Multimedia Education

An Honors Thesis (HONRS 499)

By Jennifer Hegge

Thesis Advisor

Mrs. Jean Ulman

Ball State University

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Purpose of Thesis

This thesis involves two parts: a paper discussing the rationale behind the use of multimedia in educational settings and a video illustrating the potential use of multimedia equipment and software. The paper includes an analysis of the different psychological approaches to learning and the corresponding aspects of multimedia that support these approaches. The paper also includes descriptions of the equipment, software, and classroom implementations possible in a multimedia environment.

The second part of the thesis is a short video created entirely through multimedia. This video utilizes multimedia hardware and software to provide a brief glimpse of the potential of multimedia equipment. Some of the areas explored in the video include the following: the use of scanners, video, graphics, and animation programs. Along with the demonstrations, the video includes suggestions for possible classroom uses for both teachers and students.
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The "Information Superhighway" is speeding through America's classrooms. Computer technology is changing at lightning speeds, leaving schools scrambling to catch-up. Meanwhile, "educational reform" seems to be the catch phrase of every political campaign in the country. The call has gone out from school boards to Congress for improved classrooms, higher test scores, and lower drop-out rates.

Computer companies and sales representatives are quick to offer technological solutions for all the nation's educational woes. Teachers and students alike are being encouraged to "catch a ride" on the latest wave of technology. Multimedia is one of the vehicles by which technology is changing the face of today's classrooms. However, educators are often left wondering, "What is multimedia?", "Is it a sound educational tool?", and "Can it work for my students?". The answers to these questions reveal a future of extraordinary and exciting possibilities in the high-technology multimedia classrooms of tomorrow.

The term "multimedia" is somewhat ambiguous. Its definition can vary considerably, depending on the author defining it. Multimedia can encompass as little as video discs and a computer to as much as an entire system complete with scanners, all manner of video equipment, and high-tech computer system. An article written by Turner (1992) provides a concise definition that contains the components most often considered to be part of a multimedia system. The article defines multimedia as, "the
integration of text, graphics, animation, sound, video, and music under computer control" (p. 2). It is also important to note that two other terms are frequently heard when discussing multimedia. These words are "hypermedia" and "hypertext".

"Hypertext" and "hypermedia" are often used interchangeably. Essentially, hypermedia (or hypertext) is the linking of text, video, or other information through the use of multimedia. This information can be organized and controlled differently by each individual who accesses and manipulates it (Borsook and Higginbotham-Wheat, 1992). This means that a student or teacher who wanted to learn more about Africa, for example, could explore the continent in his or her own unique way. One person might begin by looking at land masses, followed by inhabitants, and animal species. Meanwhile, another individual might find that his or her interests lead him or her in a completely different path of information. Never-the-less, each person could use hypermedia to explore Africa via multimedia following his or her own specific areas of interest.

As stated earlier, multimedia can contain many different components. A computer is the most essential part of the multimedia system. It is the central component to which all other parts of the system are linked. Multimedia computers, like Macintosh's Power PC, contain special video input/output outlets, CD-ROM capabilities, and expanded memory to accommodate the extra equipment necessary for a
multimedia system.

Aside from the computer, a multimedia system may contain a video disc player, VCR, scanner, special sound boards, and sophisticated software. A video disc player allows the user to view pre-recorded pictures on the computer. When connected to special cameras, users can create their own video disc recordings. When VCRs are used in conjunction with special software, such as Macintosh's FusionRecorder, MoviePlayer, or QuickTime, users can view, edit, and record video using their own computer. Scanners allow users to electronically scan pictures or text and place these images into the computer to be used in presentations, papers, or graphics programs. Special sound boards can be added to computers to enhance sound quality and allow video sound to be played via the computer. Finally, software can be added to enhance multimedia systems. As already mentioned, programs like QuickTime can be added to allow video creation in multimedia. Other programs can be used to create animation. For example, compact discs can make living encyclopedias and books that come to life.

Modems that allow computer generated information to travel across telephone wires have led to another exciting area of exploration that can be found in many new multimedia systems - the Internet. Internet is a essentially a network of computers that are linked together. Modem connections have allowed the Internet to connect computer systems
around the world from city to city or country to country. An individual (or school district) can hook up to the Internet by paying a subscription fee plus monthly service fees ($0-$200 per month) to a service such as America OnLine or CompuServe. Once this system is accessed, it allows the user to connect to chat lines, electronic mail, and gateways that open doors to world wide databases. This access to information is what makes the Internet such an exciting place for educators and students. Children could use electronic mail or chat lines to converse with global pen pals. Gateways can open doors to systems, such as NASA's "Spacelink" that can provide students with up-to-date information about space shuttles, astronauts, and pictures and videos from probes and satellites (Allen and Proctor, 1994).

This sophisticated equipment has taken technology a far cry from the drill and practice, one-computer classrooms of just a few years ago (Jonassen, 1993). Instead, multimedia in classrooms can encourage interactive participation, student authorship, and chances for both individual and cooperative learning opportunities (Townsend & Townsend, 1993). Recent educational trends have moved toward teaching philosophies that encourage such things as concrete learning experiences, higher level thinking skills, student authorship, authentic evaluation, and understanding varied learning styles in the classroom (Trotter, 1993). The search for ways to incorporate these ideas in the classroom has led to
an increase of multimedia in schools. Karraker (1992) reported in a recent article that 68 percent of school districts in the United states now have CD-ROMS or laser disc players.

Psychological theories on learning and cognitive development in children lend credence to the idea that multimedia can enhance student learning. Concepts found in areas such as Cognitive Flexibility Theory, studies on problem-solving, theories of learning styles, and cooperative learning seem to support the use of multimedia in classrooms. Also, some evidence suggests that multimedia classrooms may increase student interest and motivation levels.

Borsook and Higginbotham-Wheat (1992) state in a recent article about psychology and multimedia,

If both the brain and the world around us consist of networks of highly interconnected ideas, concepts, processes and events then linear educational media such as books and videotape are sorely inadequate to deal with this ever expanding universe of information—highly interconnected, dynamic information. A new way of accessing and processing information is needed (p. 2).

Multimedia can provide this new way of “accessing and processing” information, because it links information together, while giving the user the power to navigate these links in whatever order is necessary or desired. Cognitive Flexibility Theory seems to support the use of multimedia to do just that. This theory states that learners need to see information in a variety of different ways for a variety of different
purposes in order for difficult material to be learned (Borsook & Higgenbotham-Wheat, 1992). This goal seems to be easily met within the realm of multimedia. A student can explore material not only through text, but also through pictures, video, music, and animation. Multimedia also provides the user with the opportunity to connect different concepts together (e.g. viewing and comparing two countries in Africa at the same time) while constantly moving from one link of information to the next (Borsook & Higgenbotham-Wheat, 1992). Furthermore, Borsook and Higgenbotham-Wheat (1992) point out that the field of Cognitive psychology stresses the importance of active interaction with new materials while reflecting on past knowledge (p. 6). Multimedia provides this interaction between the user and the information presented, because it links information, actively engages the user, and appeals to a variety of senses (Turner, 1992).

This interaction often takes place during problem-solving activities. In recent years, the importance of teaching critical thinking skills and problem-solving skills has gained increased recognition by the educational community. In fact, critical thinking was made a national goal by the National Educational Goal Panel in 1992 (Garcia, 1994). Underwood and Underwood (1990) have suggested that the critical thinking and problem-solving skills required when using computers cause students to function at the highest level of Bloom's Taxonomy, by requiring students to
evaluate and make decisions based on the information presented (p. 62). Garcia (1994), echoes these sentiments by stressing the fact that multimedia technology encourages learners to experiment with various problems and their solutions by using a variety of auditory, visual, and written material (p. 6).

Multimedia systems can also accommodate the different learning styles of individual students. Multimedia allows students to learn and express themselves in a variety of different ways. Because multimedia is multi-sensory, it can reach students through the medium which best serves their educational needs (Turner, 1992). For example, a visual learner may read about Africa or view pictures and video about the country on his or her computer, while an auditory learner could listen to music from the Northern Regions of the continent. This type of advantage was also noted by Cannings, et al. who stated,

Computer-based multimedia and other advanced technology now provide not only great diversity and instructional designs, but individual needs, abilities, and goals. (p. 7)

Multimedia education not only can be used to meet students' individual learning needs, but it can also be used to encourage collaboration and cooperative learning among students. Groups of students can engage in such multimedia areas as exploration and student authorship. Students can use the previous knowledge of group members as a building block from which to construct new information learned through
multimedia (Underwood & Underwood, 1990). It has also been shown that children who work in collaborative groups on multimedia projects learn from each other. Underwood and Underwood (1990) noted a 1986 study by Jackson, Fletcher, and Messer of school children in The United Kingdom. This study showed that the children engaged in multimedia collaborative groups often questioned each other about new ideas and procedures, as well as correcting each other on incorrect performance and information (p. 156-57). Also mentioned by Underwood and Underwood (1990) was a study from Minnesota on collaborative groups and computers. This study showed that students in cooperative groups stayed on task, performed better on tests about the information studied, and required less teacher attention than their non-collaboratively grouped peers (p. 159-161). Therefore, it is apparent that multimedia education can be meshed effectively with teaching philosophies that stress collaborative groupings.

Whether working independently or in collaborative groups, multimedia technology in the classroom requires a change of roles for the classroom teacher. Within the context of a multimedia classroom, the teacher assumes the role of "classroom manager, author, explorer, electronic curriculum designer, ....guide, scout, motivator" and much more (D'Ignazio, 1992, p.54). The teacher is transformed into a facilitator who is a constant source of information that can be tapped into when necessary. Students are free to explore individually or as groups and seek
teacher guidance when necessary. At the same time, the teacher is free to move about the room monitoring progress, evaluating learning, and correcting mistakes.

It is hoped that this new classroom environment will motivate and encourage students in new ways. Poor national test scores and mounting drop-out rates are areas of concern for parents and educators alike. Since today's students were raised on MTV, computers, and video images of every kind, the multimedia approach to education seems to be the logical way to reach the school-age population. In fact, there seems to be some evidence to suggest that multimedia is motivating and engaging students effectively. The visual appeal of multimedia is obvious. Movies, color graphics, and animation are used to capture and hold student attention, while music and voices add excitement to the learning process. However, multimedia is more than just a pretty package. As stated earlier, multimedia education can accommodate a variety of learning styles, and this type of accommodation can increase students' perception of themselves and their work. Townsend and Townsend (1992) refer to a 1990 study conducted by Perrin that indicated an increase in students' levels of self-esteem and self-confidence when their various learning styles were met (p. 62).

It has also been suggested that multimedia education can help to alleviate the problems of high drop-out rates and absenteeism. Karraker
(1992) reports a decline in both areas at West High School in Columbus, Ohio, which is a member of Apple's Classrooms of Tomorrow (ACOT classrooms incorporate multimedia programs such as hypercard, as well as a wide-variety of other computer programs, in their classrooms). The article quotes a drop in absenteeism from 8.4 percent to 4.7 percent (p. 24). More significantly, this article notes "...the ACOT dropout rate there [West High School] in 1990-91 was exactly zero percent." Similarly, the article points out that at-risk students in a Escambia County school in Florida saw the drop-out rate for at-risk students involved with multimedia fall from 40 percent to just 2 percent (p. 26). Although these studies alone are not enough to assume a direct correlation between multimedia and lower absenteeism and drop-out rates, it does suggest that multimedia offers some exciting possibilities in ways to inspire students to seek and explore knowledge.

The benefits that multimedia can provide in the classroom have led to an increase in schools purchasing multimedia equipment and software. This is illustrated by the fact that in 1990 the state of Texas reallocated money normally spent on textbooks to a fund to purchase interactive science video discs. Florida followed suit later that year by providing money to the schools to purchase video disc software for its junior and senior high schools (Karraker, 1992). However, the high-cost of multimedia technology has made some school systems leery of
implementing these innovations into their classrooms. For example, CD-ROM computers run upwards of $2000 each, and this is only one of the most basic components of a multimedia system. Other accessories, such as scanners, video disc players, and software (CDs) can increase the costs by thousands of dollars more. In an age where school districts often find themselves the victims of budget cuts and there does not seem to be enough money to pay teachers salaries, multimedia equipment may be considered a costly "extra" that the school system just cannot afford to implement. However, school systems like those in Texas have discovered that multimedia equipment can be used to teach the same content as textbooks and have found that reallocating textbook funds is one way to escape some of the financial crunch of multimedia education.

Multimedia may be costly, but it may be better suited to handle the inclusive classroom of tomorrow. Because of technological advances in computer equipment, multimedia can provide educational opportunities for all students. This concept transcends learning styles and envelops such areas as teaching students who are physically or mentally challenged. Adaptive devices of every sort make computers accessible to the disabled. Overlays for keyboards make typing possible for students with cerebral palsy or other physical disabilities that affect fine motor control. Puffer switches, that use breathes of air to control the computer, provide accessibility to quadriplegic students. Voice navigating systems that
allow students to "talk" to the computer are helpful with these types of learners as well. Other devices, like mouse pads and touch screens, can be used with physically challenged students. Specially designed programs for mentally challenged students and for deaf students are also available. All of these devices ensure that the multimedia equipment that is used by regular education students also could be utilized by special education students.

Beyond the adaptability of multimedia equipment, multimedia can be used to provided unique learning experiences for disabled students. As stated earlier, one of the unique features of multimedia is its ability to provide learners with various modes of presentation. In other words, a learning disabled student who has trouble with reading may benefit from the auditory presentation modes that a multimedia system could provide. Multimedia also allows students to explore information in small groups or individually. Therefore, learners with disabilities are given the opportunity to work at their own pace and opportunities for social interaction with their peers. It is hoped that a combination of a variety of presentation modes and the individualization of learning can aid disabled students in meeting learning goals. A report on studies of field testing using multimedia programs with learning disabled students by Thorkildsen and Hansen (1987) seems to support this idea. A comparison between learning disabled students and regular education students using a
multimedia program (video disc plus a specifically designed software program) to teach telling time revealed that the learning disabled students performed as well as the regular education students. The teachers involved in this experimental learning program seemed to feel that this progress was the result of the step-by-step, individualized learning, and the continous feedback that this type of multimedia program provided (p. 30).

Multimedia classrooms are the wave of the future. Computers are so ingrained in every aspect of American life that the classrooms of tomorrow have little choice but to embrace this technology. Teachers, parents, and students can take heart in the fact that research seems to support the use of multimedia as an educationally sound, motivational, and inclusive educational tool. However, multimedia is not a miracle cure for the ills of society. It is an educational tool just like any other that requires commitment and cooperation if it is to succeed. Teachers and students must be trained to work with the equipment. School boards and governmental offices must be willing to provide the financial resources necessary for these types of programs. Teachers must be willing to accept new roles in the classroom. Careful planning and research must be done to ensure quality programs and instruction. Implementing multimedia does indeed involve some risk taking. However, this risk seems well worth the gains.
Multimedia technology enhances classrooms by allowing students of all ages to become active learners, explorers, and creators. Subjects can be brought to life through interactive video, computer generated images, music, and desktop publishing. The children in today's classrooms will be the workers in the technologically advanced workplace of the future. Multimedia classrooms can provide children with the skills necessary to successfully navigate the "Information Superhighway".
Bibliography


Appendix to Video
“Multimedia Education Fast Track to the Future”

The video that accompanies this paper was created entirely through multimedia. It incorporates sound, graphics, still pictures, and video into a short demonstrational video that illustrates the potential uses for multimedia within the field of education. This video is the culmination of a semester of research, experimentation, and study of multimedia equipment and software.

I began my work by learning how to use each individual program that is outlined in the video. I read the manuals and spent many hours in the computer lab experimenting with multimedia software and equipment. Finally, I compiled all my works into a computer generated slide show; which was transferred from the computer onto a video cassette.

In order to create each slide in the slide show, I first needed to create the document within its original program, and then paste it on to each individual slide. The first slide that I created was a picture from the program KidPix by ClarisWorks. This program allows the user to utilize paint pallettes, brushes, colored pencils, stamps, and other art tools within the computer to create pictures. I created my childlike picture using the paint tools. After the picture was complete, I “pasted” it onto a slide to be used in my slide show.

The “mock-up” of a newspaper page that is shown on the video was
created by using Aldus's Personal Press. This program is an easy desktop publisher. It allows the user the choice of either using pre-made templates for newspaper, newsletter, etc. designs or creating a new individualized page set-up. I chose to create my own layout and design. I captured pictures and graphics from the clip-art files, and inserted them into my document. I also used spot color to add areas of emphasis to the page. Finally, I scaled down the entire page so that it would fit completely into a slide show format. This condensing resulted in distorted print in the slideshow; however, the original document remains perfectly proportioned and easy to read.

The animation sequence "Dance of the Snowman" was by far the most difficult and time consuming slide that I created. Although it may look fairly simplistic, it actually took several days and eighteen individually drawn cells (pictures) to complete. I began by learning how to create backgrounds, props, and actors within the program ADDmotion II. This process took about one week. After I mastered the creation of these elements, I began to work on creating my own character. I drew the snowman in eighteen individual cells that each vary slightly. When all the cells were completed, I created a pathway in which the animation was to move. Finally, I added text and converted the animation into a QuickTime movie (QuickTime is the name of one of the application that allows the viewing of movies within Macintosh programs). This movie was then
transferred onto a slide.

The scanned photographs shown in the video were created using the Typist scanner. This hand held scanner is run over a photograph or type. It then converts the image or text into a computer generated graphics. The picture can be edited on the computer screen, after it has been scanned. The images shown in the video were manipulated using functions to crop, darken, and adjust gray scales. Later, the finished product was pasted onto a slide.

The video sequence was created using QuickTime software by Macintosh. A premade video was played on a VCR that was connected to the computer. The image was then transferred into a QuickTime movie using the program FusionRecorder. Once the video was transformed into a QuickTime movie, it could be displayed and played through the computer. Once this had been achieved, the new QuickTime movie was inserted onto a slide and added into the final video slide show.

After all of the slides were complete, they were placed in the appropriate sequence. The slide show was then transferred back onto video by switching the output and input cords on the computer and VCR and simultaneously playing the slide show on the computer while recording on the VCR. Voice-over was added during this process through the microphone contained within the computer. The final product was now completed and ready to be viewed.
Annotated Bibliography for Video

ADDMotion II. (1992). {Computer software}. San Francisco: Motion Works USA.

This animation program for Macintosh utilizes HyperCard to create “interactive animations, multimedia presentations or training applications...”.

This program allows the user to convert standard video images into QuickTime movies which can be played and viewed on the computer screen.


This paint program for Macintosh is easy to use and specially designed for children. It allows the user to paint, draw, stamp, and manipulate images on the screen that can be saved or printed.


This Macintosh software allows the user to create lay-outs for newsletters, newspapers, or any other publication. It features pre-made templates or user created lay-outs.


This program allows the user to play and edit videos and animation on the computer screen.


This program allows the user to create individual slides (documents)
within Clarisworks and to view these slides through a slide show format. Slides can feature such options as fade in, looping, and the simultaneous play of QuickTime movies.


This software and hand-held scanner allow the user to scan text or graphics to be displayed on the computer. Color or black and white images may be scanned, but all scanned images will be shown as black and white images on the computer screen.