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The Use of Multimedia in Online Distance Learning

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Abstract

Internet technologies are changing our lives and educational systems in many ways. Multimedia is an integral part of the educational environment through online distance learning. This survey, through the selected literature, explores the definitions and history of multimedia in distance learning, especially for adult learners. It shows advances made in capabilities and multimedia uses. Learning management systems enable the growing use of multimedia in distance learning programs. The impact of integrating multimedia and interactivity provides substantial benefits, some drawbacks, some unresolved questions, and an uncertain future. Information technology continues to advance. Many sources disagree on future predictions, but most agree on the necessity of good instructional design and development for multimedia use in online distance learning.

The Use of Multimedia in Online Distance Learning

Internet technologies are changing our lives and our educational systems in many ways (Sheybani, & Javidi, 2004). In distance education, especially in higher education and business, interactivity has become an integral part of Internet learning environments. A brief survey will facilitate an understanding of the growing field of multimedia use in online distance learning. Among some areas to consider are: what is multimedia, what is the history of its implementation, how is it being used today in online distance education, and how does multimedia use in online distance learning impact students and educators? Currently, there are over 10 million students online globally (Jalobeanu, 2003). What are some positive and negative observations that have been made about the use of multimedia in distance learning? Lastly, what trends are evolving in multimedia that will affect distance learning in the future?

A Historical Look at Multimedia Use and Distance Learning

It is important to understand fully the meaning of the terms *multimedia* and *distance learning*. Multimedia is a concept that emerged in the 1950s and commonly referred to a method that combined at least two media formats such as text and video or audio at one time to derive a more complete, not necessarily educational, effect (Heinich, Molenda, Russel, & Smaldino, 1996). Another definition is: “Media providing multisensory experiences, such as sound, visuals, animation and interaction with the media” (Porter, 2004, p. 311). Multimedia use in online distance education may include any additional materials utilized within a course and includes linked text documents, simulations, linked video, games, and music (Porter, 2004). Multimedia interactivity usually refers to a particular kind of technology and not group behaviors such as emails between students (Dempsey, & Van Eck, 2002). However, it does include the use of hyperlinks that allow users to click on a link and follow a path to a new information source in a

nonlinear manner (Hooper, & Reinartz, 2002). There continue to be some differences about how inclusive the term multimedia is.

Multimedia use grew rapidly during the late 1980s and 1990s due to improved technologies that allowed better compression, better graphics accelerators, faster chips, and two or three dimensional images with a variety of file formats and faster connections online (Jalobeanu, 2003). Storage capabilities also grew, along with changes in software (Jalobeanu). Multimedia formats can be implemented on the Internet, on CDs, with overhead projectors, on slides used with sound, on web pages, in video and audio combinations, or simply on a computer through the use of software (Heinich, et al., 1996). Online multimedia distance learning hardware and software technologies will continue to change in the future (Dempsey, et al., 2002).

Distance learning refers to instruction given without an instructor present at the same place and same time as the students (Sheybani, et al., 2004). Distance learning first started with the use of books. In 1840, Sir Walter Pittman created the first distance learning classes in Great Britain when he taught shorthand through the mails to over 10,000 students (Jalobeanu, 2003). During World War II, the army used video to make training films (Heinich, et al., 1996). Much later, in the 1950s, people started to combine their uses of different media materials; they might have used books with phonograph records or photographs with books to teach. In the 1980s, educators began to use digital video on computers; CDs replaced audiotapes. At about the same time, the term *Internet* was first used, and by 1984, the Domain Name System was being used to implement Internet naming protocols (Jalobeanu). Eventually, sound, video, and animations became available to use from software applications for distance learning on the computer (Heinich, et al.).

Distance learning is now taught though various means including radio, television, video and audio presentations, and computers, especially computers over the Internet. It is information based. It may involve different kinds of interactions including those between students and the informational materials, between students and their teacher, and between students, themselves (Dempsey, et al., 2002). It does not have to be computer based (use email, bulletin boards, other database access). It may use a network for communications and may use multimedia computer applications.

Currently, many businesses and educational institutions are adding distance learning to their training and educational curriculums (Blake, Gibson, & Blackwell, 2003). Some of the pressures that drive increased distance learning usage are economic. More training is required in business to stay up to date. Online learning systems can respond to competitive pressures quickly, with a savings in time required for travel and to print instructional materials. Online learning is flexible in terms of schedules, travel costs are minimized, and there is easy access from computers that may be located anywhere in the world. Some disadvantages are lack of support and the reliance on good instructional and site design for online learning.

When multimedia is combined with distance learning through the Internet, it provides the use of technological tools that create more even variety in learning strategies without a teacher present. There are four types of online distance learning situations in use today (Blake, et al., 2003). This includes web based computer training that offers no additional interaction but is located on the Internet. This is similar to using a CD except the program itself may contain visuals, animations and sound. Secondly, there are web or electronic performance support systems that are frequently used in business. They offer the opportunity to update business services through databases and to access support services, tools, and discussions online. There

are asynchronous classrooms that may use email and discussion groups. In this case, students and instructors are not necessarily participating at the same time. Virtual synchronous classes may have arranged times for classes. Students and instructors can interact, and video conferencing with audio may be used to facilitate discussions. Combinations of these systems may also be used. Many participants in online distance learning classes prefer to have at least one face-to-face meeting as part of the schedule (Porter, 2004). All four types of systems may use multimedia components in the instruction.

Today, there are learning management systems employed by businesses and education that allow teachers to sign on as course administrators, run discussions, and upload materials, along with multimedia components for classes to use. Examples of this are Blackboard (www.blackboard.com), TopClass (www.wbtsystems.com), Aculearn (www.aculearn.com), WebCt (www.webct.com), and LearnLink (www.learnlink.emory.edu) that are used on the Internet to implement distance learning and give access to multimedia. Learnlink includes videoconferencing, online chat, digital whiteboard, polling, screen captures and multimedia use (Tiene, 2002). WebStudy (www.webstudy.com) offers a suite of products suitable for online education. The WebStudy system includes voice messaging and feedback (Shifter, & Monolescu, 2004). Another software system in use is Macromedia Breeze. Breeze provides an interface for synchronous and asynchronous learning, including online video conferencing events into which one can import sound, animations, video, presentations with voice narration, interactive quizzes, and threaded discussions (Lee, Tan, & Goh, 2004). These are most of the prominent systems that facilitate multimedia use today.

The Impact of Multimedia Use in Online Distance Learning

How does multimedia use in online distance learning impact students and educators? As

technology continues to evolve, research shows both positive and negative impacts (Sheybani, et al., 2004). The benefits can be substantial. A common theory is that learners process information in different ways; a multisensory system may be more effective in making information accessible to more learners (Heinich, et al., 1996). In some cases, students with learning disabilities who use multimedia may substantially improve learning in a multimedia environment as compared to using materials that are text-based only (McFarland, 1996). Sheybani et al. state that non-interactive text-based classroom materials may be presented in more effective and interactive ways by utilizing auditory or visual media tools and techniques; this may help students learn faster. Sheybani et al. conducted research in which students testing engineering learning materials interacted equally well with traditional or self-paced materials.

Another benefit of multimedia use is that it provides students many more options about how they choose to learn (Sheybani, et al., 2004). Multimedia can also be implemented in a systematic way, used repeatedly, and changed easily and quickly as needed (Tiene, 2002). This creates a savings on redevelopment of online materials (Blake et al., 2003). According to Tiene, implementation of multimedia allows students to see how something works, especially through animations. Through the interactive functionality, students can give feedback. They can proceed at their own speeds, and work at appropriate levels. Audio is especially helpful for music or language learning implementation. Wright (2004) created and conducted the Computers in Musical Applications course at Temple University and found the project both time consuming and rewarding. This online course gave more flexibility to students to fit the class into their demanding academic schedules. It also saved on textbook costs. Wright thought the conceptual information taught, and not method of delivery, was of primary importance. Wright found that the course could be taught equally, though differently, in a traditional classroom or online.

The use of multimedia can improve the online experience and improve the ability to learn and retain information (Sheybani, et al., 2004). Some recent research tested information retention and what elements affect it. The combination of visuals with words has the effect of improving learning (Mayer, 2003). Some studies have shown that, dependent upon the use of good design principles, students can improve test performance and improve the transfer of learning if they are exposed to multimedia content. Mayer focused on experiments that tested cognitive theories of multimedia learning across different media. He tested the use of words (printed or spoken), and pictures (either static or dynamic), to increase learning. Learners were asked to apply information studied to problem solving in new situations. He found there was a "dual channel assumption" (Mayer, 2003, p. 129) that people process information though two different channels or paths. One channel is visual and the other channel, which processes speech, is auditory or verbal. Through a series of studies on fixing a malfunctioning pump, groups that looked at both words and pictures solved tests of their ability to transfer the learning at a "…median of 79% more creative solutions" (Mayer, 2003, p. 131). He concludes that there was a "multimedia effect" (Mayer, 2003, p. 131) using both books and computers. Learners can integrate learned materials into long-term memory more easily because there are two channels for processing new information. Mayer also says that instructional designers agree that it is important to research the effects of different media on learning across media. It is significant that the use of Internet media enables some additional methods, such as interactivity, that are not available any other way.

In another study, Lowe (2003) discusses the use of animations in educational materials and whether these effects are helpful in achieving desired instructional outcomes. Lowe says the belief that interactive graphics are more positive for learning than nondynamic graphic elements

is built on “little more than intuition” (Lowe, 2003, p. 158). He conducted experiments testing the use of temporal change in weather maps through animations showing change over time. He found the complexity of information conveyed in some animations might have a negative impact on learning. He concludes that animations are not necessarily better than static information display and may result in “cognitive overload” (Lowe, 2003, p. 158). Some elements of interactivity in the maps attracted more attention than others because of dynamic contrasts with their surroundings. Those are the elements that will be retained in memory. Lowe admits that his study may be limited in application and its conclusions should not be used to construct a model. This work points out the necessity of careful instructional and multimedia design. Using effective design skills, the areas targeted for learning are the elements retained in memory.

Multimedia use in online learning can contribute to creating a student centered learning environment (Hooper, et al., 2002). Computer oriented learning was based on the concept of drill and practice in the 1960s and 1970s. A trend away from behaviorist to more constructivist learning theories puts more emphasis on student experience and on learning environments where students have the resources to reach their learning goals. This includes interactive multimedia resources and documents. The multimedia format provides an opportunity for students to become more active in the learning process (Richards, Dooley, & Lindner, 2004).

In one model (Falk, & Carlson, 1995), there are two kinds of interactivity that correlate with responses that show whether participants are passively or actively engaged. In the first type of interactivity, the learner is engaged in responses to only informational questions. In the second kind of activity, the learner has more choices about what information to learn and how to learn it, and so is more actively engaged in the instruction. Falk at al. state that in another theory, there are three types of activities in instruction: reactive, where the learner reacts to learning the

materials; proactive, in which the learner may construct learning from experiences; and interactive, where the learner interacts with new information on a computer. Since multimedia can offer the use of multiple choices, it can be well suited for a more interactive learning model. Multimedia can also be used by groups of people to facilitate activities. Falk at al. conclude that successful multimedia implementation will incorporate interactivity that increases learner involvement. Course design remains very important and must be constructed to allow for this type of interaction within the structure of the course (Richards, at al., 2004).

Some students might feel there is not enough interaction with the instructor during a course (Blake, et al., 2003). Video clips can provide an introduction to the instructor and help students feel more personally involved (Porter, 2004). With multimedia use, students may have an opportunity to see and hear speakers who are too far away to come to campus or places too far away to visit (Richards, et al., 2004). For example, students could view a virtual tour of the Louvre in Paris online. Developing technological skills in using multimedia can be good for students' development. Lastly, the tools used in an online course may totally replace a live classroom and direct contact with an instructor and so those elements become even more important (Richards, et al.).

There are negative considerations involved in using multimedia for online educational purposes. What are the financial expenses involved in setting up and maintaining a multimedia distance learning system and is it worth the expense? Does multimedia use increase the costs? The answers to these questions are not clear as yet. Costs and benefits must be weighed and monitored (Ellis, & Cohen, 2001). Some expenses are for additional instructors or for the additional time needed by instructors to master and implement the technology (Tiene, 2002). Will instructors get needed support from institutions or businesses? More services may be

needed. Teachers or trainers may have to work with programmers or technical experts to develop courses. Many learners expect that interactive multimedia information will be provided in an online course (Porter, 2005). This puts pressure on instructors to provide increasingly more interactive materials.

These are additional pressures involved in the creation of multimedia materials. There must be good multimedia and interface design for multimedia to work effectively (Tiene, 2002). There is also the issue of copyright or "fair use" standards for educational purposes (Tiene, 2002). Copyright may be considered differently if materials are published online. In these cases, permission of the author of the copyrighted materials may be needed and the difficulty of this process may eliminate use of some materials. According to Tiene, there are technical considerations such as whether the technology available is adequate for the use of multimedia. Do learners have needed plug-ins for software? Will audio signals be transmitted smoothly and be synchronized with video? Will the computer systems, multimedia applications and Internet service provider connections of participants fail to work at a critical time?

Future Trends

Predictions about future use of multimedia cover the range of complete success to uncertainty (McFarland, 1996). The success of online distance learning in general will determine the possibility of success for multimedia as part of it. Administrators are not yet certain multimedia use will be a cost effective investment. Some critics insist that, according to research, it has not been adequately shown that multimedia adds value to the educational experience (Ellis, et al., 2001). There is also a resistance to change among educators (Jalobeanu, 2003). One positive view is that "distance learning is coming on fast" (Blake, 2003, p.1). If online distance learning systems are able to support the ongoing technology demands that multimedia use

requires, some believe “the future looks promising” (Tiene, 2002, p. 25). Online technology advances are becoming so pervasive that teachers and trainers must prepare for it, and multimedia is connected with the growth in online distance learning (Jalobeanu). Education will become more accessible, more convenient, and will be reflected in learning environments that can be tailored to the learner’s choices (Jalobeanu). It is probable that information technologies will continue to become more advanced. With the growth of the Internet, interactive multimedia resources are available now globally. Software upgrades giving increased functionality appear frequently. More bandwidth is developing. Many higher education institutions now hope to incorporate digital multimedia into their online courseware (Tiene). The roles of teachers will change, as they will need to learn many things, including how to redesign the curricula for online use (Jalobeanu). Instructors will have to continue to increase their workloads. Students have come to expect multimedia; instructional designers and teachers will have to make the extra effort to keep online learning interesting (Porter, 2005). Some consider it well worth facing the obstacles that may be presented (Jalobeanu).

Conclusions

Based on current research, results on the value of multimedia use in online distance learning are mixed. The literature surveyed gives a good sense of the current climate. The literature reviewed also indicated that research has not always confirmed a greater value in multimedia use. More studies will have to be done to show positive outcomes before predictions can be made with confidence. Multimedia use is attractive to many learners. However, some authors examined expressed uncertainty as to what the future would hold. There are so many issues to consider that a more conservative position seems sound. The importance of good instructional design emerged as a theme throughout the range of opinions given, and is

important. Mayer (2003) said that multimedia messages were more effective than using text alone to affect cognitive learning, and multimedia offers more techniques to accomplish this than printed material. Lowe (2003) illustrated the importance of good instructional design in materials. If dynamic graphics attract more attention than static elements, then multimedia animations must focus the learner's attention on significant areas to increase learning and generate positive outcomes. As in the use of more static methods, multimedia tools must be used carefully and with an understanding of causes of distraction and information overload. If online student learning environments enable students to engage in more active learning, this is another reason to effectively integrate a good use of multimedia into online educational experiences. More research is needed to show results.

If the demand for flexible online education grows, then multimedia use will grow also. New sources of education and training with integral multimedia components are appearing online every day. Most importantly, if multimedia use in distance learning is to succeed, "an instructional designer has the primary responsibility of making sure the on-line program accomplishes the learning goals…" (Dempsey, et al., 2002, p. 288). The instructional designer must ensure that all the uses of media are reviewed, revised, and finally integrated into sound instructional design and development. Otherwise, the learning objectives are not met. The addition of multimedia to online distance learning can then provide unique and worthwhile features to learners as the future unfolds.

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