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THE IMPACT OF MULTIMEDIA INSTRUCTION UPON STUDENT ATTITUDE AND ACHIEVEMENT AND RELATIONSHIP WITH LEARNING STYLES

by

Michael L. McDonald

A DISSERTATION

Presented to the Faculty of

The Graduate College at the University of Nebraska

In Partial Fulfillment of Requirements

For the Degree of Doctor of Philosophy

Major: Interdepartmental Area of Administration, Curriculum and Instruction

Under the Supervision of Professor Al Kilgore

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"The Impact of Multimedia Instruction upon Student Attitude and Achievement and Relationship with Learning Styles"

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Michael L. McDonald

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GRADUATE COLLEGE
UNIVERSITY OF NEBRASKA

THE IMPACT OF MULTIMEDIA INSTRUCTION UPON STUDENT ATTITUDE AND ACHIEVEMENT AND RELATIONSHIP WITH LEARNING STYLES

Michael L. McDonald, Ph.D.
University of Nebraska, 1996

Advisor: Al Kilgore

The purpose for conducting this study was to determine the impact of multimedia instruction upon students' achievement and attitudes and the relationship with Kolb's Learning Styles.

The two-phase study involved students from "Healthy Lifestyles 100" at the University of Nebraska at Lincoln during the Spring Semester of 1996. During phase one, students (N=298) completed the Kolb Learning Style Inventory and a survey concerning their attitudes toward multimedia instruction and the general instructional format of the class. Students' grades (final exam score and overall course grade) were collected during the second phase of the study.

Descriptive statistics and two statistical tests were used to analyze data. The frequencies, means, percentages and standard deviations for the attitude survey, learning styles, and achievement scores (final exam and course grade) and selected survey questions were analyzed. Analysis of variance and the Pearson product-moment correlation were utilized to analyze attitude, achievement, learning styles and demograhics.

Findings from the study included:

1. The use of multimedia instruction had a positive impact upon student attitude.

2. Approximately 73 percent of students believed multimedia added to the overall value of the class.

3. There was a statistically significant difference for achievement (final exam score) by class between sophomore and freshman students and between senior and freshman students.

4. There was no statistically significant difference for achievement by preferred learning style.

5. A statistically significant difference was found for student attitude toward multimedia instruction by one Kolb Learning Style.

6. A statistically significant main effect was found for student attitude toward multimedia instruction by student achievement and preferred learning style.

7. A negative correlation was found between final exam score, final course grade, and student attitude toward multimedia instruction and achievement.

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Lastly, I thank both my mom and wife (Janet). Mom's last wish for me was that I "grow up to be a builder and not a destroyer...". Hopefully, I have taken one step toward meeting mom's charge. In turn, Janet has always believed that WE could do it and she was right. The completion of the degree reflects our belief in each other and one more step toward lifelong development.

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CHAPTER I

INTRODUCTION

The rapid growth of computer numbers and use in education since the 1960s is altering how educators in K-12 and higher education view the use of computers and technology (Morrell, 1992). The number of computers in public schools has exponentially increased from 800,000 in 1985, to 1.7 million in 1988, to over 2 million in 1993 (Swan & Mitrani, 1993). Since 1991, the national ratio of computers per K-12 student has decreased from 20 students per computer to 14 students per computer in 1994 (Quality Education Data, 1994). The increased use of technology has in turn fostered a shift of instruction from the predominant mode of passive-notetaking to more active methods of learning (Apple Classrooms of Tomorrow, 1992). Educators at all levels are increasingly recognizing that teaching and learning paradigms must be modified for the computer generation.

Specifically, research in instructional effectiveness and cognitive psychology is fostering the use of technology for more effective learning (Apple Classrooms of Tomorrow, 1992; Collin, 1990; Means, 1994). Business officials have also provided impetus for technology usage by demanding that educators prepare students for a future in which technology occupies an integral role in work. Students should know how to acquire and use information and work with a variety of technologies such as multimedia, which is the combination of text, graphics, sound, video, and animation (United States Labor Department, 1991).

Recent instructional research has revealed that multimedia can enhance and improve teaching. Instruction in a multimedia environment shifts from teacher-centered to student-centered learning activities. Teachers find they move from a dispenser of knowledge to a facilitator of information, giving students increased responsibility for learning. The use of technology also gives students more venues to study complex information (Dwyer, 1994). Instructors discover students take greater responsibility for their learning, particularly when technology use is adjusted to individual differences in students' interests, abilities, and learning styles (Sandholtz, Ringstaff, & Dwyer, 1994).

A survey of student perceptions of multimedia instruction supported the positive impact of multimedia upon the learning environment. Smith and Debenham (1993) developed an interactive HyperCard program called Project 2000--Computer Tutor at the University of Utah. The researchers' intent was to individualize and automate all basic classes through computer-based instruction. Smith and Debenham sought to empower the professor as a facilitator as opposed to a basic lecturer.

Smith and Debenhams' (1993) survey results from two auditorium sections of Introduction to Criminology revealed:

> . . . 89% of the students had no problems operating the computer assisted program; 90% liked to use the program to prepare for examinations; 95% agreed using the computer to learn key terms and concepts was a more efficient way of learning than reading the text alone; over 85% of the students said they were more likely to study class materials when using the computer as opposed to using the text alone; and 84-95% of the students believed course software improved their learning of the material more than using the text alone. (p. 72)

A meta-analysis of 59 independent studies of computer usage in the college classroom revealed computer-based instruction improved student achievement in 37 of 54 studies when compared to traditional (lecture) instruction (Kulik, Kulik, & Cohen, 1980). Kulik et al. reported traditional-based instruction significantly improved student achievement in only one occurrence. A collective review of exam scores in all of the studies revealed a mean score of 60.6 percent for computer-based instruction and 57.6 percent for traditional instruction. The mean difference was statistically significant ($p < .01$).

Cognitive psychology research also supports increased use of technology in the classroom (Gardner, 1983). Gardner noted there are many ways learners know, perceive, learn, and process information. Students learn differently depending on their makeup of seven intelligences: verbal-linguistic, logical-mathematical, spatial, bodily-kinesthetic, musical, interpersonal, and intrapersonal. The areas are collectively known as multiple intelligences.

The conceptualization of intelligences was developed by combining psychometric findings; human development and neurology research; studies of normal individuals and special populations, such as brain-damaged patients, idiot savants and autistic children; findings from cross-cultural research; and evidence offered by evolution. Studies of brain-damaged patients allowed researchers to identify the influence of specific intelligences upon learning while correlating with damaged-areas of the brain (Gardner, 1983).

Gardner (1983) also found that each student utilizes aspects of each intelligence but to varying degrees, and each intelligence develops relatively independent of the other intelligences. For example, an environment that emphasized verbal-linguistic instruction (i. e., the typical K-12 classroom) would not allow each student to utilize and fully develop each intelligence. In summary, Gardner suggested multiple intelligences are a very important factor in how people learn and should be considered along with a student's learning preference\style.

Learning styles involve several information processing and output operations, including selecting, encoding, generating information, memorizing items, analyzing relations, recognizing patterns of stimuli, and exercising heuristic hypotheses (Al-Badr, 1993). The disparity in how students process information in various situations can best be attributed to two main factors: how students adapt to their external learning environment and the internal information processing steps and neuro-biological elements affecting how students learn.

Kolb (1984) developed his Learning Style Inventory to reflect how the environment and internal information processing skills influence the way students learn. Kolb suggested every student undergoes a four-stage learning cycle, beginning with concrete experiences that guide students' learning. Students then use various methods to observe and reflect upon concrete experiences. The experiences, observations, and reflections are then assimilated into concepts that serve as guides in creating new learning experiences.

The Kolb Learning Style Inventory (Kolb, 1984) was utilized to determine interaction between method of instruction, cognitive learning style, and effect upon student attitude and achievement in a mechanical engineering class (Daily, 1991). Daily hypothesized that convergers (one of the four types of Kolb learning styles) would have the most positive student attitude toward class and achieve significantly higher scores as compared to the three other styles. Convergers were chosen because of their inclination to solve problems through a pragmatic application of skills, a natural element of hypothetical-deductive problem-solving in an engineering class.

Daily (1991) used a quasi-experimental design to compare the impact of multimedia instruction upon student achievement and attitude as opposed to a traditionally instructed class. Results indicated positive student attitude toward technology-based instruction. No support was found for a significant interaction between method of instruction and learning styles. Convergers achieved higher grades and had a positive attitude toward the subject and multimedia instruction, but statistical significance ($p > .05$) was not achieved. Daily concluded the limited duration of the quasi-experimental study possibly affected the results, as all students were exposed to technology for only half the semester.

The extent to which learning style affects achievement and student attitude toward subject discipline was also the research focus of the instruction of 60 undergraduate music students with different learning styles (Ester, 1995). Ester sought to evaluate the comparative effectiveness of a multimedia approach and a conventional lecture approach. A HyperCard-based program was developed that incorporated tutorial and simulation

techniques in studying the anatomy and function of the human larynx. Students were exposed to the technology through three, 50-minute sessions over a five-day period. Ester hypothesized that concrete learners might be more successful with multimedia instruction, while abstract learners instructed through lecture would have higher achievement.

The effects of the independent variables (teaching method and learning style) on the dependent variable (knowledge of vocal anatomy and function) were analyzed using a two-way analysis of covariance, with pretest scores serving as a covariate. There was a significant interaction ($p = .006$) between instructional approach and learning style. Concrete learners performed significantly better in HyperCard as well as lecture instruction, while abstract learners' achievement was significantly higher only with lecture-based instruction. Ester suggested that further research was needed to clarify the relative effectiveness of instructional approaches with respect to students' learning styles.

Empirical findings have indicated that university students felt positive about the effect of multimedia upon achievement and attitude, and multimedia instruction could be adapted to individual students' interests and learning styles. Hotchkiss (1994) developed a self-paced, interactive, multimedia module on the topic of stream discharge measurement. Classroom lectures were supplemented by students non-linearly exploring information not covered in class through SuperCard (a type of HyperTalk). Hotchkiss discovered that multimedia was more engaging than traditional lectures and allowed the learner to demonstrate higher-level knowledge that was not easily reflected after simply reading a book or listening to a lecture.

Researchers at Wright State University reported there may be a positive relationship between student achievement and instruction when faculty supplement traditional or linear forms of presenting information (traditional lecture) with multimedia instruction (Sammons, 1995). Sammons found students perceived they understood information better and were able to retain information for longer periods of time when able to learn in an environment in which a multimedia presentation program was used. Also, students' processing of information was facilitated by the use of multimedia when adapting to various learning preferences (e.g., visual and auditory) that impacted student attitude and also, possibly, achievement.

In summary, previously cited researchers have suggested instruction at all levels, including higher education, is enhanced when the professor is able to use approaches and materials that respond to students' individual needs and abilities. Multimedia instruction that incorporates consideration for students' cognitive needs, such as learning styles, appears to be a positive step for improving instruction and learning.

Context of Study

A small group of University of Nebraska-Lincoln professors met in early 1993 to develop a university action plan for technology. Faculty members believed they should incorporate technology into their instruction. for several reasons: (1) the increasing number of incoming University students who possessed technology skills that equaled or exceeded the technology skills of many faculty and staff; (2) the mixture of student expertise and experience in technology, since some students entered with