Advancing Learning with Computer Technology

by

Paul D. Kopco
Bachelor of Arts, Mathematics, 1970
University of Florida

A Portfolio

submitted in partial fulfillment of the
requirements for the degree

MASTER OF SCIENCE
CURRICULUM AND INSTRUCTION

College of Education
Black Hills State University
Spearfish, South Dakota
2000

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Portfolio Approved By:

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I am grateful to a number of people for their help and support as I pursued the degree of Master of Science in Curriculum and Instruction. In an undertaking of this magnitude (and, as it turned out, of this length), it is impossible to do it on one's own.

First, I would like to thank my family for their understanding, support, and love. My wife, Mary, and my son, Alex, kept me motivated, gave me essential peace and quiet whenever possible, and let me know that, through it all, their love was behind me.

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Introduction to the Portfolio

The title of this portfolio is Advancing Learning Through Computer Technology. As evidence of my mastery of the knowledge, skills, and techniques I have received at Black Hills State University, this portfolio is built on the four cornerstones of the Master of Science in Curriculum and Instruction. The four cornerstones that form the foundation of this program are: Inquiry, Curriculum, Teaching and Learning, and Leadership. This portfolio contains four pieces of evidence to demonstrate mastery in each of these cornerstone areas.

Written for the Inquiry cornerstone in the Spring of 1997, the first portfolio piece of evidence is a qualitative research proposal entitled “Using Multimedia to Teach Multimedia.” This proposal outlines a qualitative study to determine the effectiveness of using multimedia courseware in the teaching of multimedia authoring. The creation of instructional multimedia is my favorite educational pursuit outside the classroom, and the purpose of this project is to design more effective curriculum for my students.

The second paper is the Curriculum requirement, entitled “The Effects of Computer Technology, Information Technology, and New Media on the Teaching of Mass Communications Courses.” It was written for the History and Theory of Curriculum class. This paper describes the influences of rapid advances in computer technology and information technology on education in the area of mass communication, which is the discipline in which I teach.

The third paper, “When Is a Portfolio Not a Portfolio: Academic vs. Artistic” is evidence for the Teaching and Learning cornerstone. It was the culminating piece for the Educational Assessment course. This paper compares and contrasts the usage and characteristics of academic portfolios vs. portfolios traditionally used in the arts, and

presents an instructional lesson in graphic design which employs one type of portfolio in place of the other.

The final cornerstone piece, done for the Restructuring America's Schools course, is a paper entitled "Implementing Educational Technology through *Total Leaders'* Framework." This paper fulfills the requirement for the Leadership cornerstone. It uses the book *Total Leaders: Applying the Best Future-Focused Change Strategies to Education*, by Schwahn and Spady, as a framework to propose implementation of computer technology as a restructuring initiative. Five leadership domains presented in the book are examined in light of their use to promote computer technology as a school restructuring component. Each of the sections ends with a discussion of how these principles impact on higher education as they pertain to educational computer technology.

Each cornerstone piece supports the overall focus of the portfolio, which is the use of myriad forms of educational computer technology to advance learning. While some teachers may fear that computers will eventually replace them, I am excited and encouraged by the use of instructional technology, in no small part due to the research in this area that I conducted in pursuit of the Master of Science in Curriculum and Instruction degree. This program has given me the knowledge, tools, and techniques necessary for me to excel as a master teacher in the information age.

Introduction to the Author

I was born in Cleveland, Ohio, the eldest of four children, and moved to Sarasota, Florida when I was five. I grew up in Florida, and graduated from the University of Florida in 1970 with a bachelor's degree in mathematics. I was a professional musician in Florida, New York City, Virginia, and Delaware, before moving to the Black Hills of South Dakota in 1994. I sang and played the guitar in a number of bands performing a variety of music - rock, standards, country, and originals. I also play drums and keyboards. I have done computer support, training, and desktop publishing for my own company, as well as for other companies back East.

Upon moving to South Dakota, I wrote and recorded an album of instrumental music based on the legends and natural wonders of the Black Hills. I have been teaching computer graphic design, desktop publishing, and multimedia at Black Hills State University since 1996. Prior to that, I have taught continuing education and adult education courses at Western Dakota Technical Institute in Rapid City, and at Delaware State University and Delaware Technical and Community College in Dover, Delaware. I have created and continue to maintain a number of educational, cultural, and entertainment-oriented web sites, and I have also written a computer education column in a local newspaper.

I have a wonderful family consisting of a wife, a son, and three engaging pets. Now that I have completed this course of study, I hope to find time to compose music, create instructional multimedia projects, and enjoy the company of my family.

CAPTION

Using Multimedia to Teach Multimedia

This piece was written as a requirement for the first cornerstone class, Qualitative and Quantitative Research. As a teacher of interactive multimedia, I was encouraged by the number of articles I found dealing with the effectiveness of instructional multimedia coursework. I have always found computers to be fascinating devices, able to very quickly and very accurately perform many useful and entertaining functions. But I have always been most excited by the potential of computers to make the task of learning easier and more fun. I view instructional computer technology as a way to amplify my teaching skills, and to deliver content in engaging and motivating ways, allowing me to become a facilitator and mentor rather than a dispenser of information.

Much research has been conducted to confirm the positive effects of instructional computer technology upon education. The use of interactive multimedia adds to these effects by engaging and motivating students, who respond to visual methods as a result of their penchant for television and video games. The purpose of the research project proposed in this first piece of evidence is to determine if, faced with a lack of ready-made multimedia courseware for the teaching of multimedia authoring, the effort to create multimedia courseware to my own specifications and based on principles I have learned in the MSCI program will be more effective than traditional lecture and tutorial classes. The expected outcome is that it will, and that I can combine my loves for teaching and computers into a worthwhile undertaking that will make learning a special and rewarding experience for my students.

Using Multimedia to Teach Multimedia

Paul D. Kopco

Spring, 1997

Inquiry Cornerstone

Black Hills State University

Abstract

Every facet of societal enterprise, corporate or individual, has been touched by some aspect of technology. Along with products and processes, education has also been influenced and shaped by advances and developments in technology. The positive changes brought about by the introduction of computer technology – and more specifically, instructional multimedia – in all levels of education are of increasing interest to all educators. This research proposal outlines a qualitative study to determine the effectiveness of using multimedia courseware in the teaching of multimedia authoring. The effects of computer-aided instruction (CAI) are discussed, followed by examples of how instructional multimedia increases the effectiveness of (CAI) even further. Issues related to the creation of multimedia courseware are investigated, and the individual information channels associated with multimedia are examined. Finally, a classroom research project to examine the advantages of employing instructional multimedia in a multimedia design course is proposed.

CHAPTER 1

Introduction

Every facet of societal enterprise, corporate or individual, has been touched by some aspect of technology. Along with products and processes, education has also been influenced and shaped by advances and developments in technology. Computer-aided instruction (CAI) has been incorporated into schools with varying degrees of success and acceptance since the late 1960s. Originally consisting of drill-and-practice, text-based exercises on black-screen monitors with green letters, CAI has developed in scope and strength right along with personal computers themselves. Today's powerful computers, along with faster and more versatile peripherals such as multispeed CD-ROM drives and sophisticated audio circuitry, make possible computer-generated and computer-controlled presentations that could not even be imagined only a few years ago, allowing the incorporation and coordination of multiple channels of information.

Variously known as multimedia or hypermedia, multi-sensory delivery systems for instruction are a prevalent topic today in any discussion of educational methods present and future. Many teachers today are at once excited about the potential for computer technology to provide new ways of learning for their students, concerned that these new advances will require a substantial investment in their time to assimilate, and even fearful that computers may ultimately replace them at their jobs. However, current trends indicate that teachers who become adept in the use of instructional computer technologies such as the design of web pages and instructional multimedia will be worth more to their students and to their colleagues as they become both proponents and mentors.

Mass communications students are also being influenced by the advancement of computer technology in the areas of mass media and digital communications. To be successful in the information age, future designers of digital information delivery must also be adept in the use of multimedia technology, though from an informational rather than an instructional standpoint. Nevertheless, the design of multimedia content is similar in both spheres, and students learning to create multimedia presentations can benefit as much, and maybe even more, than students of all the other disciplines being advanced through the use of instructional technology. This study will examine the effectiveness of instructional multimedia when used in college classes whose purpose is to teach students how to create multimedia content and presentations to be delivered via digital means, e.g., CD-ROM, internal networks, or the World Wide Web. In light of the need to understand such human qualities as motivation, comprehension, interest, attitudes, and creativity from the perspective of the students, it was decided to employ qualitative research methods in a process-oriented approach to evaluate enhancements to the curriculum.

Statement of the Problem

The conventional methods of instruction in classes designed to teach students how to create multimedia are common to most other classes in which computer usage is part of the subject matter being taught. In my own multimedia classes, they include the use of lecture and note-taking, assigned readings, class discussion, and book-based tutorials which involve instructions on how to operate specific software programs and how to manipulate disk-based examples of digital content. In an effort to advance the learning of my students, I have searched for multimedia courseware intended for the teaching of interactive multimedia design. There exists an abundance of commercially-

produced multimedia courseware in the fields of math, science, and education. However, I found virtually none for the teaching of interactive multimedia design. Like many other mass communication instructors, I find myself faced with the prospect of developing my own multimedia materials and courseware. Given the time restraints of the teaching profession, it would be valuable to know if this effort will pay significant dividends.

Goals and Expected Outcomes of the Study

The goal of this qualitative study is to design more effective curriculum for my students by determining if the use of multimedia courseware significantly and sufficiently increases students' comprehension, rate of learning, and interest in the subject being taught enough to warrant its creation. The expected outcome of the study would be that data derived from various qualitative research tools would indicate upon analysis that the use of interactive instructional multimedia does in fact increase student comprehension and rate of learning, and promotes interest, motivation, and a positive attitude beyond those realized through conventional instructional methods.

Questions to be Answered

Does the use of multimedia courseware significantly and sufficiently increase students' comprehension, rate of learning and interest in the subject being taught enough to warrant its creation? What are the reactions and perceptions of students who utilize these instructional methods? Will the use of interactive and engaging digital learning methods increase students' motivation to learn and result in more positive attitudes? These are the questions this study will attempt to answer.

Significance of the Study

As the commercial creation of multimedia courseware becomes more common and available for more disciplines, the need for creating instructional multimedia from

scratch may diminish. But the ability to augment this type of instructional material with content customized for the specific course, class level, experience level, or student interest level will continue to be a valuable skill, enabling an instructor to employ various learning theories and address learning styles that may be appropriate to his or her particular class. Thus the results of this study will be valuable not only to myself, but to all teachers who are now or are considering being involved in the creation of their own customized multimedia courseware. In the case of an educator who has the desire to create instructional multimedia but lacks the knowledge to do so, the results of this study may justify and motivate the acquisition of such knowledge. In addition, the body of work dedicated to qualitative research will be enriched as the results of this study are published both in writing and on the many Internet web sites devoted to the dissemination of such work.

Definition of Terms

Coined in the 1950s, the term *multimedia* characterized combinations of various still and motion media, even live demonstrations, to enhance instructional impact. It was based on the idea that a variety of audiovisual media and experiences could interact with other instructional materials to overlap and intensify the value of each other (Heinich, Molenda, Russel, and Smaldino, 1996). Multimedia presentations can be defined as the integration, control, and manipulation of audio, video, photography, art and graphics, animation, and text (Kupsh, 1995). However, this type of presentation, although involving many information sources, can still be designed to be viewed in a prescribed, fixed sequence.

The term *hypertext* was created by Nelson in 1974 to describe “nonsequential documents” composed of text, audio, and visual information stored in a computer.

Hypermedia refers to computer software that uses elements of text, graphics, video, and audio and is linked in a way that permits the user to easily move within the information in a nonlinear way. Users choose a route that is unique to their style of thinking and processing information (Heinich et al., 1996). Today, *multimedia* has become virtually synonymous with *hypermedia*, implying the non-linear, freely linked manner of navigation. The terms are used interchangeably in this paper.

Scope and Limitations of the Study

Due to the small sample used in this study, the results may not be generalizable beyond the specific population from which the sample was drawn. The multimedia class which will serve as the population for this study will consist of twenty-three students majoring in mass communication or communication arts, with emphases in such areas as journalism, public relations, broadcasting, photography, graphic design, computer graphics, and multimedia.

Organization of the Study

Chapter One has presented the introduction, a statement of the problem, the research questions to be answered, the significance of the study, a definition of terms, and the scope and limitations of the study. Chapter Two contains the review of literature and research. Chapter Three describes the methodology and procedures that will be used.

Chapter 2

Review of Related Literature

The review of literature was performed using all the research methods available at Black Hills State University. Computer-assisted searches of the resources of the E.Y. Berry Library were conducted both from within on library computers and without via the Internet. In addition, searches of full-text sources such as ProQuest and SearchBank were conducted via the Internet.

Effectiveness of general computer-aided instruction

The effectiveness of instruction enhanced by general computer technology has been investigated in many studies over the years. Research has shown that learners exposed to computer-based instruction demonstrated high levels of motivation and positive attitudes toward learning (Sultan & Jones, 1996). In 1991, two University of Michigan researchers found a 10-15% increase in achievement scores and a 30% increase in student productivity when computers were used as a teaching tool (Villano, 1995). In addition, computers can help to build a sense of competence in under-achieving students (Liu, 1996).

Peck and Dorricott (1994) offer ten reasons for using computer technology in schools:

1. Learners assimilate knowledge at different rates and in different ways. Lessons delivered through computer technology can be designed to individualize instruction.
2. Upon graduation, students must be adept at harnessing, processing, and communicating information. When properly designed, educational technologies can arouse students to question, formulate opinions, engage in problem solving and critical thinking, and test their views of reality.

3. Technology can further the quantity and quality of students' thinking and writing. Using a word processor seems to reduce the fears often associated with writing.
4. In the real world, students must solve complex problems. Computer programs aimed at general productivity engage students in focused problem solving, permitting them to conceive what they want to accomplish, instantly test and retest solution approaches, and display the results immediately.
5. Computer technology can foster artistic expression. Modern technology-based art forms, such as computer graphic design and digital imagery, are very popular, encouraging artistic expression among students. This aspect is very important for mass communication students with an emphasis in computer graphic design.
6. Upon graduation, students must be globally aware and able to use outside resources. Today the Internet allows students to inexpensively and instantly contact and explore the world.
7. Technology creates opportunities for students to do meaningful work, providing a widespread audience for students' work, offering new reasons to create, and offering new sources of feedback on ideas.
8. Today's learners need access to high-level and high-interest courses. Such technologies as multimedia and distance education can bring diverse experiences and information into the classroom.
9. Students must be familiar with computers. In our Information Age society, computers and other technologies are an increasingly important part of the world in which students live.

10. Schools must investigate new ways to incorporate computer technologies. When technology support techniques are perfected, many of the routine tasks done by teachers can be reassigned to computers, freeing teachers for more important roles.

Enhanced Effectiveness of Multimedia-based Instruction

So far the effectiveness of educational computer technology in general has been discussed. The next section of this proposal will specifically explore multimedia-based instruction, and its enhanced effectiveness in comparison to previous computer-aided learning methods.

Studies often demonstrate that the most effective learning occurs with a variety of learning experiences. It has been said that people remember 10% of what they see, 20% of what they hear, 50% of what they see and hear, and 80% of what they see, hear, and do (Green, 1996).

The effectiveness of multimedia as an instructional medium is based on the theory of multiple-channel communication, involving synchronous presentation of information "…through different sensory channels (i.e., sight, sound, touch, etc.) which will provide additional stimuli reinforcement" (Daniels, 1995).

Hirschbuhl and Bishop (1996) refer to a study which indicates that students felt highly motivated because they were actively engaged in learning material through an interactive multimedia environment which facilitated access to a variety of resources on an on-demand basis at their own pace. Making dull subjects engaging and letting students learn by doing help ensure the lessons are retained (Wagner, 1996). Learning is elevated when media that share information are presented because they reinforce each other. As a result, when highly related cues are summated across channels, multiple-channel presentations are superior to single channel presentations (Daniels, 1995).

An ancient Chinese proverb states: “If you tell me I will forget; if you show me I will remember; if you involve me I will learn.” Today’s version is “lecture me and I’ll forget; use multimedia technology as a glorified overhead presentation and I’ll remember; employ the full features of multimedia technology in the classroom and I’ll learn” (Wells & Kick, 1996, p. 2). Research into learning styles has yielded many interesting results and theories. In the opinion of Sultan and Jones (1996), the primary function of the multimedia-based computer is to deliver instruction which accommodates a wide variety of learning styles.

Villano (1995) contends that one of the foremost uses of computers is to identify and address individual student deficiencies. Interactive learning systems individualize instructional paths for each student. For example, a student answering a question correctly on a computerized test moves on to the next level. If a question is answered incorrectly, the student is asked additional questions until the subject is mastered.

The conclusion can be drawn that how people learn is just as important as what they have learned. Creators of instructional multimedia need to understand enough learning theory so they can design CAI that many different learners can use – not just those who have acquired one specific learning strategy (Ross & Moeller, 1996).

Proper incorporation of multimedia-based curriculum can even have a positive financial impact on an institution. In a study reported by Hirschbuhl and Bishop in 1996, the data indicated increased performance in students using an interactive multimedia program. In addition, their attitudes appeared to be more positive. The implications were that the usage of interactive multimedia reduced the failure rate from 36% to 22%, thereby increasing potential student fees by at least 14% and improving freshmen retention rates.

Multimedia Design by Novice Authors Untrained in Learning Theory

Early educational multimedia applications were developed by skilled programmers with the assistance of instructional designers. Such creation was beyond the abilities of users not specifically trained in complex programming languages or unfamiliar with learning theory. This scenario has changed with the introduction of easy-to-use multimedia authoring software such as Hypercard, Hyperstudio, Authorware, and many others. Thus, as authoring tools become more user-friendly, more educational software is being produced by novice instructional designers or people who have limited knowledge of techniques appropriate to efficient learning. This introduces a need for guidelines to employ in the creation and assessment of multimedia software, which will go beyond the blueprints used for the computer-based instruction of a few years ago (Knupfer & Clark, 1996). In short, "user-friendly computers and software have made it easier to produce bad learning materials. Authors need more than just the ability to use a multimedia or hypermedia authoring program to create effective computer-based instruction" (Ross & Moeller, 1996, p. 428). Heinich, Molenda, Russel, and Smaldino, (1996) put it another way: "Don't think that ability to use the authoring tools automatically bestows expertise either in instructional design or visual design. These skills are usually developed through special study and lots of practice" (p. 105). Finally, Ross and Moeller point out that "if we teach multimedia and hypermedia authoring without regard to design principles – teach our students the 'hows' without the 'whys' – they will be ill-prepared to fulfill their professional promise" (p. 430).

Principles of Multimedia Design

Well-designed multimedia is based on cognitive theories of how we structure knowledge and how we learn. It is designed to parallel the way people organize

information with ideas and their relationships (Heinich et al., 1996). According to Ross and Moeller (1996), prospective multimedia designers should undertake three initial stages of planning:

Audience analysis. This is the process of gathering information to construct a profile of learners' characteristics that should be considered when designing instructional multimedia. Designing effective CAI requires knowing as much as possible about the learners, including what they already know about the subject being addressed. Unless students have prerequisite subject knowledge, it must be supplied or supplemented by the instructional designer. In the words of Ross and Moeller (1996),

> As Aristotle noted, although people may be expected to serve their self-interests, different kinds of people see their self-interests differently. In an important sense, CAI designers…must understand the needs (self-interests) of learners before they can design materials to meet those needs. (p. 434)

Goals analysis. This is the process of determining educational objectives to make possible later assessment of the lessons taught by instructional multimedia.

Control analysis. This is the process of deciding how much navigational structure and freedom to allow users of a multimedia application.

When it comes to user interface or screen design, simplicity and consistency are key. Complicated and cluttered screens can lead to confusion and frustration, while inconsistent displays keep users from readily connecting with the content by preventing them from knowing what to expect. When designing screens, multimedia creators must also consider the following four principles of perceptual organization by which the mind organizes meaning:

1. Similarity – how alike screen components are;
2. Proximity – how physically close screen components are;

3. Continuity – whether the components follow a logically flowing path to guide the eye;
4. Closure – whether the minimal amount of information is present that is necessary to obtain meaning or closure (Knupfer & Clark, 1996).

Would-be content designers must be aware that computer-based learning is not merely electronically packaged lectures, but a new approach to teaching that must be studied (Ross & Moeller, 1996). Very often multimedia presentations designed by beginners are no more than glorified transparency-based presentations. Wells and Kick (1996) advise that "if multimedia technology is to be successfully employed to enhance classroom instruction and learning, the full capabilities of the technology must be used" (p. 2).

Another interesting and important aspect of multimedia design is addressed by Knupfer and Clark (1996). They points out that media often portrays people in stereotypical roles. As multimedia creators think about designing, scanning, or downloading images into the instructional presentation, they should consider what messages are latent in the images. Can the resulting multimedia presentation be used in different cultures without bias? They go on to say,

> Rather than simply avoiding stereotypes, it is important to keep the messages in proper context in terms of culture and gender. Certain examples will make better sense if the learners can relate to them. For example, portraying value systems of rural America within inner city schools and vice versa could make the instruction fall flat. (p. 349)

Elements of Multimedia

It has been pointed out that multimedia involves the integration and control of a variety of media to deliver multi-channel information. The next section of this paper

examines more closely each of the individual media under discussion, as well as some theories regarding navigation through multimedia applications.

Visuals. The first aspect of multimedia to be investigated is the visual medium. Our sense of vision arguably represents our most sensitive source of perception of the world around us. Rieber (1995) offers the following definitions: “Visualization is defined as representations of information consisting of spatial, nonarbitrary, and continuous characteristics. Verbal (or semantic) representations are arbitrary and sequential” (p. 45).

Visual imagery is one of the most important elements of multimedia instruction, yet many designers fail to utilize it to its fullest potential. Visual images can aid message interpretation and intensify learning. They can also add power to the message by providing an emotional element that is beyond that of other communication media. Emotional impact can be added to multimedia by using visuals that evoke feelings or entice learners to imagine certain situations (Knupfer & Clark, 1996).

In designing instructional multimedia, the question is not only whether to use images. A question of equal importance is which kind of image should be used, or how the subject matter should be visualized in an image. Frequently there are numerous possibilities (Schnotz, 1996). Five main categories of instructional applications of visual images include:

1. Cosmetic
2. Motivational
3. Attention-getting
4. Presentation
5. Practice (Knupfer & Clark, 1996).

Rieber (1995) offers this advice:

> Though we may never adequately understand the psychology of visualization, it will and should continue to serve as one of our most versatile problem-solving tools. Instructional designers, teachers, and all educators are therefore encouraged to consider innovative visualization strategies to nurture the creative problem-solving process. (p. 54)

Attention to the quality and quantity of visuals chosen by a multimedia designer for inclusion in interactive courseware raises the question of visual literacy, both of the creator and the user. Lockee and Hergert (1995) suggest that visual literacy is a necessity for teachers and learners of all ages. As citizens of an information society which is characterized by digitized illustrations of knowledge and dominated by the mass media, we must learn to analyze and comprehend what we see. The authors state further that, in their opinion, the American educational system to this point has not adequately addressed this need. Today's multimedia designers must further the goal of visual literacy.

Animation. A particularly effective type of visual is animation. Animated pictures display more information to the learner than static images, since they explicitly present different states of the subject matter which otherwise would have to be imagined or inferred. They lessen the cognitive load of knowledge acquisition, as they provide external support for mental simulations (Schnotz, 1996). When used sparingly, animations can be effective, but they can become annoying, distracting, or disruptive to the thought process if overused or displayed too long (Knupfer & Clark, 1996).

Generally learners do not use image data instead of text data and vice versa. Instead, text comprehension and image comprehension stimulate each other, as a more intensive processing of the text triggers a more intensive processing of the images and vice versa. On the other hand, with some learners animated pictures may result in a less intensive processing because they prevent individuals from performing applicable cognitive processes by themselves. Since learners merely have to follow an externally

displayed simulation, they may process the subject matter more superficially than they would with static images. Thus images in learning material need careful choice and design (Schnotz, 1996).

Audio. Many resources are available to guide the amateur designer in developing multimedia programs and improving visual presentations. Audio, on the other hand, has been almost an afterthought. Daniels (1995) astutely points out that

> due to the lack of research in the use of audio in instruction there are few resources to assist the multimedia producer in using sound effectively and efficiently in multimedia. As a result, most authors either utilize 'stock' sounds that are 'thrown in' without contemplating or understanding the relationship between audio and visuals, or ignore the audio medium altogether. Too often, a sound effect or music segment is used solely as a device to gain attention, and not as an integral part of the multimedia message. (p. 57)

There are only three basic audio elements that the instructional multimedia author has to work with: speech, music, and sound effects. Initially, this may seem to encompass a relatively small arsenal of communicative tools when compared to the abundance of visual elements available to the multimedia designer (color, texture, angle, etc.), especially considering the superiority of visual retention. However, one has only to consider the effectiveness of radio as a means of communicating cognitive information to realize that sound has a considerable impact in a "visual" medium (Daniels, 1995).

Sound can also contribute to the pace of a visual presentation. Narration, dialogue, sound effects, or music can establish a fast and frantic pace or a slow and somber mood to reinforce the visual (Daniels, 1995). Audio proves to be especially essential for non-readers, whether through age or disability (Liu, 1996).

Text/Verbals. Research has shown that both text and speech are received as verbals. Thus, narration with text are considered variations of the same channel, and can cause intra-channel interference. When information is presented across channels it should

be highly correlated to enrich learning and avoid inter-channel interference. The instructional multimedia designer should ensure that images or verbals presented across channels do not conflict with each other (Daniels, 1995). With regard to textual information, large amounts of text are more effective when printed, because when such quantities are presented on the screen, they can cause eye fatigue and are more likely to be forgotten (Knupfer & Clark, 1996).

Navigational controls. When designing instructional multimedia, authors need to incorporate certain control principles. For example, researchers report that some learners cannot draw conclusions from information presented in an unstructured hypermedia environment. Some learners simply cannot grasp the *hyper*, or freely linking, concept (Ross & Moeller, 1996). The user of the courseware should be able to control the display rate when possible so that there is enough time to read the text, interpret the graphics, and consider the meaning of the message (Knupfer & Clark, 1996).

Sevenye and others (1996) investigated the navigational behavior of students using multimedia applications. Special analysis software tracked and counted the usage of the various navigational buttons present in the screens of the multimedia courseware. It was discovered that, given the chance to return to previously-viewed screens of information, the students chose to do so quite frequently. The researchers concluded that

> the effects of students' decisions to go back to previous instruction may be an important finding for developers of CAI. Supporting data indicate that students liked having the option to go back to previous screens whenever and wherever they desired. (p. 664)

According to Knupfer and Clark (1996), designers must realize that learners may not want to move through topics in a given order. Multimedia applications must allow users to navigate more freely. This necessitates designing information in smaller, more

independent segments that do not depend on sequence or quantity of content to be considered complete.

Paradigm Changes Necessary for Computer Aided Instruction to be Effective

For multimedia-based instruction and educational computer technology in general to succeed in providing our students with superior learning opportunities, the literature indicates that major shifts in our teaching paradigms must occur. Green (1996) enumerates three major impediments to a more permanent learning experience for students:

1. Conventional teaching strategies are outmoded. The lecture approach most prevalent today manifests itself in the typical scenario of students sitting in a class taking notes as a professor expounds on his specialty. This kind of passive learning can be exceedingly tedious, and even if a student takes good notes and learns the material successfully enough to pass the exams, the knowledge acquired is temporary and, therefore, useless.
2. The learning habits of many of today's students are ineffective for long-term retention. As a result of the single-minded attention to verbal and math skills, college coursework has been reduced to an exercise in mostly passive learning that often barely gets beyond training in simple memory skills. What is needed is an approach that encourages a blend of technology with the arts to make sense of the world and to experience the world more directly. This is where media-enhanced education becomes valuable.
3. Educational goals must shift from a belief that intelligence is measurable by a single paper-and-pencil instrument to the realization that intelligence is not mere mental recall but the ability to solve problems or to create authentic products.

The literature clearly indicates that computer-aided instruction has a positive impact in education, elevating motivation, attitude, and productivity among students. CAI can enhance students' problem solving and critical thinking skills, increase the quality of their writing, and extend their contact with the world around them. Computer technology is also making possible the teaching of courses to students across town or across the world via various distance education methods.

Instructional multimedia, by virtue of its multi-channel delivery of information, improves on the impact of general CAI by actively engaging students in the learning process and addressing their different learning styles. The educational content taught through instructional multimedia is retained far longer as a result. And regardless of learning style, students can progress at their own pace, thus increasing interest levels and providing on-going challenges.

Chapter 3

Methodology

In keeping with accepted qualitative research strategies, the use of triangulation will be used to neutralize bias in any one approach to data collection. Three research methods will be used to collect data: a student questionnaire and brief random interviews, teacher observation and journaling, and evaluation of student journals and portfolios.

In order to carry out this study, some interactive multimedia courseware exercises will first need to be developed so that student reactions and learning effectiveness can be measured and compared with the conventional teaching techniques used to teach previous multimedia classes. Three exercises will be created: one to be utilized early in the course based on introductory and fundamental content; one to be utilized midway through the course based on intermediate content; and one to be utilized at the end of the course based on more advanced content. An attempt will be made to incorporate all the principles of successful and effective interactive multimedia design described in the Review of Literature. The remainder of the course will be taught in a conventional manner, utilizing lecture and note-taking, class discussion, and book-based software tutorials.

Questionnaire and Interview

At the completion of each interactive multimedia instructional exercise, a questionnaire will be administered designed to measure students' perceptions, opinions, attitudes, and motivation regarding their experience with the exercise. The questionnaire will consist of a mixture of weighted-response questions and open-ended questions. In addition, some of the students will be chosen at random and briefly interviewed in an

attempt to measure their reactions to the multimedia exercises in a more spontaneous and personal way than answering an impersonal questionnaire.

Teacher Observation and Journaling

During the course of the semester, teacher journaling and observation will be practiced. A daily journal will be kept in which detailed descriptions and observations will be recorded in an attempt to capture student behavior and reaction in the context of the classroom.

Evaluation of Student Journals and Portfolios.

The students will be required to keep a journal and compile a portfolio of projects produced in class. Entries in the journals will be evaluated with regard to differences in comprehension, interest, perception, motivation, and attitude between periods of multimedia instruction and conventional instruction. Portfolio projects will be analyzed to detect differences in quality and demonstrated ability between those created after multimedia instruction and those created after conventional instruction.

Data analysis

The data collected from these qualitative research methods will be analyzed using a combination of naturalistic inquiry and analytic induction. Teacher observation and journaling will record the human activity of the students and their reaction to the various teaching methods in the natural classroom setting, thus interpreting their actions as they experience the instructional events. Both the students and the environment as they interact in the teaching/learning process will be considered when analyzing the data.

The answers to the weighted-response questions in the questionnaire will be coded so that analytic induction strategies can be utilized to synthesize the data. Rubrics will be used to quantify the portfolio pieces for comparison and analysis.

By using these data collection methods and multiple data analysis strategies in accordance with accepted qualitative research practices, valid results should indicate whether or not the use of interactive instructional multimedia increases student comprehension and rate of learning, and promotes interest, motivation, and a positive attitude beyond those realized through conventional instructional methods.

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Reflection

The use of interactive multimedia technology to teach my interactive multimedia design class will provide me with the unique experience of using interactive multimedia teaching presentations which in themselves are models of what the students will ultimately be creating. Of course, not all my students will be creating multimedia projects that are strictly educational in nature. Some will be crafting entertainment projects, and some will be using the multimedia techniques they learn in my class to enhance web sites. But the basic principles important to the user-friendly operation and effectiveness of multimedia presentations – audience analysis; goals analysis; control analysis; appropriate use of visuals, animation, audio, and text/verbals; and proper navigational controls – will all be there for them to see and experience in the very courseware they will be using. Other than in a class designed to teach textbook writing, I can think of no other occurrence of this unique situation.

The results of the study proposed in the previous evidential piece will provide me with the information to successfully design courseware that takes advantage of my students affinity with computer technology, and in so doing will help me become not only a master teacher, but also an experienced facilitator and mentor. And the research techniques I have learned as a result of my participation in the MSCI program will stand me in good stead in my role as a life-long learner – and to be successful in the rapidly changing and evolving field of computer technology, one must be a life-long learner just to keep up.

CAPTION

The Effects Of Computer Technology, Information Technology, And New Media On The Teaching Of Mass Communications Courses

This piece was written as a requirement for the second cornerstone class, Curriculum History and Theory. As a teacher of interactive multimedia, I was encouraged by the number of articles I found dealing with the effectiveness of instructional multimedia coursework while performing the background research and review of literature for this paper. Of course, mass communication involves more than just my area of expertise – desktop publishing, computer graphics, multimedia design, and web design – which is now called "new media." It was enlightening to find out how instructional computer technology is being incorporated in other areas of mass communication such as journalism, broadcasting, and public relations, both in their instruction and practice. These disciplines are rapidly converging as the Internet and other computer technologies make available delivery mechanisms so pervasive and instantaneous that the amount of information at our disposal now would seem futuristic and staggering only a few years ago. This piece of evidence takes a look at how computer technology and new media have transformed mass communication, and how they must be incorporated into the curriculum for students to learn essential skills.

The Effects Of Computer Technology, Information Technology, And New Media On The Teaching Of Mass Communications Courses

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Curriculum Cornerstone

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The Effects Of Computer Technology, Information Technology, And New Media On The Teaching Of Mass Communications Courses

Introduction

Computer technology, information technology, and new media are revolutionizing all phases of our society, and their impact on the education of learners of all ages is especially profound. Educators are using computer technology as a teaching tool in almost all subjects, and how to use computer technology is becoming a large part of what it means to be proficient in virtually every field. This dual usage of computer technology is nowhere more evident than in the subject area of mass communication. The influences of rapid advances in computer technology and information technology on society have given new meaning to the term "information explosion." These influences have affected both the subject matter and the teaching methods of mass communications courses.

This paper will begin by describing these influences on education in general, and look at what it means to be "educated" in the information age. It will then define mass communication as we now know it and how it has been seen in the past. The term "new media" will be defined and discussed, followed by a focus on the Internet as one of the chief new media and a mass medium in its own right. Computer technology's influences on mass communication in our society will then be discussed. Finally, the influences of computer technology, information technology, and new media on the teaching of mass communication will be presented based on current research in the field.

Influences Of Computer Technology In Society

Technology is helping to change the world and to make us aware of these changes so fast that the majority of what today's students are learning will be obsolete in just a

few years. Only lifelong learners will continue to be successful participants in this fast-moving world (Matheson, 2000b). Driving this dizzying technological transformation is the Internet, which is becoming the essential infrastructure of the global marketplace, affecting virtually every company and industry. More than 17 billion e-mail messages are sent in the U.S. every day. This figure is expected to rise to as much as 37 billion by 2003 (Matheson, 2000a). By most counts there are over 100 million users of the Internet today. The number of web pages is in excess of 750 million, and in the next two years is projected to exceed one billion (Matheson, 2000a).

As rapidly as these changes seem to be taking place, the changes to society brought about by technological revolution were studied and written about by cultural commentator Marshall McLuhan back in the 1960s. Many of his ideas were thought strange and abstract at the time, but as we look back now on his theories, many of them seem to have come into focus with crystal clarity. As a media theorist, McLuhan recognized major consequences for everyday life from mass media. He maintained that changes in communication technology, such as the phonetic alphabet, printing press, telegraph, and computer, radically altered the way people process sensory experience. McLuhan concluded that the coming of the electronic age was a turning point in human history (Varey, 1999). Thus, the consensus among experts is that emerging electronic media are not only fundamentally changing the ways we perceive the world, but subsequently how we act in it (Ott, 1999).

The advent of CT in combination with information technology (IT) has resulted in an information explosion. Our society has produced more information in the last 30 years than was gathered in all the last 5000 years put together. The English language now contains five times more words than it did in the 1500’s. A Sunday edition of the New

York Times holds more information than an educated person of the 17th Century would encounter in a lifetime (Matheson, 2000b). It is becoming increasingly obvious that information is, indeed, power, and those who control it will be able to dominate, and possibly manipulate, the information society. In light of this, one of the great challenges for education will be to overcome passive acceptance of information in favor of the active use of independent judgment ("The information society," 1989).

Influences Of Computer Technology In All Education

Today the rapid proliferation of information due to advances in CT is changing what it means to be "educated." In the agricultural economy, a person went to school from age 7 to age 14. In the industrial economy, the learning interval was expanded to start at age 5 and end at age 22. In those days you could rely on information to be constant long enough to last a lifetime. But knowledge and information is too vast and changing too rapidly to even begin to "learn it all" in school. In fact, the skill of studying is actually more important in many ways than the things students are learning. Being able to learn well must now become their number one goal (Matheson, 2000b).

In today's information society, the emphasis must be on the ability to seek and select information, think critically, solve problems, work in teams, form value judgments, communicate, and constantly re-assess knowledge and skills in the light of changing needs. These educational goals must be considered equally important to conventional literacy as fundamental requirements for all members of society ("The information society," 1989). Computer information technology, particularly the World Wide Web with its innovations in the areas of hypertext, multimedia, and interactivity, has had a profound impact on higher education (Sutherland & Stewart, 1999).

To many in the information and communication field, the terms “information technology” and “new media” are virtually synonymous. As cited by Panici (1998):

> Massy and Zemsky (1995) and others suggest that the use of new media technologies in education benefits students and teachers by providing access to enormous quantities of information available through the Internet and various online databases, easing the limits of time and space for educational activities, increasing access to more and better information resources, enabling students to be active within the learning process, accommodating different learning styles, and enhancing the ability of institutions to stimulate experimentation and innovation. (p.52)

Definitions: Mass Communication And New Media

The term “mass communication” is used more by academic people than by journalists and others in communications fields. Many departments and schools throughout the 1970s and since substituted “mass communication” for “journalism” or added the words to their names (Cleghorn, 1996). The institution of research in mass communication has traditionally accepted newspapers, radio, and television as its focus of study for social, political, and economic reasons. As technology advances and informational media converge, those research categories now include new media such as the Internet and related technologies (Morris & Ogan, 1996).

The term “new media” can mean different things to different people (Singer et al., 1996). In a study done by Panici (1998), Departments of Journalism and Mass Communication chairs/heads found in the Association for Education in Journalism and Mass Communication Directory responding to a survey were asked to define the term as they us it in their introductory mass communication courses. Several themes were used to define new media: the use of computers, digital technologies, and the interactive nature of new media. Thus the term “new media” can refer to content such as text, graphics, animation, music, sound, or video delivered by digital means, such as CD-ROMs or the Internet. It can include the use of some form of interactivity, allowing the user to make

choices about how the content is viewed or experienced. It can also include the use of multimedia, or simultaneous multiple media such as text, graphics, animation, music, sound, and video. On the horizon are the emergence of digital TV, and the promise of virtual reality.

As cited by Panici (1998), Kawamoto (1997) suggests that new media should be defined in broader terms. When compared to traditional media, new media can be characterized using the themes offered by Panici's sample along with distance insensitivity, horizontal flow of news and information, no space or time constraints, decentralization of power and control, low access costs for producers, non-linearity of content, simple and effortless feedback, diverse funding sources, and flexible formats.

History Of The Internet/Web Wide Web

When the Internet came into being in the 1970s as a United States military research project called ARPANET, it was text-only. Electronic mail, file servers, newsgroups, and other text-based services were available to Internet users during the 1980s, but it wasn't until the 1990s when three developments came together to form the Web as we now know it:

1. Widespread use of graphical interfaces on computers (Macintosh and Windows)
2. Modems fast enough to transmit graphics
3. The idea of hypertext links, created by American technologist Ted Nelson in the 1970s, implemented in a programming language called Hypertext Markup Language

The World Wide Web was originally developed in 1990 at CERN, the European Laboratory for Particle Physics. It is now managed by the World Wide Web Consortium, also known as the World Wide Web Initiative (What Is the Web?, 2000). The National Center for Supercomputing Applications (NCSA) at the University of Illinois at Urbana-

Champaign was instrumental in the development of early graphical software using the World Wide Web features created by CERN. NCSA Mosaic was one of the earliest web browsers, distributed free to the public. It led directly to the phenomenal growth of the World Wide Web. In just the last four years the World Wide Web has evolved from no web pages to millions of them – a new page is being created approximately every four seconds. The Web is doubling itself every 90 days, and more than 80% of the sites that will exist a year from now have yet to be created (Matheson, 2000a). The Internet had as many as 200 million users worldwide at the end of 1999 (Hargittai, 2000).

The Internet As A Mass Medium

At first, according to Morris and Ogan (1996), mass communication researchers overlooked the potential of the Internet for several reasons. It was developed by hobbyists, students, and academics in a piecemeal fashion, as opposed to emerging full-blown in its present form. It didn't fit researchers' ideas about mass media since it didn't conform to the models of print and broadcast media they were used to. Morris and Ogan further contend that

> A collection of communication services – electronic bulletin boards, Usenet groups, e-mail, Internet relay chats, home pages, gophers, and so forth – comprise the Internet. Each of these specific Internet services can be viewed as we do specific television stations, small-town newspapers, or special interest magazines. None of these may reach a strictly mass audience, but in conjunction with all the other stations, newspapers, and magazines distributed in the country, they constitute mass media categories. So the Internet itself would be considered the mass medium, while the individual sites and services are the components of which this medium is comprised." (np)

Kirchner (1995) agrees that the World Wide Web has turned the Internet from little more than a laboratory experiment into a mass-communication medium.

Influences Of Computer Technology On Mass Communication

A study undertaken by Sutherland and Stewart (1999) explores how programs of the Accrediting Council on Education in Journalism and Mass Communications are using the Web for instructional and informational purposes. The 1997-98 Journalism and Mass Communications Accreditation Guide states that students should have instruction and training in the use of basic equipment necessary for their careers. The Web now appears to constitute basic equipment needed by journalists and other communicators to do their jobs.

Sutherland and Stewart (1999) maintain that the growth of the World Wide Web is pressuring higher education to turn out journalists highly proficient in computer technology, since industry analysts have seen the Web as taking its place alongside broadcast and print media as a major news medium in the last five years. As an example of how CT has changed broadcast news, McMullen et al. in 1994 foresaw that new technologies would allow the gathering of the news to be much more efficient, resulting in faster coverage and better presentation. The concept of a "one-man band" – a television reporter who shoots his own video, thereby reducing staff needs – was at that time a futuristic idea, but is now relatively commonplace.

Journalism has been shaped by technological advances since its origins in the 18th century. As the Columbia University Graduate School of Journalism New Media Program website (2000) explains,

> The print, radio and television industries developed into distinct fields because the technology behind each one emerged at different times – telegraphy, color printing, frequency modulation, vacuum tubes, transistors. The lines of separation still exist today in academia and what we refer to as the media industries. As a result, storytelling methods are very much bound by the technology of the medium. Ironically, advances in information technology allow us to break out of this technological orientation. The 1990s saw the emergence of the Web and digital media content. This media industry convergence gives journalists the

> opportunity to address the story first, choosing the media elements that best tell the story." (np)

Perhaps even more so than in the journalism realm, advances in computer technology have influenced the field of graphic design almost to the core. Now, as never before, graphic design as a profession demands skills in multiple media. In fact, according to McCarron (2000),

> The term "graphic design" has been gradually replaced by "visual communication" and, most recently, by "communication design." The evolution is significant – we have gradually discovered the core purpose of this branch of the design professions: to communicate. We now work in many media to accomplish our purposes – sometimes in print, but often in sound, moving images, and complex environments that integrate many media. The scope of application of design thinking is widening rapidly, moving designers into new roles in organizational development and communication." (p. 32)

Influences Of Computer Technology On Teaching Mass Communication – Early 1980s

As new communications technologies have emerged, so have the challenges and opportunities within communications curricula (Curtin & Witherspoon, 1999). Technology has had an impact on the teaching of mass communication long before the emergence of the Internet as a force. In the early 80s studies were done to determine the willingness of colleges and universities offering mass communications programs to enter the "new technology" era. Of course, the "new technology" of the early 80s seems like woefully "old technology" by today's standards. For example, in a study for the Association for Education in Journalism and Mass Communication done in 1983, Newton (1984) reports that 37.4 percent of the 206 college journalism programs which returned questionnaires said they had courses dealing with videotex, teletext, cabletext or related technologies. Most people today would be hard-pressed to know anything about these technologies, yet they were among the most advanced of their day. Videotex was a first attempt at interactive information delivery for shopping, banking, news, etc. Many trials

were made, but it never caught on in the U.S. and was not very successful anywhere except in France, where it is known as Minitel. Videotex uses a TV set-top box and keyboard. Data is delivered by phone line and stored in the box as predefined frames with limited graphics that are retrieved by menu (TechEncyclopedia, 2000).

Although the specific technologies differ from then to now, the concepts of the influence of new technology on education remain the same. For example, one respondent to the questionnaire used in the 1983 study by Newton said this:

> In 10 to 12 courses in our program ranging from the introductory mass media and society course to our newspaper editing course, a considerable amount of time is spent on new technology. This is true in our advertising courses, public relations courses, magazine courses, even photojournalism courses. The approach in all instances it two-fold: one is conceptual – what will be the impact and influence of the new communications technologies from a sociological, economic perspective; the other is the issue of hands-on instruction" (Newton, 1984, np).

Influences Of Computer Technology On Teaching Of Mass Communication Today

In a study conducted by Toth (1999), educators in the area of communication production and presentation recommended that students be knowledgeable in desktop publishing resulting in the creation of such documents as brochures, leaflets, and newsletters. In the area of visual/technological communication, necessary skills included video editing, media integration, photography, audio editing, and graphics/animation. Computer/new technology skills should include knowledge of industry standard software, CD-ROM, website use and creation, and graphic design.

The purpose of a study by Curtin and Witherspoon (1999) investigating public relations curricula was to determine what computer skills heads of public relations programs nationwide consider most useful for students to know in order to be prepared to enter the profession and what skills they actually incorporate into their classroom curricula. They questions asked were designed to provide a baseline knowledge of the

perceived usefulness and curriculum requirements for eight specific computer skills areas: word processing, desktop publishing, online information searches, e-mail, statistical analyses of data, creation and maintenance of web sites, project management software, and time tracking software. Of the eight specific computer skills, knowledge of word processing rated the highest. Next was how to do online information searches, followed by e-mail. Desktop publishing skills ranked fourth, followed by the ability to create and maintain a web page. Curtin and Witherspoon add that almost 40 percent of respondents said they used computers in the classroom for applications other than the ones outlined above. The most frequently mentioned additional uses indicate a strong visual component to many curricula: presentations, using software such as PowerPoint, and multimedia/video, design/layout, and graphics.

Gustafson and Thomsen (1996) have this to say about the effects of the Internet on public relations instruction:

> The Internet will gradually change the way business is conducted around the world…. It will affect the way companies communicate internally and externally…. These changes provide both new challenges and opportunities to public relations and advertising instructors…. There are myriad ways to meaningfully incorporate the use of the Internet in campaign and techniques courses. The results are better teamwork, an improved end product, and a more real world experience. (pp. 41-42)

Much of what would have been conveyed by text 50 years ago is now routinely communicated through visual and audio imagery. As internationally-known education consultant Tom Cyrs has said, “Human communication is evolving into pre-Guttenburg expression.” In other words, communication is moving from written text back to word pictures, visual representations, and storytelling (Gray, 2000, p.14).

The design and development of interactive multimedia programs require new ways of communication and familiarity with the tools of multimedia development. These

approaches to human-computer interaction create a need for a new curriculum in this area, hence the appearance over the past few years of courses with titles like Multimedia Authoring, Interactive Design, and Building Virtual Worlds. Janet Murray, the author of *Shakespeare on the Holodeck: The Future of Narrative in Cyberspace*, calls professionals coming from this new curriculum "interactive designers" (Cavalier, 2000, p.22).

Panici offers the following information (1998, p. 53):

> Hudson and Holland (1992) reported that, in an Introduction to Video Production course, students using an interactive multimedia exercise perceived that they learned more and enjoyed the class more than their counterparts who were exposed to the same material via a traditional lecture. The authors further suggest that this phenomenon may be "enough of a motivator to provide some long-range advantages, such as increased participation by students in their learning." (p.25)

Faculty members at the California College of Arts & Crafts in San Francisco believe that the traditional format of training designers to solve communication problems remains essential, but have launched a new Design and Media concentration because they want their students to be more "fluid" in terms of communicating via the most appropriate media (McCarron, 2000). One concern the study by Curtin and Witherspoon (1999) addresses is that both educators and employers may take for granted that students will develop computer and Internet skills on their own and do not need instruction in these areas as part of the formal curriculum. Studies of student computer use do not necessarily support this belief.

As a result of the ease with which information can be published on the Internet, Mass Communication students must be taught responsibility in the delivery of information. They must be made aware that many consumers of news are extremely gullible, believing all of what they see and hear, "… at times with a willing suspension of distrust about obvious distortions in news content" (Aikat, 1999).

The goal of authentic, engaging, and meaningful coursework is achieved through the use of new media, according to the study done by Panici (1999). Respondents to his survey suggested that integrating new media into mass communication courses creates a more relevant and "real world" experience for students entering the journalism and mass communication fields. In addition, respondents suggested that the use of new media enhances the learning experience, resulting in "wonderful tools that make learning exciting" (p. 53). Finally, respondents suggested that students may develop critical thinking skills by talking about and using new media in mass communication courses.

Conclusion

With the arrival of computer technology, information technology, and new media, the world has been changed forever, and continues to change at a rapid pace. Today's students must be taught how to keep up with the flood of information that flows from mass media sources worldwide. Mass communication students are now, or soon will be, at both ends of the river of data emanating from TV, radio, newspapers, magazines, the Internet, and various forms of new media present and future. As consumers of mass media, they are as inundated with the deluge of data as is the rest of society. But as future mass media workers, they will be shaping and directing this flow, and in order to do this in a productive and effective manner, they must be familiar with the tools of the information age. By incorporating interactive multimedia, Internet technologies, and other forms of digital content delivery into mass communication courses such as journalism, public relations, broadcasting, and the new media of desktop publishing, computer graphics, multimedia design, and web design, learning is accelerated and enhanced by the very tools the students are learning about. Thus our students will be entering the workplace with not only the technological knowledge and skills they need to

succeed in the field of mass communication now, but also the research and learning skills they will need to keep up with inevitable technological change in the future.

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Reflection

The students we educate at Black Hills State University will be entering a global workplace that will continue to be influenced by computer technology at a blistering pace. They must have the knowledge and skills necessary to compete. I am determined to provide these essential tools, and writing this paper was an enlightening experience for me as I prepare coursework and exercises for my classes. It has enabled me to envision a wider approach to communicating with computers that will benefit my students from now on.

CAPTION

When Is A Portfolio Not A Portfolio: Academic vs. Artistic

This piece of evidence, written in the Spring of 1999, was the culminating product for the third cornerstone class, Educational Assessment, fulfilling the Teaching and Learning requirement. As a student in elementary and even in secondary school, I remember always wondering, “Why do I need to know this? What good will memorizing these arcane facts do me in real life?” Now I know I was not alone. Although I was successful in the standardized, memorized, pen-and-paper testing days of the 50s through 70s, I would much prefer to have been taught using the authentic assessment techniques being espoused in education today. And I am particularly happy to be able to use these techniques in my own teaching, enabling my students to be better prepared for success in their lifelong endeavors.

I did not set out in life to be a teacher, but gravitated toward the profession almost accidentally. Before I knew it, I was first giving music instruction, and later teaching adult education and continuing education courses. In the latter area I was always responsible for creating my own curriculum, which I found to be not terribly daunting from the standpoint of content knowledge. But where I felt I was severely lacking was in two critical areas: educational learning theory and assessment techniques. That is why I considered the Education Assessment class for which this paper was written one of the turning points in my career as an educator. I feel this piece of evidence clearly illustrates how far our country’s educational system has come in the area of assessment from the days when I went to school, and further illustrates how an accepted form of evidential assessment from the visual and graphics arts world has been adapted to provide today’s students with a more meaningful way to learn.

When Is A Portfolio Not A Portfolio: Academic vs. Artistic

Paul D. Kopco

Spring, 1999

Teaching & Learning Cornerstone

Black Hills State University

When Is A Portfolio Not A Portfolio:

Academic vs. Artistic

Introduction

The educational trend away from traditional multiple-choice, machine-scorable tests which measure memorizable facts to alternative, authentic assessments such as portfolios, journals, and standards-based assessments which measure whether students can apply their knowledge, skills, and understanding in important, real-world contexts could be the most welcome revolution in the history of American education. Portfolios, in particular, have become perhaps the most popular examples of performance-based assessment. The use of portfolios, however, has long been a tradition in the visual and graphic arts to showcase an artist's best work. Yet academic portfolios and artistic portfolios are quite different in both content and purpose.

The goal of this paper is to investigate these differences, and to support an instructional lesson in graphic design which will use one type of portfolio in place of the other. The journey will start, via a literature review, with a brief overview of traditional standardized assessment and its pros and cons. Then various types of alternative assessment, with a focus on academic portfolios, will be investigated. The similarities and differences between academic and artistic portfolios will then be discussed. Finally, a graphic design lesson developed according to the Understanding By Design method is presented.

Traditional Assessment – Standardized Tests

Any examination that is administered and scored in a predetermined, standard manner is considered a standardized test. By far the most common type of standardized test is the norm-referenced test; however, minimum competency and criterion-referenced

tests—those that measure student performance against established criteria—can also be standardized (Worthen & Spandel, 1991). In this paper, the term “standardized test” will refer to norm-referenced tests. Standardized tests fall into two major categories: aptitude tests and achievement tests.

The purpose of standardized aptitude tests, like the SAT-I and ACT, is to predict how well students will perform in a future educational setting, such as college. Standardized achievement tests, of which the Iowa Tests of Basic Skills and the Stanford Achievement Tests are but two examples, are what citizens and school board members rely on when they evaluate a school’s effectiveness (Popham, 1999). These norm-referenced tests allow a student’s relative knowledge and skills to be compared with those of a national sample of students of the same age or grade level. Norm-referenced tests measure learning in a manner that answers the question of how this student compares to others one may wish to compare him or her to (Castiglione, 1996). In Popham’s (1999) words,

The task for those developing standardized achievement tests is to create an assessment instrument that, with a handful of items, yields valid norm-referenced interpretations of a student’s status regarding a substantial chunk of content. Items that do the best job of discriminating among students are those answered correctly by roughly half the students. Developers avoid items that are answered correctly by too many or by too few students. (p. 9)

The chief value of standardized tests is that they allow inferences to be made about a student’s relative strengths and weaknesses across subject areas, alerting parents to the fact that, for example, their child is strong in English but weak in math.

Standardized achievement tests can also indicate the growth over time of a student in different subject areas (Popham, 1999).

Standardized tests are very good at doing what they are intended to do, but problems arise when results of standardized tests are used for other, wrong purposes, such as to judge the quality of education. That is not the purpose of a standardized test. Standardized achievement tests have a different measurement mission than indicating how good or bad a school is. Using standardized achievement test results to evaluate educational quality is like measuring temperature with a tablespoon—the measurement method is inappropriate (Popham, 1999).

Other criticisms of standardized testing abound. For example, a study showed that between 50 and 80 percent of what was measured on most tests was not suitably addressed in most textbooks (Popham, 1999). Also, since no one test can possibly address the nation's curricular diversity, test developers attempt to create assessments in a "one-size-fits-all" format, which fits no one adequately. In addition, Popham (1999) points out that

> As a consequence of the quest for score variance in a standardized achievement test, items on which students perform well are often excluded. However, items on which students perform well often cover the content that, because of its importance, teachers stress. Thus, the better the job that teachers do in teaching important knowledge and/or skills, the less likely it is that there will be items on a standardized achievement test measuring such knowledge and/or skills. To evaluate teachers' instructional effectiveness by using assessment tools that deliberately avoid important content is fundamentally foolish." (p. 12)

Meisels (1996) adds that lack of specificity and absence of explanation and illustration are among the greatest limitations of norm-referenced, group-administered achievement tests. Meisels presents these seven criticisms of standardized tests:

1. Standardized achievement tests do not promote student learning. They provide little direct support for what goes on in the classroom. Standardized testing can never replace teacher-centered assessment.
2. Standardized achievement and aptitude tests are poor predictors of individual students' performance. They may accurately predict future performances of groups, but they are often inaccurate predictors of individual performance. If standardized tests were thousands of items long and took days to administer, they'd probably be better predictors than they are now.
3. The content of standardized achievement tests is often mismatched with the content emphasized in a school's curriculum and classrooms. Again, the problem is the size of the test. We simply cannot cover in 10 or 20 test items the richness and diversity that characterize many current curriculums.
4. Standardized tests dictate or restrict what is taught.
5. Standardized achievement and aptitude tests categorize and label students in ways that cause damage to individuals. Tests are not infallible; and even when tests are accurate, categorization of students into groups that carry a negative connotation may cause more harm than any gain that could possibly come from such classification.
6. Standardized achievement and aptitude measures are racially, culturally, and socially biased. We must acknowledge that even well-intentioned uses of tests can disadvantage those unfamiliar with the concepts and language of the majority culture producing the tests.
7. Standardized achievement and aptitude tests measure only limited and superficial student knowledge and behaviors.

Even the best tests can create problems if they're misused. Here are some important pitfalls to avoid (Worthen & Spandel, 1991):

- Using the wrong texts
- Assuming test scores are infallible
- Using a single test score to make an important decision
- Failing to supplement test scores with other information
- Setting arbitrary minimums for performance on tests
- Assuming tests measure all the content, skills, or behaviors of interest
- Accepting uncritically all claims made by test authors and publishers
- Interpreting test scores inappropriately
- Using test scores to draw inappropriate comparisons
- Allowing tests to drive the curriculum
- Using poor tests
- Using tests unprofessionally

Finally, Schmoke and Marzano (1999) put forth the opinion that standards and expectations for reaching them must be clear, not confusing, and essential, not exhaustive.

Alternative assessments

The alternative to testing students' knowledge of discrete facts through multiple-choice, true-false, and matching questions is to require evidence of knowledge, skills, and understanding through performance and outcome-based assessments consisting of projects, products, and real-world performance tasks. Performance-based assessment techniques also include interactive computer-based simulations, simulations employing role playing, oral examinations, observations of sample performances in situ, and

portfolio assessment. Performance-based assessment methods are now used in education more widely than at any time since the multiple-choice test format was introduced in about 1914 (Castiglione, 1996; Zhu, 1997). Not only are more teachers using performance assessments in their classrooms, but such assessments are beginning to influence district- and state-level testing programs as well. At least forty states are now either exploring alternative testing procedures or are in the process of changing assessments of student and/or professional performance (Castiglione, 1996). Performance assessments not only provide more direct and valid information about student progress than has ever been offered by traditional assessments, but they also yield information that is useful to teaching through a process that both validates and enhances teachers' knowledge (Falk & Ort, 1998). From portfolio reviews and other performance-based assessments the following question is answered: has this student met an acceptable standard of performance as determined by agreed-upon criteria (Castiglione, 1996).

However, by merely increasing the use of performance assessments, student performance is not automatically improved. If students are expected to improve their performance on these authentic measures, then "performance-based instruction" needs to be employed. McTighe (1996) offers these seven principles for performance-based instruction:

1. Establish clear performance targets. To teach effectively, we need to be clear about what we expect students to know, understand, and be able to do as a result of our instruction. But performance-based instruction calls for more. We also need to determine how students will demonstrate the intended knowledge, understanding, and proficiency.

2. Strive for Authenticity in Products and Performances. Performance tasks should call upon students to demonstrate their knowledge and skills in a manner that reflects the world outside the classroom.
3. Publicize criteria and performance standards. By sharing the criteria with students, we begin to remove the mystery of how work will be evaluated, while highlighting the elements of quality and standards of performance toward which students should strive.
4. Provide models of excellence. If we expect students to do excellent work, they need to know what excellent work looks like. Some teachers are wary of providing models of quality, fearing that students may simply copy or imitate the examples. This is a real danger with activities for which there is a single correct answer (or one "best" way of accomplishing the task). With more open-ended performance tasks and projects, however, we can minimize this problem by presenting students with multiple models. In this way, students are shown several different ways to satisfy the desired criteria, thus discouraging a cookie-cutter approach.
5. Teach strategies explicitly. One straightforward approach is to use the direct instruction model, in which teachers, introduce and explain the purpose of the strategy, demonstrate and model its use, provide guided practice for students to apply the strategy with feedback, allow students to apply the strategy independently and in teams, and regularly reflect on the appropriate uses of the strategy and its effectiveness.
6. Use on-going assessments for feedback and adjustment. Deep understanding or high levels of proficiency are achieved only as a result of trial, practice, adjustments based

on feedback, and more practice. Assessment should enhance performance, not simply measure it.

7. Document and celebrate progress. Supporting novice performance by encouraging small steps, celebrating incremental achievements, and documenting growth encourages students to keep trying and to strive for greater competence.

Falk and Ort (1998) maintain that if educators are to increase the likelihood that standards-based performance assessments will produce positive outcomes, there are some cautions to bear in mind. For example, standards and their accompanying assessments need to focus on essentials. If they are too prescriptive and reduce learning to the recall of hundreds of discrete objectives, subskills, and facts, they may result in the kind of skill-and-drill instruction they are trying to eliminate.

Performance-based assessments are typically scored using a tool such as a rubric, rating scale, or performance list. A rubric is a written description of performance accompanied by a value on a scale indicating the quality of the performance. The rubric's frame for assessing student work guides teachers to use evidence, rather than personal response, as the basis for making evaluations. Looking at student work in relation to standards helps teachers understand the strategies and approaches students bring to their learning. Of course, the ability to do this is contingent upon having worthy assessment tasks that are designed to be as contextualized as possible, that ask students to show and explain their work, and that allow a wide range of students to be able to demonstrate their abilities. When the tasks possess these characteristics, the process of scoring student responses offers a view of what students know and can do as well as how they actually do it. Recognizing differences in students' understandings and responses helps teachers broaden their views of what constitutes quality work (Falk & Ort, 1998).

Portfolios

Authentic demonstrations such as exhibitions, performance-based assessments, and portfolios are becoming more common as instruments of student assessment (Jonson and Jones, 1998). Derived from the graphic arts, the term portfolio learning has come to mean the collection of evidence that learning has taken place (Murphy, 1995). A working definition of a portfolio was given by Paulson et al., (1991):

> A portfolio is a purposeful collection of student work that exhibits the student's efforts, progress and achievements in one or more areas. The collection must include student participation in selecting contents, the criteria for selection, the criteria for judging merit and evidence of self-reflection. (as cited in Snadden & Thomas, 1998, p. 193)

It is essential that the portfolio does not become a mere collection of materials, but contains critical reflections on these and the learning that has been made from them (Snadden & Thomas, 1998). In the words of Lambdin and Walker (1994),

> Developing a portfolio involves reflection, writing, and self-critiquing in an effort to present a composite picture of oneself. This approach makes a portfolio much different from simply being a collection of sample pieces of a student's work. (p. 231)

Lambdin and Walker also submit that, in most cases, students need guidance in being reflective.

The benefits of portfolio-based learning and assessment are enormous and covered in great abundance in the literature. A typical account is given by McTighe (1996):

> North Frederick, MD, Elementary School Principal Carolyn Strum says the school's portfolio program has had at least four benefits:
> 1. the systematic collection of student work throughout the year helps document student progress and achievement;
> 2. student work serves as a lens through which the faculty can reflect on their successes and adjust their instructional strategies;
> 3. school-to-home communication is enhanced as students present and explain their work to their parents and other adults; and

4. students assume greater ownership of their learning and display obvious pride when involved in selecting and showing off their accomplishments and growth. (np)

As important and popular as portfolio-based assessment has become, it is not without its drawbacks, not the least of which is the element of time. Evaluating portfolios is very time-consuming. Snadden & Thomas (1998) also contend that, in addition to assessing the finished products, most teachers invest a substantial amount of time initially learning about portfolios and developing portfolio-based lessons. Some teachers find portfolio evaluation not only time-consuming, but difficult as well. Plake, Hambleton, and Jaeger (1997) suggest that a variety of technical problems exist in performance assessments, including development, assessment of validity and reliability, equating of forms, score reporting, and standard setting. Snadden & Thomas (1998) put it this way:

> The effective assessment of portfolios will continue to be difficult if we remain trapped within our traditional view of assessment. In other words, assessment based on comparing students with each other and with issuing grades or marks does not fit easily with portfolios which are essentially non-standardized. Portfolios will remain difficult to assess until new non-comparative assessment methods are developed. (p. 196)

Despite these difficulties, most advocates of portfolio-based assessment seem to overwhelmingly agree that the investment of time is more than worth the positive results. Castiglione (1996) had this to say:

> Some teachers had 120 portfolios to score, taking 35 to 40 minutes each to grade. ‘Teachers who are going to work the contract are not going to do this. . . . I can’t even begin to tell you how many hours it took to do this. But there are some of us who are crazy enough to want to do it. I’ve never seen so much learning take place in an English classroom as I did this year.” (p. 7)

Performance-based assessment and technology

A growing number of educators agree that technology, if used appropriately, promotes the kind of education now being encouraged; namely, multidisciplinary tasks, performance-based assessment, interactive instruction, collaborative work, and student

participation and exploration (Charp, 1995). Portfolio-based assessment can be greatly assisted by multimedia. Instructors can scan images of student's written work or art, capture audio of students reading, and include word processing and hypermedia files. Also, with the advent of digital video, instructors can digitize video of students' performances via computer; another option would be to save performances on videotape. All of these items can be compiled into a students' portfolio. Teachers can save all electronic files to a recordable CD-ROM (CD-R) or Zip disk (Gellerman, 1994).

Several companies offer portfolio assessment software. Synapsys Software, for example, provides Portfolio, a Windows package that allows educators to compile audio files, pictures, slide shows, movies and text about a student's performance into an electronic scrapbook. The program also provides a long-term view of the student's educational history. The portfolio becomes a showcase of students' talents, where they become responsible for self-assessment and tracking their own performance. Included in Portfolio is a module that creates assessment models that apply to all curriculum areas by designing outcomes and rubrics for each topic (Gellerman, 1994).

Another way technology can have a positive impact on performance-based assessment is through e-mail. Use of electronic mail between students and teachers is becoming widely accepted; students state instructors are more accessible by e-mail. The quality and quantity of electronic discussion are resulting in greater critical analysis. Students are much more participatory and display investigative characteristics. On-going contacts with instructors after a course is completed have been noted. E-mail is usually answered promptly and students appreciate not having to wait for an appointment (Charp, 1995).

Academic portfolios vs. artistic portfolios

As mentioned earlier, portfolios are not new, but have been an integral part of the graphic arts in tracking the professional development of artists for a long time (Snadden & Thomas, 1998). The idea of a portfolio is historically rooted in the traditions of the visual arts, where one's portfolio consists of a carefully selected sample of one's work. These conventions include illustrations or samples of the past performance of a designer, artist, or photographer. These are never random samples of an artist's work. Not every element has an equal opportunity for inclusion. What an artist selects for inclusion is intended to be appealing—to represent the most creative, outstanding, professionally accomplished, and engaging work. A great deal of reflection and careful consideration go into making the final choices (Castiglione, 1996).

In a portfolio, an artist's "public self"—or professional persona—is presented to a viewer. The public self represents the way the artist desires to be viewed by others. Consequently, portfolios most often contain what artists believe to be the very best of their work (Castiglione, 1996).

But some risk is involved in displaying any material that in some major respect missed the mark. Flawed work introduces to the viewer the unmistakable possibility of inadequate performance. The need to bring that unattractive and unlikely prospect to the attention of a potential client is usually difficult to justify. Thus an artist's portfolio does not usually contain works that reflect private doubts, dead ends, or even process (Castiglione, 1996).

For all practical purposes, when the term portfolio is used in education apart from the visual arts, the term is a metaphor altered and adapted for disciplines with needs that are different from those found in the world of art. Academic portfolios display the public self but, in contrast to the visual arts, frequently disclose considerably more about the

student's private self because they include examples of process and reflection. When portfolio assessment is used outside the arts as a means to determine a student's level of academic proficiency, rather than satisfying the needs and desires of a client, there are far more complex criteria to be met. Examples for inclusion are chosen to reflect progress toward the various goals of learning (Castiglione, 1996).

The products contained in a portfolio will usually include early drafts leading to a final paper; information about the classroom activities that led to the production of the portfolio; and a narrative reflection, written by the student, describing what he or she learned. These products are rich in information. They constitute a superb foundation for analyzing individual student needs, a vital element in planning for future instruction—and a purpose altogether absent in arts portfolios (Castiglione, 1996).

Understanding By Design Instructional Unit

Lesson Plan: Principles of Rhetoric as a model for Graphic Design

Identify desired results

What overarching understandings are desired?

- How elements of rhetoric, the science of figures of speech capable of convincing by means of an image, define many communications techniques used daily by graphic designers to solve problems.

- That figures of speech that show a relationship or resemblance are most important and have graphic parallels in visual communications.

What will students understand as a result of this unit?

- Students will understand how to convince and persuade through the use of visual and textual communication by employing elements of rhetoric.

What are the overarching "essential" questions?

- Do we always mean what we say and say what we mean?

What "unit" questions will focus this unit?

- What are rhetorical devices?

- How can language serve as a model for graphic design?

- Through devices such as irony and hyperbole, how can we visually say one thing and mean another?

Determine Acceptable Evidence

What evidence will show that students understand how to use rhetorical devices to solve graphic design problems?

Performance tasks, projects:

- Students will choose a rhetorical device from a list of twelve, and create a poster using the device to inform, delight and win over, or move an audience. Examples: metaphor, simile, parody, personification, pun, hyperbole, irony, allegory, etc.

Quizzes, tests, academic prompts:

- A quiz in which students are required to name the twelve rhetorical devices and give a descriptive definition of each using visual and textual examples.

Student self- and peer-assessment

- Students will critique both their own and fellow students' projects during their creation to allow for the incorporation of feedback before final assessment.

Plan Learning Experiences and Instruction

Given the targeted understandings and the assessment evidence identified, what knowledge and skills are needed?

Students will need to know…

- The definitions of the twelve rhetorical devices and examples of each

Students will need to be able to…

- Operate graphics software, layout software, and scanners
- Navigate the Internet and know how to download images
- Choose appropriate typefaces
- Make appropriate use of color

What teaching and learning experiences will equip students to demonstrate the targeted understandings?

- Present each rhetorical device and give its definition.
- Discuss different ways it might be used to inform, delight and win over, or move an audience.
- See and discuss examples of graphic design pieces illustrating the use of each rhetorical device to solve a visual communication problem.
- Have students choose one of the twelve rhetorical devices to use as the basis for a poster they will create using computer graphics and layout software. They may use their own photographs or they might acquire images from books, magazines, CD-ROMs, the Internet, etc.
- After a week of initial planning, designing, and creating a rough draft, assess and give feedback on the posters; allow students to self-assess and assess their peers.

- Review the definitions of the twelve rhetorical devices and any other graphic design principles discussed in class interactively on the teacher's instructional internet web page.

- Create a portfolio and include in it any sketches, rough drafts, original images, and other components of the poster.

- Compose three reflective narratives to be included in the portfolio—one at the outset of the project, one after the self- and peer-review stage, and one at the completion of the project.

- Conclude the unit with the quiz, a final public critique of the posters, and teacher assessment of the portfolios.

Conclusion

The use of an artistic portfolio to showcase creative work may be the culminating act of a graphic design or art student looking for employment in the industry, but the use of an academic portfolio while learning in school will result in a more authentic and meaningful learning experience for that student and a more successful and satisfying instructional experience for the teacher. As portfolio use increases in the K-12 sector, portfolio-based instruction and assessment in higher education should increase as well. It can only be hoped that this valuable means of performance-based instruction and assessment will pervade all levels of learning in all disciplines, so that real-world knowledge and skills can be gained by all who graduate from our schools and enter our society. By incorporating this method of instruction and assessment in a graphics arts class, the portfolio has come full circle to its historical origin, transformed from a mere display of artistic talent to a means of acquiring the understanding and insight that can enhance and propel that talent and many others.

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Reflection

In my role as an instructor in the Division of Fine Arts in the College of Arts and Sciences, I am required to review the portfolios of my graduating advisees in lieu of their taking an exit examination. As evidence of the most successful artistic works of Mass Communication and Communication Arts students over their college careers, these portfolios are far different from the portfolios being used as instruments of authentic assessment in today's schools (and the one you are now reading). The information gleaned in the preparation of this paper has not only enabled me to better design authentic, academic portfolio requirements for the classes I teach, but has assisted me in evaluating the artistic portfolios I encounter at the end of every semester. This is yet another way that the Master of Science in Curriculum and Instruction program has made me a better teacher.

CAPTION

Implementing Educational Technology through *Total Leaders*' Framework

Taking the class entitled "Restructuring America's Schools" enabled me to fulfill the requirements for the fourth cornerstone area, Leadership. In all honesty, this was not a class I would have chosen had my schedule and the schedule of the College of Education worked out differently. Nevertheless, as the parent of a middle school student, I found great value in this course and many other courses I took while pursuing the MSCI degree. Knowing why and how my child is being taught according to current educational theory and practices is extremely important to me. However, as an instructor in higher education, the chief value of this class to my own career was in the areas of collaboration and professional development. The techniques covered for the sharing of ideas and expertise among colleagues were most helpful.

The focus of this paper, using computer technology as a school restructuring component, has many parallels in the higher education arena, where the implementation of educational technology has been met by teachers with varying degrees of excitement, frustration, resentment, and anxiety. These professional development issues are universal to the teaching profession, thanks to the rapid advancement of computer technology and the pressure by school administration, government, and community for teachers to become adept at its use as quickly and thoroughly as possible. I feel that, through the publication of this portfolio, this piece of evidence can prove helpful to future K-12 educators in the MSCI program as they attempt to better their teaching and their schools.

Implementing Educational Technology through *Total Leaders*' Framework

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Summer, 1999

Leadership Cornerstone

Black Hills State University

In their book *Total Leaders: Applying the Best Future-Focused Change Strategies to Education*, Schwahn and Spady (1998) propose five domains of leadership critical to any successful implementation of organizational or educational change. In the context of school restructuring, these domains provide a clear framework for leaders of change to follow as they put into practice the various restructuring initiatives decided upon in their strategic planning.

One particularly effective restructuring initiative is the use of computer technology to enhance teaching and learning. Although computers have been used in classrooms since the 1950s, more recent advances in educational technology have put computer use at the forefront of efforts to promote authentic, performance-based standards and practices in the ways teachers teach and the ways children learn. According to a major project conducted by the International Society for Technology in Education (ISTE) and funded by a grant by IBM, students improve problem-solving skills, outscore classmates, and learn more rapidly in a variety of subject areas when using technology as compared to conventional methods of study (Kinnaman, 1991, p. 31).

As Goodman (1995) points out, recent developments in electronic technology and information processing will certainly have major impacts on the way in which we live and on our children's education (p. 6). As our society transforms from an industrial society to a high-tech information society, schools must incorporate available technology into the courseware delivery system (Lezotte, 1993). Chris Dede, futurist and expert on educational technology, in a conversation with John O'Neil, Senior Editor of *Educational Leadership* (1995), maintains that new technologies can help transform schools, but only if technology is not simply used to automate traditional models of teaching and learning. Similarly, Robelen (1999) recounts that for 8th graders, the use of computers to teach

higher-order thinking skills was positively related to higher achievement in math, whereas in cases where teachers used computers primarily for drill-and-practice applications generally associated with lower-order thinking skills, student performance declined. In the opinion of Walley (1995), rather than merely serving as passive electronic workbooks, current innovations in educational technology encourage students to actively create information and develop concepts. In a panel discussion entitled "Do schools really need interactive technology?" (1993), Gwen Solomon, Director of the School of the Future in New York City, had this to say:

> You can have a wonderful school without technology, but in the end I do think technology is crucial. Students today are so much more visual than we were. They're no longer "good little kids" who sit and soak up what a teacher tells them. They need hands-on experiences and the chance to associate what they do in school with the real world. Technology-rich projects help them make these connections. (p. 17)

Dede feels technology can have a major impact on schools if it is used to enable new models of teaching and learning – models that can't be implemented without technology (O'Neil, 1995). And if these models of teaching and learning extend into the community, the workplace, and the family, then technology's impact on education and learning will be massive. For example, the advances in collaborative undertakings afforded by today's telecomputing technologies are uses of technology that couldn't be imagined even a relatively few years ago. This paper will examine each of Schwahn and Spady's leadership domains in light of their use to promote computer technology as a school restructuring component. Each section will end with a brief discussion of how these principles impact on the world of higher education as they pertain to educational computer technology.

Defining a Purpose

The Total Leader must first of all put forth a clear and convincing purpose for the change s/he proposes (Schwahn & Spady, 1998). This perspective is described in the authentic leadership domain of the Total Leader model.

According to Robelen (1999), teachers have been reenergized, students' motivation to learn has increased, and parents have become more engaged in their children's learning through the use of new technologies. And in more and more classrooms the traditional roles of teacher and student have been altered, as teachers lecture less and instead become learning facilitators through the use of computers and other technology.

Robelen (1999) further points out that some experts say technology holds great potential to individualize instruction through interactive computer-based systems that can accommodate the needs, abilities, and learning styles of individual students. This position is supported by Betts, deputy executive director for operations at the Association for Supervision and Curriculum Development, who says, "…Technology gives us the capability to realize some of what for us are new philosophies of learning that have been described as constructivist, allowing more people to participate in the learning process" (Robelen, 1999, p.2). This provides a new paradigm in which students become actively involved in creating their own knowledge.

A particularly exciting and promising use of educational technology is in the area of telecommunications. Hirumi (1996) offers the following list of benefits educators can realize by investing in and connecting to electronic networks such as the Internet:

Student-centered learning environments. Interactive and telecollaborative activities help meet the needs of individual students, promote active participation, stimulate higher-order thinking, and encourage life-long learning.

Essential skills for the 21st century. To be successful, educated individuals must be able to search for, access, retrieve, interpret, organize, transfer, and communicate information via electronic networks.

Educational opportunities. Technology makes available tools which, when accessed, provide equity to rural schools where there may be a shortage of teachers, and provide all schools with access to current, unfolding events worldwide.

Simulations. Participating in simulations enhances thinking and real-world skill. Students can take authentic data and test hypotheses while collaborating with others from the U.S. and around the world.

Research projects. Students can participate in and review research projects, where they can participate as data collectors for scientists.

Virtual fieldtrips. Students and teachers can participate in virtual fieldtrips, sharing observations and experiences of actual travelers. Many recent expeditions have "webcast" their progress to schools around the world.

Expert advice. Scientists, engineers, artists, and other professionals can become mentors to students and teachers alike.

Opportunities for practice. Research suggests that students may be more highly motivated, write more, and work with more precision when their work is made public by publishing it on the Internet.

Collaborative problem-solving. Students in classes around the world can work together to research, discuss, and solve authentic or realistic problems.

School assignments and activities. Students and parents can access information about and for school assignments and activities from home or work.

Educational computer technology is of equal, if not greater, importance in higher education than in the K-12 arena. College is the jumping-off point into the world of employment for most college students. As ubiquitous as computer technology is in the work world, it is essential that they become familiar with the appropriate software and hardware for their discipline, whether it be general business productivity software or specialized software in the science, mathematics, or communication arts fields. This goal will be more surely met if educational computer technology is used in their classes, both as a subject to be learned and as a tool in the learning of other subjects. Institutions of higher education that are not utilizing educational computer technology in a majority of their classes, or are not utilizing it appropriate, constructive ways, are doing an immense disservice to their learners.

Providing a Clear Vision

The next task of the Total Leader is to provide a clear vision of what the future will be like after the changes s/he proposes have occurred. This perspective is described as the visionary leadership domain. In the case of school restructuring through the implementation of educational technology, there is good news and there is bad news.

The good news is the transition from the abstract to the concrete of all the purposes mentioned above – picturing schools as places of learning where all students have access to the myriad benefits of well-designed and well-implemented educational technology.

The bad news is that, to many teachers, the vision of the future offered by the use of computer technology has far fewer teachers. And some are even worried that, with the

rise of distance learning via telecomputing, schools may eventually disappear altogether. The Total Leader must dispel these myths.

For one thing, according to futurist Dede, schools have two other functions in addition to being learning environments: they are socialization institutions, and they are custodial settings (O'Neil, 1995). His opinion is that, because of the custodial and socialization aspects, schools will never disappear. We may not call them schools, but there will be some place that students go to keep them safe and to enhance their socialization into the nation. These points should be made by the Total Leader.

Some teachers fear computer technology will make them obsolete. However, children need mature models; they need adults to care about them and to see the value in their ideas. As Soloway (1996) eloquently states, "Teacher-proof curriculum is a silly, hostile notion, as is the idea that computer-based tutorials can replace teachers. Augment, yes – replace, no" (p.11). Peck & Dorricott (1994) add,

> Some things only teachers can do. Teachers can build strong, productive relationships with students. Technologies can't. Teachers can motivate students to love learning. Technologies can't. Teachers can identify and meet students' emotional needs. Technologies can't. Technology-based solutions in education can, and must, free the teacher to do the important work that requires human interaction, continuous evaluation, and improvement of the learning environment. (pp. 13-14)

Fullan (2000) has this opinion:

> The more powerful technology becomes, the more indispensable good teachers are. Technology generates a glut of information, but it has no particular pedagogical wisdom, especially regarding new breakthroughs in cognitive science about how learners must construct their own meaning for deep understanding to occur. This means that teachers must become experts in pedagogical design. It also means that teachers must use the power of technology, both in the classroom and in sharing with other teachers what they are learning. (p.582)

In summary, regarding the use of computer technology in schools, the Total Leader must clearly evoke a vision of what the future will be, and equally important, of what the future will not be.

Some teachers in higher education are no less worried about being replaced by computers than K-12 teachers, especially in the area of content delivery. But just as in the elementary and secondary realms, no matter how effective computer technology is at promoting and accelerating learning, master facilitators and mentors with proficiency in various fields will always be necessary. In highly specialized subjects and complex laboratory courses where human experience is of paramount importance, teachers will always be needed to deliver expert instruction based on their skills, talents, and knowledge.

Instilling Ownership

Once the Total Leader has provided a purpose for and a vision of the change, s/he must now get the people involved in the change to "buy into" the project. This perspective is described as the cultural leadership domain. There are many techniques to persuade individuals in many different areas, but research has shown that getting people to adopt innovations is a study in itself (Harris, 1998). According to Whitney, as quoted by Siegel (1995), "It's a difficult concept asking people to think of things in a different way and to … apply it to the curriculum" (p. 23).

In her book *Design Tools for the Internet-Supported Classroom*, Harris (1998) offers some fascinating insights into how to introduce telecomputing technology to teachers. She refers to the efforts of Everett Rogers, who in more than 30 years of research has led the tradition that teaches us about who adopts innovations, when they do so in comparison to their peers, and what conditions accompany changes in their

behavior. Rogers has shown that information about new tools, including telecommunications applications and other uses of computer technology, travels by interpersonal connections. Each person's decision about whether to use a new tool regularly is more dependent upon who shares the news of the tool than upon how well the tool might actually assist them.

Rogers and his colleagues explain that many peers do not trust the opinions of the most innovative members of any social system (Harris, 1998). This means that the very first educators to create Web pages often will not be emulated by fellow faculty members. In fact, most of the community may perceive this innovative behavior as abnormal.

Thus, Rogers says, it is not the "innovators" in social systems who can help others become receptive to adopting an innovation, but what he calls the "opinion leaders" (Harris, 1998). They are people to whom others look for information and advice about new ideas, tools, and techniques. Their positions of authority are rarely official or formal, and though they are often technically competent, they are much more socially accessible than teachers who adopt an innovation first. More important, opinion leaders conform to the system's norms much more than "change agents" do. Opinion leaders will be most effective in persuading colleagues to explore and use computer technology. Thus, these people should be the targets of the Total Leader. If s/he can get them on board, the others will follow in time.

Total Leaders also know that by including as many different factions as possible in the decision-making process, and by giving as many people as possible a personal stake in the outcome of implementing technological change, the "ownership factor" will

be of utmost importance in ensuring the successful efforts of everyone involved in the restructuring plans.

The tactics presented in this section are effective with users of computer technology in all organizations, including institutions of higher education. Thus their successful use is equally important to ensure that college instructors are adopting the employment of educational technology both in behind-the-scenes support of their teaching and in the classroom as an integral part of their course delivery.

Developing Capacity

The Total Leader knows that all the computer hardware and software in the world will amount to a colossal waste of money if teachers are not sufficiently trained in their use. As Nelson (1999) puts it, “Technology adds zero value if our teachers are not fluent in computers” (p.85). Thus, professional development, both at the outset of adopting technology tools and as an ongoing practice, is of paramount importance. This perspective is described as the quality leadership domain.

Harris (1998) offers a number of suggestions for professional development in the area of telecomputing. She contends that workshops will be more effective overall if they are offered, rather than required, and if maximum support is first provided to a smaller number of volunteer participants who are opinion leaders. She says, like Everett Rogers, that those people will naturally spread the word through their own communications channels, and they will attract additional participants later.

Harris (1998) contends that the problem-solving skills necessary to use the Internet both for professional development and instructional purposes cannot be taught directly; rather, their development can be assisted through relevant instruction in

appropriate formats to willing participants. She offers the following eight forms of instruction:

Independent learning. This is probably the most time-consuming and frustrating way to learn.

Independent learning with remote assistance. Most teachers who presently use Internet tools have learned to do so by applying patience, persistence, and good problem-solving skills both independently and with assistance from more experienced colleagues.

One-to-one coaching. This instructional form is for teachers lucky enough to work or live near a more experienced Net surfer who is willing to provide informal, individualized training.

Large-group demonstration with independent practice. This model is more effective in coaxing teachers to decide to adopt an innovation and in lining up support from decision makers than it is useful for helping anyone to truly use Internet resources.

Large-group demonstration with assisted practice. This format improves upon the previous format in convincing decision makers and in helping teachers use the tools once they are in place. Still not as effective as the following three formats.

Hands-on lab, intensive schedule. According to the author, due to the overwhelming amount of information on the Internet and the multiple skills necessary to master effective access to and use of that information, this may not be the best training model for teachers. She thinks it may be too much too soon.

Hands-on lab, paced schedule. Spreading hands-on experiences over a reasonable period of time is preferable to planning labs on an intensive schedule. This approach is successful mostly because it allows teachers to practice the skills they learned independently or with individualized assistance before they encounter the next new skill

or resource type. This is the format of TTL, or Technology for Teaching and Learning Academy offered in the State of South Dakota.

Hands-on lab, paced schedule, with structured online activities. Although this model takes the most effort for trainers, Harris feels it is probably the most effective overall. The success of this professional development model attests to the current popularity of the online course.

Once Internet skills have been acquired and the necessary technology is in place, Hirumi (1996) maintains that they will afford the following additional benefits for professional development:

1. Ideas and shared experiences – telecomputing technology can provide support for and communication with other colleagues.
2. Discussions – one of educators' greatest complaints is that they feel isolated in their classrooms; with electronic networks, they can join a variety of discussion groups on school restructuring and other current topics.
3. New curriculum and instructional materials – thousands of lesson plans (available on close to 200,000 websites), instructional activities, and educational resources are available through the Internet, covering a wide range of topics and disciplines.
4. Updating on current events – and access to national and regional education service centers and government agencies. (np)

Ongoing Support for the Restructuring Effort

Now that a compelling purpose and an inspiring vision have been established, the players in the game plan have been brought on the bandwagon and are motivated, and sufficient quality and training to carry out the restructuring plan are in place, there is one more critical phase of the overall restructuring effort – ongoing support. This perspective is described as the service leadership domain. There are many areas of support necessary to sustain the implementation of computer technology in schools. Acquisition of the necessary hardware and software, interconnection of computers to each other and the Internet, and training teachers to make inspired use of these tools to enhance teaching and

learning are all important. However, even if adequate funding and other resources can be secured, often the most difficult commodity to find in sufficient amounts is time. As Whitney puts it, “I don’t know if it is ever possible to have the right amount of time – time for teachers to discuss and reflect” (Siegel, 1995, p. 23)

Total Leaders know how crucial their support efforts in this area are. O’Neil (1995) states that perhaps the biggest barrier to technology use is time: time for training, time for teachers to try out technologies in their classrooms, time to talk to other teachers about technology. If teachers aren’t given more time to explore the uses of various technologies, and if the help they need in terms of training and support isn’t available, progress toward the vision espoused by the Total Leader will be painfully slow. Harris agrees in the previous discussions about opinion leaders that they should be provided with access to telecomputing resources and support for their use in the forms of training, ongoing assistance, funding, and – most important – time.

Based on a survey they conducted, Watts and Castle (1993) have identified five strategies that educators have used to solve the problem of finding more time:

1. Freed-up time. These are generally temporary and ad hoc tactics to break teachers out of the usual constraints of the school calendar, the school day, and the usual teaching schedule. Mostly this involved finding someone else – teaching assistants, administrators, another team teacher, support staff, college of education interns, or parent volunteers – to cover classes so that teachers can meet together to plan technological changes.
2. Restructured or rescheduled time. This involves formally altering traditional time frames, such as rearranging the daily schedule in some fashion. This can take many forms: adding student time on four days so they can be released early on the fifth day;

creating a first period before students arrive – the instructional day starts later and students stay longer in the afternoon – which provides common time for faculty to work while they are fresh; and various block scheduling plans.

3. Common time. A large number of schools are scheduling common prep or planning periods involving colleagues with similar assignments, such as by subject area, grade level, or teams.
4. Better-used time. The idea behind this strategy is to attempt to use currently scheduled meetings and professional development activities more efficiently, for planning or technology training rather than for administrative or informational purposes.
5. Purchased time. This is a desirable but unrealistic strategy for many schools. However, some creative ways of purchasing time within current funding constraints were suggested, such as buying summer time to study technology by using staff development funds to pay stipends to teachers, similar to the Technology for Teaching and Learning program in South Dakota.

Dede (O'Neil, 1995) has another interesting idea. He says that collaborative learning and constructive learning are not new concepts in learning, but they've never been sustainable, because teachers who try them usually burn out. The reason, he says, is because they didn't have an infrastructure that supported them. He goes on to say that technology itself can help establish a supportive infrastructure that makes it possible to use those powerful models without burning out. This would be an example of ongoing support once the implementation of technology in the school has been achieved.

Professional development in general is no less important in higher education than in the K-12 arena. In fact, it may be even more so, since specialized subject matter tends

to evolve more rapidly than generalized subjects. Also, since continuing education is mandatory in the K-12 world, college teachers may not be as familiar with current ideas in learning theory and techniques as their K-12 counterparts, especially as they pertain to the use of computer technology in creative and constructivist ways.

Conclusion

Total Leaders as defined by Schwahn and Spady (1998) are adept at operating in the five leadership domains described in this paper. Implementing educational technology in all its many forms as an element of school restructuring is not an easy task, but the framework provided by the authors as illustrated in this paper show that, if taken step by step, a workable program can be devised to bring about change in this vital area. The 21st century is upon us, and only by being Total Leaders will teachers ensure the success of students in this challenging and exciting era.

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Reflection

The value to me of the preceding piece of evidence is not only in the realm of education, but in the art of politics and persuasion in any other area of life that finds one trying to put forth an innovative or unpopular idea. The step-by-step plan described in Schwahn and Spady's book *Total Leaders: Applying the Best Future-Focused Change* Strategies to Education is a straightforward method to bring about change wherever it is needed.

As a result of my completion of the Master of Science in Curriculum and Instruction degree, I am contemplating running for a seat on my community's school board at some point, so that I can put what I have learned to practice for the benefit of my school-aged child and for the future of my community which its children represent. After going through the masters program, I feel I will be ideally qualified to deal with the many issues confronting the educational decision-making bodies of our communities and region. However, the community members who make up these boards are very often not well-versed in current educational trends and theories, and convincing people who may be opposed to change or new ways of doing things may need to be persuaded to see things differently for the sake of the children in our schools. That is where the principles set forth by Schwahn and Spady will be invaluable.

Final Reflection

There is an old cliché that says “Those that can’t do, teach.” If that is the case, thank goodness for these non-doers, for they are among the most inspiring and influential people in our society. I can think of no more worthy life’s work than to join their ranks, and I am proud to have done so.

The rewards of being a teacher are as obvious as the bright faces I encounter in my classroom every day. We all remember teachers who inspired us and made learning an exciting and rewarding experience, and I strive to be a similar factor in the lives of my students.

Because I teach an elective subject, my students are in my classroom because they want to be, not because they have to be. They share a common interest with me in creativity, communication, and technology. Every day I try to learn new ways to strengthen this bond in the hope of encouraging a love of accomplishment and learning. I endeavor to express my enthusiasm for the subjects I teach, just as the teachers I most remember and revere did in my formative years.

We all have different learning styles. Some learn best by watching or reading, some through hearing, some through doing, and some through different combinations of all these techniques. It is my job to discover each student’s unique pathway to knowledge, and to present material in such a way that as many of these paths are traveled as possible.

The ability to do this consistently and successfully is rapidly becoming more widespread through the use of multimedia, one of the subjects I teach. Multimedia presents information in a variety of ways, thus enabling the learner to gain knowledge interactively through text, graphics, sound, animation, and video, either individually or in

concert. By reinforcing the subject matter on multiple levels while interactively involving the learner, retention increases. Additionally, a much higher degree of interest is maintained as compared to more traditional teaching techniques which passively deliver information to the listener.

However, no matter how much technology is employed to aid in delivering course content in innovative and exciting ways, a computer is a poor role model to young adults seeking answers and forming behavior patterns as they develop their mental and social skills. A computer will never be looked up to or emulated as a life-long learner sharing knowledge and excitement with fellow learners. This will always be the role of the teacher. College students of all ages need the guidance, inspiration, and understanding that only comes with the human factor – an experienced, enthusiastic and caring teacher.

I derive a great deal of enjoyment in preparing my students to the best of my ability to go out in the business world and become successful professionals in the industries which demand their talents – publishing, advertising, broadcasting, corporate communications, commercial art, or any other occupation combining creativity and artistic talents with technological skills. Through years of experience in a variety of computer publishing jobs in a number of different industries, I am able to share with my students techniques for handling real-life situations. Although there is no substitute for making our own mistakes and learning our own lessons, I can at least make my learners aware of certain circumstances that occur in the business world, and give them advice regarding which ones to seek out and which ones to avoid. This knowledge, coupled with the skills being learned in the classroom, can give them a head start on a rewarding and productive career.

To help people to fully realize their potential and to develop into happy and successful individuals is the greatest accomplishment I can imagine. And it is why I will never regret having chosen teaching as a profession, and the pursuit of the Master of Science in Curriculum and Instruction degree as the capstone to that profession.