR EDUCATIONAL USE

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Abstract

This paper analyzes in detail the most important platforms for multimedia applications. In the paper the main components of the Computer Based Instruction will be introduced. The paper shows also the black box model of multimedia-based teletraining.

Keywords: multimedia, multimedia-based teletraining, computer based instruction.

1. Introduction

In the past years some requirements in connection with training appear ever more frequently and with increasing emphasis (general upgrading of skills and qualifications or competence etc.). Parallel to these requirements and nearly quite independently from them, modern electronic telecommunication technologies (training by computer, new video and audio technique, multimedia etc.) have come to the fore and are playing a substantial role in the renewal of the educative techniques. All these taken together have lead to the rapid expansion of teletraining which uses multimedia. Under such circumstances it is crucial to investigate what constituents have an impact on the applicability efficiency of the multimedia-based curricula and what are the most important factors of it. The purpose of the present paper is to offer an insight to our research work directed on to the development on the efficiency model of the multimedia-based teletraining.

2. Multimedia, Hypermedia

The purpose of this part is to describe the definition and the most commonly used platforms and elements of hypermedia/multimedia training materials from the point of view of distant learning, distant education. We also try to collect the advantages of using hypermedia/multimedia in distant learning.

According to some sources multimedia is defined technically as a plural noun describing the combination of visual and audio display from different sources delivered in the same presentation. More commonly, it is used to describe the use of text, music, animation, moving images, and sound to educate and/or entertain. As the word 'Multi-Media' is used more extensively, the hyphen is increasingly being dropped creating a compound word 'Multimedia'. Multi-Media can be delivered in a variety of forms. Web site is one example. CD-Rom's another. Other popular examples include cross-media or mixed-media presentations and promotions. We are increasingly expecting more interaction from our Multi-Media. Examples of high quality Multi-Media have traditionally required dedicated hardware and customized software. Due to this demand for greater responsiveness and faster delivery, standards and techniques are slowly being adopted within the industry that allow for distribution beyond the realm of dedicated computers. When considering hypertext and hypermedia it was noted that the two terms are interchanged. Unfortunately, the same can also be said for hypermedia and multimedia. Several years ago, there was a distinct difference in definition between the two of them with hypermedia being a program which was self contained so that the associated media were displayed on the computer, while multimedia referred to a presentation where a computer was used to control a peripheral device which was normally a videodisc player. In this case, the information from the videodisc was displayed on a high resolution video monitor and not the computer screen.

The situation in regard to multimedia is further confused by the fact that there are two distinct types of it, presentation multimedia and interactive multimedia.

Presentation multimedia is used mainly by the business world. The computer is used to control various media such as sound, graphics, animation and video to produce a presentation which is then recorded on video tape for use as promotional material. The main advantage of this over preparing such materials by conventional means is that it does not necessarily require specialist staff to produce them and so it is much cheaper. This is illustrated by the production of computer generated animated films where the films can be produced at a fraction of the cost of normal animation where teams of highly specialized animators are involved. While the use of such multimedia is usually confined to the business sector, some see it as having a role in education, not as a means of instruction, but rather as a way of students presenting information that they have studied. The type of multimedia most commonly used in education is the interactive multimedia. The user, as the name suggests, can interact with this so that information can be accessed in a non-linear fashion. This term can be further sub-divided according to the hardware platform that supports it.

The most important platforms for multimedia applications are:

2.1. Interactive Video

Videodisc is the original optical disc and has been available for more than 10 years. They are 12 inches in diameter and store information in analogue form. The disks are doublesided and can hold 30 minutes of video on each side. Videodiscs have three levels of interactivity. At level I a videodisc is played on a videodisc player with little user control. In this mode, a videodisc would be used for replaying a film in much the same manner as it would be played by a VCR. Level II uses a small hand-held device which is used to give a degree of interactivity, while at level III, a computer is in control of the videodisc player and it is at this level at which interactive multimedia becomes a reality.

There are two different forms of interactive videodisc systems. In the first, the video from the disc is displayed on a separate television screen. While this is the cheapest form, extra cost is incurred through the necessity to purchase a high resolution monitor. Also, there is no real focus to the presentation as the text appears on the computer screen and the video on the monitor. The second type uses a video card in the computer to which the videodisc player is attached. This allows the video image to be viewed directly on the computer screen and to be merged with the normal computer output.

2.2. CD-ROM

Compact Disc Read Only Memory (CD-ROM) is based on the same technology as the Compact Discs used for storing and replaying music. They have been available since 1985 but it is only recently that they have started to make a major impact on the market. There are several reason for this. While today's CD-ROM players access information at a slower rate than can be achieved from a floppy disc, this is considerably faster than previous models. The price of players has also dropped considerably. CD-ROMs are 4.72 inches in diameter and hold approximately 650 MB of data. As indicated previously, while this appears to be a large storage capacity, when it comes to storing video it is woefully inadequate.

2.3. Digital Video Interactive

The essence of DVI is a set of compression algorithms held in hardware that can reduce the storage requirements of one video frame to less than 5 kilobytes which enables a CD-ROM to hold more than an hour of video. Since its creation in 1984, DVI has not made a great impression on the education market but the technology has now been acquired by Intel (who manufactures the range of central processing units used in MS-DOS computers) and IBM, and Intel claim that DVI technology will be built into the microprocessor itself and so will become a standard feature of the personal computer by the year 2000.

2.4. Compact Disc-Interactive

Unlike the other systems described so far, CDI, which was developed by Philips and Sony in 1986, is not an add-on to a personal computer, instead it is a stand alone unit which is designed to connect to a home television set. Its primary market is home entertainment, and this is reflected by the fact that it is capable of playing audio CDs as well as CDI discs. Due to its low cost, however, it may well make an impact on the classrooms of the future.

2.5. Commodore Dynamic Total Vision

Commodore Dynamic Total Vision (CDTV) is a similar system to CDI in that it is a stand alone unit that plugs into a television set and is capable of playing audio CDs. It is based around the technology of the Amiga computer and gives high quality sound and graphics, as yet it does not support full-motion video but this facility is under development.

2.6. Compact Disc-Read Only Memory Extended Architecture

Compact Disc-Read Only Memory Extended Architecture (CD-ROM XA) was developed by Microsoft, Sony and Philips and released in 1988. It is designed to hold digital and still images but has been demonstrated to provide limited amounts of video. Like a standard CD-ROM player, the CD-ROM XA player is connected to a personal computer

2.7. Laserdisc-Read Only Memory

Laserdisc-Read Only Memory (LD-ROM) was developed by Pioneer in 1989. It is designed to combine the analogue technology of the videodisc with the digital technology of CD-ROM. It can hold 30 minutes of video per side (the same as standard videodiscs) plus 270 megabytes of digital information.

The most commonly used elements of multimedia are indentifiable. According to Graystone Multimedia Design Group, multimedia is defined as using a combination of elements to create a dynamic, visual presentation that catches the viewer's attention and maintains their interest throughout the presentation. There are several elements – text, graphics, photos, sounds, animation and video – that can be included in a multimedia presentation. Obviously, a TRUE multimedia presentation combines all of these elements.
The most important elements are:

2.8. Text

Traditionally text has been used to convey messages. Although text is an excellent device for delivering information, text can often be too slow at getting the message across.

2.9. Graphics

Graphics can convey messages instantly. Trends are immediately evident in the graph. A picture can be worth a thousand words if used properly to convey message.

2.10. Photographes

Nothing can describe something like a full color photograph. Full-color photographs can also add impact to any presentation when used as backgrounds for text and graphics.

2.11. Sound

Without a doubt, sound is the best way to attract attention. Simple sound effects can easily be used to draw attention to various aspects of electronic brochure and will fit on a floppy disk. For more complex presentations on a hard drive or video, voice-overs and music add depth, making the presentation more enjoyable for the viewer.

2.12. Animation

Animation does not necessarily have to involve complex 3D graphics to be effective in multimedia presentations. Simple animations add enjoyment to the electronic brochure and attract the attention of browsers to the display at trade show booth or store front. However, more complex animation can be used to demonstrate and instruct. With animation, man can show the operation of product in ways that are impossible with static pictures.

2.13. Video

In the past, video has been defined as multimedia. Video makes use of all the elements of multimedia, bringing products and services alive, but at a high cost. Scripting, hiring actors, set creation, filming, post-production editing and mastering

can add up very quickly. Five minutes of live action video can cost many many times more than a multimedia production. For these reasons, video has traditionally been used sparingly.

As far as we can think over the possibilities of using the above mentioned platforms and elements in distant education, we can state that the main advantages of using hypermedia/multimedia in distant learning are the following:

- Effectivity of the teaching–learning process through the used several elements
- Individual learning
- Flexible time schedule for learning

The characteristic features of hypermedia/multimedia platforms and elements and the increasing general technical standards in education make it possible to create effective training–teaching materials and courses with low costs. Multimedia is one of the best ways to keep the effectivity/cost ratio of the teaching–learning process as low as possible.

According to Tony Brown there are a variety of terms used to describe the educational use of computer and each has a slightly different meaning. Computer Assisted Learning (CAL) is an all encompassing term to describe any educational use of computers.

There are three main groups:

1. when the computer is used as a tool (word processor, data base, spread sheet, and graphics application)
2. when the student 'teaches' the computer, for example, by issuing a set of instructions to the computer through a programming language such as Logo, and
3. when the computer delivers some instructional material

This latter situation is termed Computer Based Instruction (CBI) or Computer Assisted Instruction (CAL) which is an older term than CBI.

Computer Based Instruction has traditionally been composed of four main components:

- Drill and Practice
- Tutorials
- Games
- Simulation and Modelling

Modern technologies have added to these Hypertext, Hypermedia and Multimedia.

2.14. Drill and Practice

was probably the most extensively used CBI application in the early days of the educational use of computers. It can be argued that there were two main reasons for this:

- they were comparatively easy to program, which was important as there was little available commercial software and so teachers who wished to use computers had often to write much of the software themselves
- the programs could show off effectively the capabilities of the computer and this was important for the computer-enthusiast teacher as it could help to win over colleagues to the cause, and hopefully, result in more money being spent on computers in schools.

A drill and practice program typically deals with material that has already been taught. The student is presented with a task, often selected randomly, and feedback is offered immediately it is completed. A well constructed program of this type should be able to keep pace with the student by offering remedial or advanced level if and when they become necessary. There is a place for drill and practice mainly for the beginning learner or for students who are experiencing learning problems. Their use, however, should be kept to situations where the teacher is certain that they are the most appropriate form of instruction.

2.15. Tutorials

attempt to teach new materials. Typically, they present information and then question the user to ascertain the level of learning achieved. The program should be able to monitor the student's progress and to present remedial or advanced levels if and when required. From a practical point of view, the computer tutorial is very limited in its ability to assess the level of understanding of the student. In the classroom situation, when teachers ask questions, they can assess the level of understanding of the topic, the degree of comfort with the material, etc., by not only listening to the answer given, but also by observing the speed with which it is given, the degree of hesitation, the body language of the student, and so on. The computer, however, is only capable of responding to the answer given, usually by typing characters on a keyboard. A teacher can accept a slightly wrong answer and probe deeper to get the correct one. The computer can normally only respond to a small number of possible answers and often cannot cope with a slightly incorrect answer; for example, if the expected answer is apples and the student enters apple, the computer will frequently reject it which can result in a considerable degree of frustration on the part of the student. There is also a problem from the designer's point of view; after a screen of information has been presented, it is difficult to determine which question will demonstrate an understanding of all the information that has been given. Research is being conducted in the production of Intelligent Tutoring

Systems which should overcome this problem, but these will depend upon artificial intelligence (AI), however, some people state that the true meaning of AI is always impossible.

2.16. Educational Games

are normally placed in a group of their own, but in practice it is often difficult to differentiate between games, drill and practice programs or simulations. It is possible to have a game and a drill and practice program that contain the same content, but which have a different end result. For example, the game Maths Invaders has the same content as a drill and practice program in that users are asked to complete a number of sums, but the outcome is different as when a question is answered correctly, as in the game the student gets to shoot down an alien. A game can also have the format of a simulation but the major difference between the two is that a simulation normally models a real life situation whereas a game can model an imaginary one. Games also have a place to play in the classroom especially as a way of increasing the motivational levels of students. However, they should be used with care. Many students, especially boys, spend a lot of time playing computerized games and it is important that the classroom computer is not seen solely as another games machine.

2.17. Simulation Programs

normally model some real life situations and they enable students to manipulate and experiment with it. The normal justification for using them is in situations where the real thing is too expensive, too dangerous or too time consuming. For example, students would not normally be able to observe the evolution of a species as it would take too long but the whole process could be observed in a very short period of time on a computer simulation. While simulations have a potential to be useful in the classroom, they do have some drawbacks.

As information and computer technology developed, hypertext, hypermedia, multimedia became even more popular, "computer" in the expression CBL or CBI means almost always multimedia or hypermedia equipment concerning training materials, so MULTIMEDIA BASED INSTRUCTION (MBI) can be defined as any educational use of multimedia or hypermedia-equipment, and MBI has almost the same forms and similar platforms as former CBI and CAI. However, MBI can be seen as perhaps a more developed form of CAI.

However the end-user of an MBI-material is always the pupil, we think that we should divide the users into two types: teachers and pupils (because there are always also teachers who have to deal with MBI-materials).

The ways in which teachers can best be supported (according to Lydia Plowman) include:

- easily skimmable materials for gaining an overview;
- an introductory guided tour;
- accompanying documentation, including clearly defined relationships between the material and the curriculum;
- support materials, such as photocopiable worksheets;
- provision for printing out materials.

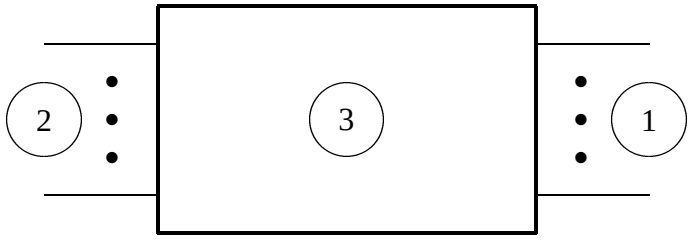
The methods, learners can be supported with, relate to the need for guided interaction. This includes:

- an introductory guided tour which includes basic conventions of user-interface design, as well as what is on the disc and how to escape;
- easily identifiable on-line help;
- fairly short task units with clear connections to each other;
- structured activities

3. Black Box Model of Multimedia-Based Teletraining

Under the model of the multimedia-based teletraining we understand such a model the output variables of which are essential features for those who get in connection with learning, while the output variables are factors which can be changed by the curriculum developers.

The purpose of the model is to describe the relationships between the input and output variables:



1: output variables
2: input variables
3: impact

To identify the output and input variables of this model and to define the order of priorities among them we have carried out a survey of exploring character, by individual questionnaires. The population of the sample primarily consisted of those who get in connection with the curricula (student, teacher, school provider, sponsor, teletraining center, software developer, etc.). The sample covered 50 persons. We have used random sampling by quotes and within the quotes.

The results showed that:

The most important output variables are:

1. efficiency of the teaching–learning process
2. costs of teaching
3. tractability of the curricula
4. ease of use
5. costs of development

The most important input variables are:

1. structure of the used multimedia elements
2. the number of applied effects
3. quality of applied elements

This model can help curricula developers and providers to understand the requirements against multimedia based educational products, and help them to create more usable curriculas.

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