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LEARNING STYLES, MULTIMEDIA HYBRID VERSUS TRADITIONAL TEACHING, COURSE SATISFACTION, AND LEARNING OUTCOMES IN ART APPRECIATION COURSES

Presented in Partial Fulfillment of the Requirements for the Degree of

Doctor of Philosophy

Lynn University

By

Ching-Chuan Chan

Lynn University

2007

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LEARNING STYLES, MULTIMEDIA HYBRID VERSUS TRADITIONAL TEACHING, COURSE SATISFACTION, AND LEARNING OUTCOMES IN ART APPRECIATION COURSES

Chan, Ching-Chuan, Ph.D.

Lynn University, 2007

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U.M.I
300 N. Zeeb Road
Ann Arbor, MI 48106

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LEARNING STYLES, MULTIMEDIA HYBRID VERSUS TRADITIONAL TEACHING, COURSE SATISFACTION, AND LEARNING OUTCOMES IN ART APPRECIATION COURSES

Abstract

Dramatic changes in technology in the 1980s have had an impact on human lives, not only in the field of business, but also in the field of education. In recent years, more academic institutions have chosen to deliver curricula online, and instructors have used different educational technology tools to support students' learning abilities. In fact, web-based educational approaches have been examined by numerous researchers, and as a practical issue in the educational field, web-based instruction can be cost-effective, flexible, and convenient.

The purpose of this exploratory (comparative) and explanatory (correlational), prospective survey research design was to investigate the relationship among course delivery methods (multimedia hybrid versus traditional face-to-face), learning styles, course satisfaction, and learning outcomes (course grade and learning gains) in higher education art appreciation courses. This study was conducted in a private university in south Florida, with a sample of 71 participants. There were three classes that constituted the sample of students that were taught via multimedia hybrid (n=44) and two classes that formed a sample of students taught by traditional methods (n=29).

Independent t-tests and Chi-Square tests showed no difference in student background characteristics and learning styles between the two groups; however, course satisfaction, course grade, and learning gains were significantly higher in the multimedia hybrid classes. Eta, Pearson r correlation, and hierarchical linear regression analyses

were used to test the hypotheses, which were partially supported: (a) learning style and student characteristics explained 25.2% of the variation in course satisfaction for the traditional group versus 18.6% for the multimedia group; (b) learning style and student characteristics explained 16.7% of the variation in course grade for the multimedia group versus 15.3% for the traditional group; and (c) learning style and student characteristics explained 35.2% of the variation in learning gains for the traditional group versus 10.0% for the multimedia group. Reliability and construct validity were also examined.

Findings suggest that use of instructional technology in teaching art related classes can enhance learning and course satisfaction. Recommendations for future research included construct validation of the Learning Style Inventory, and replication of this study in larger universities, with larger samples, and in different countries.

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CHAPTER I

INTRODUCTION TO THE STUDY

Introduction and Background to the Problem

Instructional technological innovation has rapidly changed in recent years and instructors are using different educational technology tools to support learning in the classrooms (Clarke, Flaherty, & Mottner, 2001; Parssian, 2005). Kozma (2003) indicated that teaching, learning, and curricular practices have undergone significant changes due to instructional technology innovation. Today, students experience education via different delivery formats to access information immediately from around the world (Burnett, 2001; Miller, 2001). Miller (2001) stated that instructional technologies have demonstrated the ability to expand educational capacities. According to the survey investigated by the U. S. Department of Education's National Center for Education Statistic (NCES), data indicated that during the 12-month 2000-2001 academic year, 56% (2,320) of all 2-year and 4-year Title IV-eligible, degree-granting institutions offered distance education courses for all levels of audience. An additional 12% of institutions surveyed plan to create distance education programs within the next three years. In addition, more than 3,077,000 students were enrolled in distance education courses in the 12-month 2000-2001 academic year (National Education Association, 2003).

Web-based delivery tools have led to the re-casting of instructional methods for the online environment (Peterson & Bond, 2004). Moreover, web-based education can enhance students' self-directed learning behavior, facilitate students to accept information and knowledge via the Internet, encourage communication with instructor and peers, and further improve students' critical thinking skills (Perlman, Weston, & Gisel, 2005).

Current educational studies are exploring how specific types of instructional technology and instructional (pedagogical) methods influence learning (Young, Klemz, & Murphy, 2003). The belief that the traditional face-to-face class is the greatest approach to support learning is being questioned (Jacobsen, 2001; Johnson, Aragon, Shaik, & Palma-Rivas, 2000; Taylor, 2004). Actually, the flow of information in traditional ways of teaching is mostly one-way, from teacher to student (Salter, 2003).

Indeed, instructors play a critical role to guide, coach, and motivate students in order to succeed in the use of technology and the quality of education (Burnett, 2001; Jacobsen, 2001; Wiesenberg & Stacey, 2005). Nevertheless, instructors should realize how to successfully use new technology and to be sensitive to the diverse impacts on the students as well as their learning process (Hong, Lai, & Holton, 2003). Simultaneously, with the intention of increasing competition and protecting the schools' reputation, instructors and administrators are also concerned about the programs' quality (Parssian, 2005). Unfortunately, in order to increase enrollment, many institutions rushed to join onto the electronic super highway without deeply understanding the delivery methods (Hallock, Satava, & LeSage, 2003). As Young et al. (1993) stated, "The reality of most classroom environments is that there is a multitude of instructional variables that produce a joint effect on learning, thereby limiting the usefulness of the reported effects of a specific instructional technology examined in isolation" (p. 130).

Different students' learning styles may influence student learning outcomes and satisfaction within a web-based course in different disciplines (Kanuka & Nocente, 2003). In addition, Hallock et al. (2003) stress that student learning outcomes will improve when a student learning style was matched to the learning environment. For instance, students

who are classified as visual learners may have higher performance when information is offered using pictures or design methods (Hallock et al., 2003). Understanding the differences of student learning styles may facilitate instructors to create educational approaches to suit students' needs and increase learning achievements. For instance, Neuhauser (2002) pointed out that visual learners may benefit from text, charts, and graphs; auditory learners may favor traditional face-to-face instruction.

Kolb (1984) identified the *learning style* as a recognized factor in the process of student learning, and that educational achievement depends on not only intellectual ability and aptitude of the learner but also on the individual's learning style. Learning style refers to the manner in which learners respond to or interact with stimuli in the learning context, and is closely related to the learner's personality, temperament, and motivation (Kolb, 1984). Furthermore, Cooper (2001) stressed that, in educational psychology, style has been recognized and is viewed as a key component to describe individual differences in the context of learning. Claxton and Murrell (1987) considered learning styles as an important component in improving higher education students' learning and learning outcomes. Several researchers asserted that awareness of "learning styles can help instructors develop better teaching practices, and clarify issues relating to the role of the instructor in the educational process" (Cooper, 2001, General Concepts for Learning Styles section, para. 9).

Student learning outcomes are among the major factors used to measure student achievement in web-based curricula (Rivera, McAlister, & Rice, 2002). Spady (1994) stated that desirable outcomes are definitive learning results that students demonstrate at the end of important learning experiences. These outcomes are what learners can actually

achieve with what they have learned; they are the concrete usage of what has been learned. Outcomes occur at the end of a learning experience, so these represent the ultimate result that is desired from learning. Spady (1994) further describes that most exit outcomes are defined as broad performance capabilities, rather than as specific curriculum skills.

In art appreciation education, a large number of art instructors use the Internet as a resource in a variety of ways for themselves and the students (Erickson, 2005). Evidence has demonstrated that prior empirical studies produced inconsistent results in web-based courses. Moreover, understanding students' satisfaction within a web-based education course is also important for art appreciation instructors to facilitate the examination of outcomes and adjust teaching approaches and content of the course. There was no empirical study found that examined the relationship among student background characteristics, learning styles, course satisfaction, and learning outcomes in the field of art appreciation education. Therefore, a further reexamination of this relationship is needed.

Purpose of the Study

The primary purpose of this quantitative, non-experimental, exploratory (comparative), explanatory (correlational), prospective survey research study, and was to examine the difference of students' course satisfaction, course grades, and learning gains of students enrolled in art appreciation courses with differing teaching methodologies. The study participants will be enrolled in multimedia hybrid or traditional face-to-face art appreciation courses. This research was focused on student background characteristics

and learning styles in higher education. There are five specific purposes of this study, which include one descriptive, three explanatory, and one exploratory purpose:

1. The descriptive purpose seeks to describe the relationships among course delivery formats, student background characteristics, learning styles, course satisfaction, course grade, and art appreciation learning gains in higher education art appreciation courses;
2. The first explanatory (correlational) research design seeks to explain the relationships among student background characteristics and learning styles effects on course satisfaction for students participating in multimedia course delivery (H_{1a}) and students participating in traditional face-to-face course delivery (H_{1b});
3. The second explanatory (correlational) research design seeks to explain the relationships among student background characteristics, learning styles, and course satisfaction on students' course grade for students participating in multimedia course delivery and students participating in traditional face-to-face course delivery;
4. The third explanatory (correlational) research design seeks to explain the relationships among student background characteristics, learning styles, course satisfaction, and course grade on art appreciation gains for students participating in multimedia course delivery and students participating in traditional face-to-face course delivery; and
5. The exploratory (comparative) research design seeks to compare differences between course delivery systems for respective dependent variables of

course satisfaction, course grade, and art appreciation learning gains (post-test minus pre-test).

Definition of Terms

In this study, based on the research designs, variables (course satisfaction and course grade) may be analyzed as casual (attribute or independent) or dependent variables.

Student Background Characteristics

Theoretical Definition

Student characteristics included age, gender, student motivations to enroll in online courses, student expectation of online courses, and student experiences with online courses (Kirtley, 2002).

Operational Definition

In this study, student background characteristics included gender, age, major, and prior computer experience which were used to determine participants' social demographical features. Gender was defined as two levels which included female and male. Student age was divided as four levels: (a) 18 years old; (b) 19 years old; (c) 20 years old; and (d) 21 year old and above. Major consisted of Arts and Sciences, Communications, Education and Human Services, Business, Hospitality and Undecided. In addition, prior computer experience was used to explore how many times student enrolled in online or web-based courses before the spring semester, 2007.

Multimedia Hybrid Teaching

Theoretical Definition

Multimedia hybrid teaching is a blended teaching approach combining instructional methods which include traditional campus-based and web-based learning

methods (Dennis, El-Gayar, & Zhou, 2002; Gregory, 2003; Rivera et al., 2002; Roblyer, 2003; Toor, 2005) that allow students synchronous interactions and encounters with instructor and peers (Dennis et al., 2002).

Operational Definition

Multimedia hybrid art appreciation courses were taught in the classrooms with web-based instructions. The course delivery method of the multimedia hybrid sections included computer-generated slide lectures and discussion, active reading, virtual museum field trips, informal and formal writing, online research assignments, and faculty-student-peer review. Students in the hybrid sections were required to access course information and submit homework assignments via the Blackboard instructional system.

Traditional Face-to-Face Teaching

Theoretical Definition

Traditional face-to-face teaching method is an on-campus, textbook-based, and instructor-led format that requires learners to attend lectures and take notes in an existent place at the same time (Jones, Moeeni, & Ruby, 2005; O' Malley; Jo, Jones, & Cranitch, 2000).

Operational Definition

Traditional face-to-face art appreciation courses were taught in the classrooms with slide lecture format. The primary course delivery method of traditional face-to-face sections involved use of the textbook, active reading, discussion, and slide show presentation.

Learning Styles

Theoretical Definition

Learning styles refers to the manner in which learners' respond to, or interact with stimuli in the learning context, personality, temperament, and motivation (Kolb, 1984).

Operational Definition

The Kolb's Learning Style Inventory (KLSI 3.1) was used to assess student learning styles.

Course Satisfaction

Theoretical Definition

Student course satisfaction is identified as the student's feelings about a course that applies instructional technology, as well as whether they may again want to take a course offered in a similar format (Rivera et al., 2002).

Operational Definition

The portion of two global items of the Course Satisfaction Instrument created by the researcher was used to measure students' course satisfaction.

Art Appreciation Learning Gains

Theoretical Definition

The intended student learning outcomes in art appreciation education (Anderson, Cerbin, Choy, DuBois, & Grill, 1997)

Operational Definition

The pre-test and post-test of art appreciation learning gains were measured by the Aesthetic Experience Assessment (AEA), developed by Anderson et al. (1997) and modified by the researcher.

Course Grade

Theoretical Definition

Students' final semester course grades were used as indicator of student performance of the course (Hallock et al., 2003; Young, 2003).

Operational Definition

Course grade was measured using GPA associated with each letter grade (A= 4.00, A-= 3.67, B+= 3.33, B= 3.00, B-= 2.67, C+= 2.33, C= 2.00, C-= 1.67, D+= 1.33, D= 1.00, F= 0.00).

Justification

This study was an exploratory (comparative) and explanatory (correlational), prospective survey research design. In addition, a secondary data research design is researchable and feasible because: (a) concepts of theoretical framework are measurable; (b) research hypotheses can be tested; (c) participants are available; and (d) time investment is manageable.

Research into the use of multimedia hybrid course delivery has been conducted in numerous subject areas (business, finance, information sciences, and communications). However, this research was needed because evidence pointed out that the lack of empirical studies examining the influence of course delivery formats, student background

characteristics, and learning styles on course satisfaction, course grade, and learning gains in higher education art appreciation courses.

The weaknesses of traditional format of art courses revealed by Cason (1998) indicated that traditional slide lecture format introduced vast unfamiliar images to students in a dark classroom, which may make students to sleep than intellectual stimulation. A multimedia hybrid course format may be designed to engage students in the art appreciation learning experience. Furthermore, Cason (1998) pointed out that traditional mode of instruction is lacking in achieving the goals of visual literacy which includes the development of critical and analytical skills necessary to understand art works. Another issue to explore is which course delivery method increases visual literacy.

In the aspect of practical implication, this study may contribute to theories such as Kolb's experiential learning theory (Kolb, 1984) and constructivist learning theory (Almala, 2005; Prater, 2001). The findings of this study may facilitate instructional innovation in the field of art appreciation education. Moreover, the findings of this study may also motivate instructors in art appreciation education to rethink the design of course delivery methods in the near future. Finally, the results may support studies that had similar findings in related research areas.

Delimitations and Scope

In this study, the participants were day undergraduate students who were enrolled in art appreciation courses at a private university in south Florida during Spring semester, 2007. The participants were least 18 years of age.

Chapter I of the study provided a synopsis which included an introduction of the background and purpose of the problem, definition of variables, justification, and delimitations. A critical analysis of the theoretical and empirical literature about learning styles, course satisfaction, student learning outcomes (course grade and art appreciation learning gains), and instructional technology (multimedia hybrid vs. traditional face-to-face) were provided in Chapter II. Furthermore, theoretical framework (research model), research question and hypotheses were also discussed in Chapter II.

Chapter III presented the research methods which consisted of the research design, population, sampling, survey instruments, data analysis procedures, ethical considerations, methods of data analysis, and the evaluation of the research methodology. The findings of this study were described in Chapter IV. Chapter V presented the interpretations of the results, conclusions, implications and limitations, and suggestions for future research.

CHAPTER II

REVIEW OF THE LITERATURE, THEORETICAL FRAMEWORK, RESEARCH QUESTION, AND HYPOTHESES

Review of the Literature

The current literature review was compare the students' learning outcomes and course satisfaction of students who are learning through both *Traditional Face-to-Face* and *Multimedia Hybrid* art appreciation courses at a private university in South Florida. Realizing the impact of technology integration, student learning styles on student learning outcomes in art appreciation courses may be able to help art appreciation instructors choose useful teaching approaches, improve students' problem-solving abilities for real world living, and further enhance student art appreciation learning gains.

Student Learning Outcomes

Outcome-Based Education (OBE)

In 1994, Spady introduced his seminal theory of Outcome-Based Education (OBE), and stated that "Outcome-Based Education means clearly focusing and organizing everything in an educational system around what is essential for all students to be able to do successfully at the end of their learning experiences" (p. 1). The theoretical literature on learning outcomes indicated that OBE provided fundamental conceptions to think about the topic of learning outcomes (Spady, 1994). The major propositions of this theory are: (a) all students can learn and succeed, but not on the same day in the same way; (b) successful teaching promotes successful learning; and (c) schools control the conditions that directly affect successful school learning. Moreover, in order to inspire success for students and staff, OBE proposes: (a) ensuring that students are equipped with

the knowledge, competence, and qualities needed to be successful after exiting the educational system; and (b) structuring operating schools so that those outcomes can be achieved and maximized for all students (Spady, 1994). This model identifies four essential principles that include: (a) clarity of focus; (b) design from the top down; (c) high expectations; and (d) expanded opportunity (Spady, 1994). However, OBE focused on "the product" rather than on the educational "process" (Harden, Crosby, & Davis, 1999). Expanding opportunity and instructional support for learners were the key components of Spady's model (McNeir, 1993). However, OBE stressed that all learners are able to learn and can achieve high levels of capability (Spady, 1994), and further to emphasized classroom reform, program alignment, external accountability, and system transformation (Harden et al., 1999; O'Neil, 1993). Additional, OBE emphasized observation and measurement of outcomes (McNeir, 1993). This theory is socially significant addressing essential issues about student learning outcomes in the educational discipline. In recent years, the theory has been revised and widely adapted to the education field.

Weaknesses about OBE were revealed by several scholars and articles. In the final report of OBE, two problems were described by Kearney (1994): (a) the failure to be built on a strong research base; and (b) the inability of faculty to clearly define learner outcomes and effectively evaluate those results, such as how to achieve and assess learning outcomes, and how students will be affected. Furthermore, North Central Regional Educational Laboratory (2006) indicated that discussion about OBE discloses extensive confusion about the use of terminology and concepts. The terms "outcomes", "standards" and "goals" are used interchangeably, but there is disagreement about the

meanings and applications of these terms. These terms also are used arbitrarily to reference various types of results, including content outcomes, as well as students' and school performance. Further examination of outcome-based education that applies in higher education art appreciation courses is needed.

Course Satisfaction

Student course satisfaction is identified as the student's feelings about a course that applies to instructional technology, as well as whether they may want to again take a course offered in a similar format (Rivera et al., 2002). Moreover, Johnson et al. (2000) discussed student course satisfaction in regard to student perceptions of course quality, interaction, structure, and support. To measure student course satisfaction, Zhao (2003) revealed three important factors which include (a) satisfaction with the medium; (b) quality of the course; and (c) the outcomes of learning should be considered. The findings based on previous research produced mixed results of student satisfaction in Web-based courses (Hong et al., 2003). Several studies focused on the field of Web-based education reported higher levels of students' satisfaction with the courses (Hong et al., 2003; Kanuka & Nocente, 2003). In contrast, numerous studies revealed student satisfaction within the Web-based courses had no significant difference (Johnson et al., 2000; Rivera et al., 2002) when compared with traditional face-to-face courses.

Course Grade

Course grading is one of the most important means of measuring student learning achievement in the field of education. According to Young et al. (2003), an instructor-assigned grade, provided at the end of a course, is used as a learning outcome measurement.

Art Appreciation Learning Gains

Anderson et al. (1997) explained that, in art appreciation courses, student learning outcomes were determined as the intended learning achievements of the general education category. Three specific purposes of arts education (the aesthetic experience) by Anderson et al. (1997) are: (a) to treat the arts as a primary resource of human enrichment; for learners to become comprehensive and articulate in understanding and finding pleasure in one or more of the arts; (b) using language, historical perspective and aesthetic taste to discuss artistic presentations in a particular form of art; and (c) "become a lifelong consumer, advocate and/or practitioner of one or more of the arts" (p. 1).

Measurement of Learning Outcomes

Many measures of learning outcomes have been used in educational research of course grade, exam scores (Young, et al., 2003), and student course satisfaction (Rivera et al., 2002). Young et al.'s (2003) interpretation using multiple outcome variables such as instructional technology, learning styles, instructional methods, and student behaviors in the field of education to help make certain of the multiple goals and the multiple dimensions of learning outcomes. McCloy, Campbell, and Cudeck (1994) stated that performance can be defined as a multidimensional construct joining the behaviors or actions that are appropriate to the goals of course. Students' self-assessment of general knowledge increased, their skills and abilities developed, and the endeavor they spent in a virtual class relative with other classes improved (Young et. al, 2003). With a web-based curriculum, although student performance is an important factor in measuring success of a course, course satisfaction also is important factor for the continued success of such a program (Rivera et al., 2002).

Measurement of Course Satisfaction

Student course satisfaction is identified as the student's feelings about the course of applying instructional technology, as well as whether they might want to take a course offered in a similar format again (Rivera et al., 2002). In this study, student course satisfaction was measured using two global items of *Course Satisfaction questionnaire* which was developed by the researcher and approved by faculty. The instrument has been used to assess student perception of course quality of learning experiences. Use of 5-point Likert scale, each of the two items ranged from 1= Strongly Disagree, 2= Disagree, 3= Neutral, 4= Agree, and 5= Strongly Agree.

Measurement of Course Grade

Course grade regarding the final grade was measured using GPA associated with each letter grade (A = 4.00, A- = 3.67, B+ = 3.33, B = 3.00, B- = 2.67, C+ = 2.33, C = 2.00, C- = 1.67, D+ = 1.33, D = 1.00, F = 0.00) offered by the instructors at the end of the term.

Measurement of Art Appreciation Learning Gains

In 1997, Anderson et al. created an assessment to measure student learning outcomes in art appreciation courses. "The purpose of the assessment was to determine the extent to which students achieve the intended learning outcomes of the general education category" (Anderson et al., 1997, p. 1). The *Aesthetic Experience Assessment* (AEA) is a rubric scoring scale (three criteria and three response levels) to assess the degree of the intended students' learning outcomes in art appreciation courses (Anderson et al., 1997). The original assessment in the part of art is an essay question. Students will view a slide of Picasso's "Guernica" and will be asked to " Explain how Picasso uses

format elements of design, style, content, and subject matter to create this image of pain and destruction" (Anderson, et al., 1997). In this study, the researcher was expanding this assessment to a total of three questions based on the same criteria.

Johnson et al. (2000) conducted an exploratory empirical study which used a non-experimental, causal comparative, quantitative research design, of students enrolled in one of two versions of a graduate level instructional design course for human resource development (HRD) professionals. The major purpose of this study was to compare the differences that included (a) student ratings of instructor and course quality; (b) assessment of course interaction; (c) structure; (d) support; (e) learning outcomes such as course projects; (f) grades; and (g) student self-assessment of the their ability to perform various Instructional Systems Design (ISD) tasks, between an online course and an equivalent course taught in a traditional face-to-face format in which students were enrolled. Further, this study attempted to determine if properly designed environments that differ on many characteristics, can be equivalent in terms of learning and satisfaction. The title, *Comparative Analysis of Learner Satisfaction and Learning Outcomes in Online and Face-to-Face Learning Environment*, adequately described this study.

The literature review of this study provides the background to the problem and significant of the quality of online instrument to instructor, learners, and institutions. Johnson et al.'s literature review, however, was not thorough and lacked in comparing theories or framework related to the problem, and application of theories in empirical studies. Empirical studies of Schutte (1997), and LaRose, Gregg, and Eastin (1998) were examined, leading to the major gap and conflict in the literature about the effectiveness of online instruction compared with more traditional face-to-face offering.

Johnson's et al. (2000) study was designed to answer three research questions: (a) the differences of student satisfaction with the learning experience which exist between online and face-to-face learning environment; (b) the differences among student perceptions of student/instructor interaction, course structure, and course support between online and face-to-face learning environments; and (c) what differences exist in the learning outcomes (i.e., perceived content knowledge, quality of course projects, and final course grades) of students enrolled in online versus face-to-face learning environment.

An experimental, non-probability sampling plan resulted in a data-producing sample of 38 graduate students who were enrolled in two groups (19 students enrolled in online course, and 19 students enrolled in face-to-face format) throughout a semester. However, five students (two online students and three face-to-face students) required an incomplete for the course. Therefore, the final sample total was 33 subjects.

Three established instruments were adopted in this study. First, the university's *Instructor and Course Evaluation System* (ICES) was used to evaluate general student perceptions of the quality of the learning experience (course interaction, structure, and support). The authors reported that ICES as a validated instructor rating system comprised of a four-point Likert scale which is used to evaluate an instructor's teaching effectiveness and the overall quality of a course.

Second, the *Distance and Open Learning Scale* (DOLES) and the *Dimension of Distance Education* (DDE) instruments were chosen to assess online instruction. DOLES is a 94-item group instrument to assesses student perceptions of the learning experience related to the eight components of effective learning environments: (a) interactivity; (b)

institutional support; (c) task orientation; (d) teacher support; (e) negotiation; (f) flexibility; (g) technological support; and (h) ergonomics. The DDE instrument is needed as the DOLES do not fully emphasize instructor-to-student and student-to-student interactions. The DDE and DOLES instruments are appropriate items for online instruction which is guided by the opinion of context experts. In the education field, the selected items (a total of 50 items) were to ensure the instrument was sufficiently general to be useful for both the face-to-face and online environments. Reliability of the instrument was estimated and pilot tested in an undergraduate engineering course (43 students) and two graduate education courses (25 students).

Based on factor analysis, the researchers reported that construct and criteria validity was established. Statistical analysis was conducted using independent sample *t*-test and supported with a non-parametric Mann-Whitney *U* test. All statistical tests in this study were conducted with a significant level of a .05.

The first research question findings revealed that both groups of students presented positive ratings, with the face-to-face group ($M = 4.21$, $SD = .79$) having more positive views for interaction and support than online group ($M = 3.58$, $SD = 1.07$). Therefore, this difference was significant ($t = 2.07$, $p = .05$). However, the calculated *p*-value of .46 displays the need for further research in this area. No significance was found between two groups for the overall course quality rating ($t = 1.94$, $p = .05$).

In the aspect of perceptions of course interaction, structure and support, findings indicated that, overall, both groups of students had positive perceptions, with the face-to-face group having more positive views for interaction and support than the online group: (a) student to student interactions ($t = 3.847$, $p = .05$); (b) student and instructor

interaction (t = 2.455, p = .05); (c) course structure (t = 1.641, p = .05); (d) instructor support (t = 2.690, p = .05); and (d) departmental support (t = -2.921, p = .05).

Moreover, findings of the third question revealed: (a) course projects used a blind review process to evaluate the quality of the projects and to compare the outcomes across the two courses. On a four-point scale, the 30 projects were rated very favorably (M = 3.43, SD = .60). The overall mean rating of the face-to-face class project was 3.47 (SD = .60) and the mean rating for the online class projects was 3.40 (SD = .61). The results found no significant difference between the two groups; (b) there were no significant differences in students' course grades between the two groups; and (c) significant differences were found on only five (distinguishing among various ISD models; preparing a learner analysis; preparing a content analysis; writing goal statement; and writing terminal objectives) of the 29 items on the self-assessment instrument.

Limitations reported by the researchers were that the small sample size makes interpretation of the two groups difficult, as well as reducing the ability to generalize to the overall population. In addition, the lack of clearly reported reliability of two instruments was another limitation of this study. Further, no hypotheses were stated, and the literature review was not thorough. These limitations lead to weakness of internal validity of this study. Additionally, samples only focused on graduate students in a specific discipline may not be generalized to the overall population. Therefore, external validity of this study is not robust. Strengths of this study included clearly stated procedures, plus the use of one clearly stated instrument. In addition, a pilot study was conducted to determine reliability.

Suggestions for future research provided by the authors were: (a) continue to develop and use online programs which require identifying and implementing new communication strategies to facilitate student/instructor communication; (b) a better understanding of why online learners report lower levels of comfort with their learning is needed; and (c) limitations of online programs were needed to familiar when instructor who intend to create an online course.

Learning Styles

Kolb's Experiential Learning Theory (ELT)

In 1984, Kolb introduced his seminal theory of ELT that is derived from the educational philosophies of Lewin, Dewey, Piaget, and others. Zull (202) observed the linkage between the ELT and neuroscience research that suggested the process of experiential learning is related to brain functioning, and occurs due to the structure of the brain. This linkage increases individuals' understanding the way they learn and the process of learning from experience (Kolb & Kolb, 2005).

The theoretical literature on experiential learning theory by Kolb (1984) provides a sufficient framework to determine individual preference and learning styles. Kolb's theory identifies four modes of experiential learning based on the experiential learning cycle: (a) concrete experience (CE - feeling); (b) reflective observation (RO - watching); (c) abstract conceptualization (AC - thinking); and (d) active experimentation (AE - doing) of learning styles, which are offered on a two-axis grid and represent four stages in experiential learning. Kolb (1984) stated that "In this model, concrete experience/abstract conceptualization and active experimentation/reflective observation are two distinct dimensions, each representing two dialectically opposed adaptive

orientations" (p. 40-41). This structural model of learning process "gives the basic comprehension processes of apprehension and comprehension independent structural statues" (Kolb, 1984, p. 61). Moreover, "the ELT learning model suggests that the learner must continually choose which set of learning abilities he or she use in a specific learning situation" (Kolb, Boyatzis, & Mainemelis, 2000, p. 3). The four types of Kolb's learning styles were described as:

1. C*onverging* (doing and thinking - AC/AE): The dominant learning abilities of this approach rely primarily on abstract conceptualization and active experimentation. Problem solving, decision making, and the practical application of ideas are the three greatest strengths of this approach. Individuals with a converging learning style can organize knowledge through hypothetical-deductive reasoning. Kolb (1984) explained that convergent people are controlled in their expression of emotion. In addition, a converging style inclined individual is like to experiment with new ideas, to simulate, and to work with practical applications. These individuals have a preference for technical tasks, and are less concerned with the aspects of people and interpersonal learning styles.

2. *Diverging* (feeling and watching - CE/RO): This type of learning styles has "opposite learning strengths from convergent, emphasizing concrete experience and reflective observation" (Kolb, 1984, p. 77). Kolb (1984) stated that "this style called *diverger* because a person of this type performs better in situations that call for generation of alternative ideas and implications, such as a "brainstorming" idea sessions" (p. 78). These people are rich in imaginative ability and consciousness of meaning and values. Such individuals are sensitive,

and prefer to watch rather than do, tending to gather information and use imagination to solve problems. Moreover, the main adaptive ability of divergence is the holistic ability to look at concrete things from different perspectives, and organize numerous relationships into a meaningful "gestalt". People with a diverging learning styles have interests in other people, are prone to having interpersonal learning styles, and tend to be imaginative and feeling-oriented.

3. *Assimilating* (watching and thinking - AC/RO): The dominant abilities of assimilation learning styles are abstract conceptualization and reflective observation. Strengths of this orientation lie in inductive reasoning and the ability to create theoretical models. Kolb (1984) stated that "this orientation is focused on people and more concerned with ideas and abstract concepts" (p. 78). Additionally, individuals with this style are more attracted to logically sound theories than approaches based on practical value. "Ideas, however, are judged less in this orientation by their practical value" (Kolb, 1984, p. 78).

4. *Accommodating* (doing and feeling - CE/AE): The learning styles emphasize concrete experience and active experience that differs from assimilation. An accommodating inclined individual performs better in "doing things", in carrying out plans and tasks and getting involved in new experiences. "The adaptive emphasis of this orientation is on opportunity seeking, risk taking, and action" (Kolb, 1984, p. 78). The accommodating learning style deal best with those situations where one must adapt oneself to changing immediate circumstances. Indeed, people with an Accommodating learning style will tend to rely on others for information rather than on their own analytic ability.

The ELT model comprises six propositions: (a) learning is best conceived as a process, not an outcome; (b) learning derives from experience; (c) learning requires an individual to resolve dialectically opposed demands; (d) learning is holistic and integrative; (e) learning requires interplay between a person and environment, and (f) learning results in knowledge creation (Kolb, 1984). Additionally, the ELT model aims "to identify the essential and enduring aspects of the learning process that determine its functioning, separating them from secondary, accidental aspect" (Kolb, 1984, p. 40) further to understand and explain the different individual people learning styles, and towards helping others to learn (Kolb, 1984). This theory provides a model of human cognitive structures and the periods of growth in basic abilities to know individuals learning preference, which enables instructors to adopt the preferred method for students (Chapman, 1995-2005). In addition, the ELT model provides a clear understanding about the differences in student's learning styles that may help educators to modify teaching approaches and processes to enhance learning outcomes (Felder & Brent, 2005; Kanuka & Nocente, 2003; Kolb, 1988; Young et al., 2003).

This is the predominant theory used to assess students learning styles with well-developed propositions and strong empirical support. In the last 30 years, this theory becomes well-known in the nature of experiential learning. For example, Atkins, Moore, Sharpe and Hobbs (2001) indicated models such as Honey and Mumford's LSQ and McCathy's 4MAT system are founded in Kolb's experiential learning theory. Several empirical studies such as Karakaya, Ainscough, and Chopoorian (2001), Moores, Change, and Smith (2002), and Young et al. (2003) led to refinement in the theory to classify students' learning styles and further to examine the influence of student learning styles on

student learning outcomes. The results of these studies supported the conceptions of Kolb's theory that indicated different learning styles will influence individual's learning performances in various educational fields. In fact, one or more learning styles may be well-suited to online learning environments (Hallock et al., 2003). For example, Kolb and Kolb (2005) stated that the learning style of most science-based professionals are inclined toward converging, while mathematics and the natural sciences are inclined to the assimilating learning style. Moreover, the learning style of humanities, social sciences, and the arts prefer the diverging learning style.

The ELT is socially significant, addressing essential issues about active involvement in learning, relating with other people, and learning by experience in the psychological discipline of student learning styles. The theory is useful in explaining, predicting, and discriminating among learning styles on student learning outcomes. For example, the different learning styles performance may favor specific instructional processes and/or instructional technology, and result in a disparity learning outcomes. Thus, this theory is a well-developed guide to identify learning styles in different fields which include education, occupation, and adult development (lifelong learning). The theory has a good balance between simplicity and complexity, contributing to its usefulness, and can be relevant to any kind of learning through experience.

Myers-Briggs Types Theory

Atkins, et al. (2001) described that the Myers-Briggs Type Indicator (MBTI) as being derived from Carl Jung's theory of psychological types. "Preferences in the four dimensions of: extraversion/introversion, sensing/intuition, thinking/feeling, and judging/perceiving, are used to characterize people according to sixteen types" (Atkins, et

al., 2001, p. 74). "Jung adopted a very holistic approach to the study of psychology through his intense desire to integrate a natural and human science perspective" (Moir, 1998, p. 1). Moir (1998) stated that based on Jung's thinking, and through the creation of various theoretical constructs and concepts, Jung attempted to produce a cohesive explanation of the development of human personality and individuality across the life span. Jung's theory of psychological types is a well known, predominant, and a widespread theory.

Myers (1962) developed a self-report inventory that would transform Carl Jung's psychological types to language fitting more individuals. Therefore, the MBTI measurement provides a description of individuals' preferences for cognitive activities. In brief, this instrument enabled people to anticipate specific personality differences in particular individuals and provided means for coping with the various types of people. The model for the MBTI indicated a person's preference on each of four dichotomous dimensions that include: (a) Extroversion (E) versus Introversion (I); (b) Sensing (S) versus iNtuition (N); (c) Thinking (T) versus Feeling (F); and (d) Judging (J) versus Perceptive (P). The four categories carry out the total of 16 unique personality types. An additional question, to determine Judging vs. Perceptive, was suggested by the existing theoretical literature to recognize individuals' preference types in order to help these individuals make decisions. These theories seem too complex to employ into a real situation, which suggests simplifying the process of the assessment in the future.

Both MBTI and LSI followed Carl Jung's theory in recognizing that learning styles result from individuals' preferred ways for adapting in the world. Additionally,

Myers (1962) descriptions of these MBTI types are very similar to the corresponding LSI learning styles as described by ELT.

Due to much of literature emphasizing the convenient and flexible schedule of online courses, relatively few studies have contributed on understanding learning characteristics of students (Ryan, 2001). As a result, Mupinga, Nora, and Yaw (2006) conducted a non-probability research which was to establish learning styles, expectations, and needs of students taking an online course.

In this study, the target sample consisted of 131 undergraduate students who enrolled in three web-based courses in the Department of Industrial Technology Education at Indiana State University. An informal and free online *Myers-Briggs Cognitive Style Inventory* personality test was used to evaluate students' personality types. The MBTI led to sixteen learning styles found that the two top majority learning styles were 16% of ISTJ (introvert, sensor, thinker, and judger), and 16% of ISFJ (introvert, sensor, feeler, and judger). The three most minor student learning styles were 0.76% of ENTJ (extrovert, intuitor, thinker, and judger) and 1.53% of INFP (introvert, intuitor, feeler, and perceiver), and 1.53% of ENFJ (extrovert, intuitor, feeler, and judger).

Further, an open-ended questionnaire was used to ask the participants about the expectations and needs of online students; the overall response rate of 66%. Results indicated that the top three expectations of online students were communication with the professor (83%), instructor feedback (79%), and challenging online courses (75%), respectively. Technical help (93%), flexible and understanding instructors (80%), advance course information (78%), and sample assignments (72%) were the top four needs of online students. Based on the findings, Mupinga et al. (2006) concluded that

online learning activities needed to adopt multiple designs due to no specific and predominant learning styles emerging among the participants. Moreover, some students in this study exhibited needing to spend considerable time making preparations rather than improvising in class. Finally, instructors should have provided appropriate instructional materials so that students were inspired to engage in class discussion.

However, there were four main disadvantages emerging in this study. First of all, due to adopting informal and free online MBTI to assess students' learning styles, the reliability and validity of this instrument may be questioned. Therefore, the authors need to use the official MBTI. Second, the authors did not reveal relations among learning styles, expectations, and needs of students. Third, the reliability and validity of the open-ended questionnaire were not mentioned, so the quality of the study may be damaged. Fourth, owing to the lack of statistical tools to further analyze the data, relationships among learning styles, expectations, and needs of students may not be explored by the findings.

In fact, learning style instruments, such as MBTI and LSI, often provide an opportunity to help college students adjust and achieve. In recent years, however, only a few longitudinal studies focus on learning styles of college students and generally with only one measurement. Salter, Evans, and Forney (2006) conducted a longitudinal, non-probability, and pre-experimental research plan for the purpose examining the stability trait, which was the lack of the significant change, of two popular assessment tools---the Myers-Briggs Type Indicator or MBTI and the Learning Style Inventory or LSI-1985. Salter's et al. (2006) literature review gave a clear view on interpreting the components of the instruments of the MBTI and LSI.

This study was based on the assumption that learning style characteristics were to be stable. First, a typical inferential hypothesis was sought to explore significant differences in observed data. Secondly, the researchers were to examine changes in LSI profiles and MBTI scales using the long-linear technique of CFA (Configural Frequency Analysis).

A total of 292 master degree students in the program of student affairs administration participated in this study. In the end of this research, 222 students, which were included 13 class cohorts, had completed data sets from all administrations of the instruments during the period from 1987 to 2001. Students were administered the MBTI-Form G (Myers. 1987) and the LSI-Research Version (Kolb, 1985) three times during the program: at the beginning of the first and second year and at the end of their second (final) year in the program.

The stability of LSI and MBTI were analyzed by using CFA technique which "allows researchers to pinpoint particular multivariate profiles of categorical scores, such as MBTI profiles of categorical, that appear in a sample more or less frequently than expected" (Salter et al., 2006, p. 177). Three demographic variables (gender, ethnicity, and status) were examined for any inconsistent relationships in the MBTI and LSI results with likelihood-ratio Chi-Squares (L^2).

The findings for the MBTI showed that the relationship between gender and the thinking-feeling scores ($L^2 = 17.61$, $p < .001$) were significant, and gender also seemed related to LSI profiles ($L^2 = 9.67$, $p = .004$). Each of the eight preferences of MBTI showed significant statistical types, using the a priori EXPs (expected frequency). For

extraversion and intuition, all three patterns of change were significantly underrepresented; therefore, demonstrating stability of pattern.

In the second analysis, for five of the eight preferences: sensing, thinking, feeling, judging, and perception, the configuration failed to reach significance in the priori analysis, however, was significant in the standard CFA. Additionally, in the second analysis, that configuration was also significant for extraversion and intuition.

The similar result appeared in the studies of LSI profiles. In the a priori analysis, the stable pattern was significant for accommodators, assimilators, and divergers. Therefore, only accommodators were observed as underrepresented. Accommodators were the most stable pattern using the standard CFA analysis. On the other hand, Convergers did not show a stable pattern in a priori analysis. "In contrast the MBTI results, an "exposure effect" did not seem as apparent" (Salter et al., 2006, p. 180-181).

In this study, the researchers reported several limitations: (a) in order to achieve the high order interactions suggested in psychological theory, the researchers suggested that large sample size is needed; (b) graduate students may have a greater ability to recognize key aspects of their personalities than undergraduate students; (c) a typical four to five year undergraduate degree program may more suited for this study than a 2-year program; and (d) an important aspect to both theories, the CFA only provided the existence change and did not address the exact nature of these changes.

For future studies, the researchers suggested that using different populations from other disciplines might lead to different results. In addition, the researchers questioned whether the students learned to adapt to the demands of an academic program and moved away from their true natures in the process.

Flaherty's Learning Modalities

Flaherty (1992) offered four major kinds of learning modalities which included Kinesthetic (The doers), Tactual (Sensitive students), Auditory (Yakkety yak), and Visual. Kinesthetic learners were active students who preferred to do something first and read about it later. "They can appear impulsive to educators who generally prefer people to act only after studying first. These students most frequently will read to get meaning, such as consulting a manual on how to assemble a car" (Flaherty, 1992, p. 32). The core idea of Flaherty's learning modalities was derived from the theory of Visual-Auditory-Kinesthetic-Tactile (VAKT), a popular multi-sensory approach developed by Fernald (1943).

Flaherty (1992) stated that tactual students have a heightened awareness of their learning environment, because they are conscious of how hot or cold a classroom may be and whether it is too dark for learning (p. 33). Tactual students' focus on non-verbal communication and are naturals at interpreting its meaning. These students learn best in an environment in which they have respect and regard for the teacher. "They need special attention and an environment that is warm, welcoming, comfortable, and caring" (Flaherty, 1992, p. 33).

Flaherty (1992) explained that auditory learners read for comprehension and not speed. These students need an "out loud" environment for reading, i.e., books on audio tape would benefit these learners. An efficient way for auditory learners is to provide small group discussions which facilitate auditory learners to compare ideas and learn by saying. Moreover, the fourth major group of learners is visual students who deeply relying on seeing that they want everything in print: overhands, handouts, books, and

papers (Flaherty, 1992). For visual learners, increasing the use of videos to support the development of applied academic courses is needed (Flaherty, 1992). Furthermore, in order to reinforce visual students learning by seeing, instructors may need to use written tests and reports as part of a comprehensive student performance portfolio (Flaherty, 1992). The weakness of this modality theory is the lack of supporting empirical studies.

Multiple Intelligences

In 1983, based on psychological and educational study, Howard Gardner introduced his seminal theory of Multiple Intelligences (MI) in the book of Frames of Mind which indicated seven candidate intelligences: (a) linguistic intelligence; (b) logical-mathematical intelligence; (c) musical intelligence; (d) spatial intelligence; (e) bodily-kinesthetic intelligence; (f) intrapersonal intelligence; and (g) interpersonal intelligence. Furthermore, Gardner (1993) stated that "In the subsequent decade, I discern at least two new trends: contextualization and distribution" (p. xiii). In addition, Gardner (1999) stated that each individual was equipped with these intellectual potentials. The major propositions of this theory are "each child's profile of intelligences can be assessed; the ways in which each child can be aligned with curriculum, particularly with reference to the way in which that curriculum is presented to the child; and the ways in which youngsters with particular profiles of intelligence can be matched up appropriately with educational opportunities outside the confines of school" (Gardner, 1993, p. xv).

In the last 20 years, this theory has been revised and adapted to educational field by Gardner, his colleagues and other scholars. This theory is socially significant addressing essential issues about student learning styles in the educational field. Several

empirical studies by Chan (2004), Cluck and Hess (2003), and Johnson and White (2002) added refinement to this theory.

The seven types of intelligences are interpreted as below:

1. *Verbal-linguistic intelligence*: Individuals who possess the verbal-linguistic intelligence talent have the capacity to follow rules of grammar, and, on carefully selected occasions, to violate them, Gardner addressed (1993). Additionally, sensitivity to the sounds, rhythms, inflections, and meters of words are other characteristics of verbal-linguistic inclined individual whose ability can make even poetry in a foreign tongue beautiful to hear (p. 77). "And a sensitivity to the different functions of language---its potential to excite, convince, stimulate, convey information, or simply to please" (Gardner, 1993, p. 77). Lawyers, writers, and poets are the individuals who are the exemplars of verbal-linguistic intelligence (Gardner, 1989, p. 41).
2. *Musical-rhythmic intelligence*: musical talent is the earliest gift with which individuals may be endowed. Gardner (1983) stated that "Though speculation on this matter has been rife, it remains uncertain just why musical talent emerges so early, and what the nation of this gift might be" (p. 99). A musically-inclined individual always possesses the ability to produce and appreciate rhythms, pitch, timbre, and larger musical patterns (Gardner, 1993, p. 101). The representative individuals of musical-rhythmic intelligence are composers, musicians, and performers.
3. *Logical-mathematical intelligence*: Gardner (1993) described, in contrast to linguistic and musical capacities, that the thinking processes of logical-

mathematical intelligence "can be traced to a confrontation with the world of objects...logical-mathematical rapidly becomes remote from the world of material objects" (p. 129). Furthermore, Gardner (1999) stated that "logical-mathematical intelligence involves the capacity to analyze problems logically, carry out mathematical operations, and investigate issues scientifically" (p. 42). The roots of the highest regions of logical, mathematical, and scientific thought can be found in logical-mathematical inclined individuals. The representative persons of logical-mathematical intelligence are mathematicians, logicians, and scientists.

4. *Visual-spatial intelligence*: Central to spatial intelligence are the capacities to recognize the visual world accurately, to carry out transformations and modifications upon one's initial perceptions, and to manipulate re-create aspects of one's visual experience (Gardner, 1989, 1993). Gardner (1993) stressed that individuals with talent in visual-spatial intelligence may be acute, say, in visual perception, while have little ability to draw, imagine, or transform an absent world (p. 173). Gardner (1993) stated that visual-spatial intelligence can develop in individuals who are blind and no direct contact with visual experiences (p. 174). Research with blind participants has indicated that spatial comprehension is not totally reliant upon visual experience, and that blind subjects can even recognize certain features of images (Gardner, 1993). Moreover, Gardner (1993) stated that spatial intelligence entails a number of loosely related capacities: the ability to transform or to recognize a transformation of one element into another; the

capacity to conjure up mental imagery and then to transform that imagery; the capacity to produce a graphic likeness of spatial information; and the like… the aforementioned capacities typically occur together in the spatial realm (p. 176). Artists, engineers, aviators or navigators, chess players, surgeons and scientists are representative persons of visual-spatial intelligence.

5. *Bodily-kinesthetic intelligence*: Generally, characteristic of bodily-kinesthetic intelligence include the ability to utilize one's whole body or parts of the body in highly differentiated and skilled ways to solve problems or fashion products, and the capacity to work skillfully with objects (Gardner, 1989, 1993). Gardner (1993) stated that two of core capacities of bodily intelligence are "control of one's bodily motions and capacity to handle objects skillfully" (p. 206). Dancers, swimmers, artisans, athletes, instrumentalists, inventors, crafts persons, and actors were people categorized into the bodily-kinesthetic intelligence (Gardner, 1993).
6. *Interpersonal intelligence*: Interpersonal intelligence involves the understanding of other persons which includes how to interact, to motivate others, and how to realize their personalities, etc. Most businesspersons, teachers, clinicians, and those involved in politics or religion are individuals have developed this skill.
7. *Intrapersonal intelligence*: Gardner (1989, 1993) stressed that emotional life as a key feature of intrapersonal intelligence. Gardner (1999, 2005) further stated that characteristic of intrapersonal intelligence is the capacity to

understand oneself which includes one's strengths, weaknesses, desires, and fears.

No research was found about gifted students and multiple intelligences (MI) from different perspectives. In response, Chan (2004) conducted a study to investigate Chinese gifted students' multiple intelligences from different perspectives (students, parents, teachers, and peers) in Hong Kong. The study was based on theory of multiple intelligences, which include eight sub-constructs: (a) verbal-linguistic; (b) musical; (c) logical-mathematical; (d) visual-spatial; (e) bodily-kinesthetic; (f) intrapersonal; (g) interpersonal; and (h) naturalist intelligences.

A population size of 1,200, from a government gifted education center, was chosen. A final self-selected sample of 133 students, their parents, teachers, and peers participated voluntarily in the study. There were two instruments used in this study. First, the SMIP measured multiple intelligences, which was adjusted to different versions for ratings by parents, teachers, and peers. Second, a self-report scale measuring creativity and leadership was also included.

Inferential statistical analyses of ANOVA, MANOVA, and regression were conducted to analyze the data. MANOVA was used to compare differences between gender and grade level from grades two to 11 on the eight intelligences. The results showed that the gender main effect was significant. A follow-up test of ANOVA showed that the differences between genders in their self-ratings on the eight intelligences were not statistically significant. Further, a two-way ANOVA and a follow-up one-way ANOVA were tested and found that the eight intelligences were significantly different within each perspective. Differences of ratings on multiple intelligences from different

perspective were also found by ANOVA. Finally, a regression analysis was analyzed and found that student perceived creativity and leadership were best predicted from student perspective (R^2 = 41% for creativity and R^2 = 40% for leadership). Creativity was significantly predicted from verbal-linguistic, logical-mathematical, and visual-spatial intelligences (traditional cognitive domains) while leadership was significantly predicted from interpersonal and naturalist intelligences.

Overall, multiple intelligences were rated differently from different perspectives. However, gifted students rated themselves higher on their interpersonal and musical intelligences and lower on verbal-linguistics intelligence. The findings of the study highlighted that a student's profile of strengths, weaknesses, and needs might be perceived differently from his/her parents, teachers, and peers. Therefore, all perspectives should be considered, respected, and complementary.

A major limitation is related to the study's sample. Only 11% of the total number of gifted students responded. Thus, a larger sample size should be included for future study. Another direction for future studies might aim at "how communication of the various perspectives could affect gifted students' learning and talent development" (Chan, 2004, p. 23). In addition, objective performance-based or product-based measures for prediction should be considered such as "students' creative products, experiences in leading or managerial positions in school clubs and societies, or other evidence of creative productivity and leadership" (Chan, 2004, p. 24).

Internal validity was achieved by a sufficient literature review which resulted in a MI theoretical framework. A considerably high level of data analysis, and well-defined procedures permitted replication. However, hypotheses were not stated, indicating a

weakness of internal validity. A purposive and self-selected sampling was used specifically for a small sample of gifted students. Further, a low response rate limited generalizability. As a result, external validity of generalization was constrained.

Measurement of Learning Styles: Kolb's Learning Style Inventory (KLSI 3.1)

The Kolb's Learning Style Inventory is based on a comprehensive theory of learning and development, and differs from other tests of learning style and personality used in educational field (Kolb & Kolb, 2005). The primary purpose of Kolb's LSI is to classify individual learning styles and provide working information of learners' preferred approach to learning (Kolb & Kolb, 2005). In addition, Kolb (1984) states that the LSI was created to measure the way people learn from experience and how individuals deal with everyday situations. Moreover, the LSI is "developed as an experiential educational excise designed to help learners understand the process of experiential learning and their unique individual style of learning from experience" (Kolb & Kolb, 2005, p. 9).

The first version of Kolb's LSI was established in 1976 (LSI-1976 or LSI 1) and has four different learning modes that each is determined by nine items. In order to describe individuals learning styles the inventory was further revised into different versions, the LSI 2 (LSI-1985), LSI 2a, and LSI 3, contained 12 items on each learning mode in 1985, 1993, and 1999, respectively. In addition, the last version of learning style inventory (KLSI 3.1) was published in 2005. Based on a conceptualization of learning as a cycle, Kolb & Kolb (2005) stated that

> The LSI assesses six variables: four primary scores that measure an individual's relative emphasis on the four learning orientations --- Concrete Experience (CE), Reflective Observation (RO), Abstract Conceptualization (AC), and Active

Experimentation (AE) --- and two combination scores that measure an individual's preference for abstractness over concreteness (AC-CE) and action over reflection (AE-RO). (p.12)

The KLSI 3.1 was created as a self-assessment exercise and tool which was a self-report ipsative (rating) scale that consisted of 12 items and four responses to each item, leading to a total of 48 variables. However, the primary four scales of the LSI were the forced-choice format of instrument that used ipsative scales. Although, the combination scores AC-CE and AE-RO were not ipsative scales.

The LSI is a well-developed instrument designed to help individuals identify the way they learn from experience, corresponding learning environment and to enhance psychometric specifications. This instrument is made up of a four-stage process that can be identified along two bipolar dimensions of thinking (Abstract Conceptualization) to sampling words and feelings (Concrete Experience) and doing (Active Experimentation) to watching (Reflective Observation). The four-stage processes are consistent with four learning modes that include "Accommodating", "Diverging", "Assimilating", and "Converging". "Each item asks the respondent to rank-order four works in a way that best describes his or her learning styles" (Kolb, 1984, p. 68). Through those processes, the instrument guides learners to provide a better understanding of how they learn.

Recently, criticisms of the LSI were launched by several scholars. For example, statisticians pointed out that the LSI use of the force-choice format will lead to statistical limitations, the results of the ranking procedure, called ipsativity (Kolb & Kolb, 2005). Baron (1996) stated that other criticisms questioned that the ipsative scores make

performing a parametric statistic analysis difficult, and lower internal reliability estimates and lower validity coefficients will be produced.

This instrument can be utilized as inspirational for individuals to interpret and reflect on the ways that people prefer to learn in specific settings (Experience Based Learning Systems, Inc., 2000-2005; Towler & Dipboye, 2003). Several empirical studies (Cox, 2004; Karakaya, et al., 2001; Loo, 2002; Moores et al., 2004) have used the LSI to evaluate students' learning styles in difference disciplines. For instance, Cox (2004) explains that most learning styles of business students were classified as "Assimilating" (40.2%), followed by "Converging" (24.5%), "Diverging" (23.5%), and "Accommodating" (11.8%). A similar result also found in the study conducted by Moores et al. (2004). Indeed, the LSI and the MBTI are examples of self-scoring inventories that want to help both individual students and instructors identify cognitive learning styles.

The reliability of LSI was substantially improved as a result of the new randomized LSI 3.1 which is a self scoring format. Kolb and Kolb (2005) reported that based on seven across population studies, with a total sample of 6977 users who utilized the KLSI 3.1, the results showed good internal consistency reliability (average = .70). In addition, the four learning modes all show strong internal consistency determined by coefficient alpha and test-retest reliability as measured through zero-order correlations (Kolb & Kolb, 2005). For example, in a study conducted by Veres, Sims, and Locklear (1991), the findings indicated that test-retest reliabilities of the randomized KLSI 3.1 were much greater than 0.9 in all cases.

However, a study administered by Ruble and Stout (1991) reported that the average of the test-retest reliabilities of LSI was estimated 0.54 for the six LSI scales. Based on former related studies, Kolb and Kolb's (2005) reported, test-retest correlation coefficients in those studies were examined and ranged from moderate to excellent. In consequence, the difference between the studies was difficult to explain even though ELT assumed that learning style varied to correspond to environmental demands (Kolb & Kolb, 2005).

There have been hundreds of studies testing the validity and applicability of the LSI since first publication in 1971. For example, Hickox (1991) concluded that 83% of the studies analyzed provided support for the validity of experiential learning theory and learning styles inventory. Furthermore, construct validity of LSI was confirmed by revealing the two bipolar scales and a measure of instructional preference (Aragon, Johnson, & Shaik, 2002).

Several major weaknesses of ELT were: (a) the lack of focus on the process of reflection (Gold & Holman, 2001; Smith, 2001); (b) the claims made for the four different learning styles about converging, diverging, assimilation, and accommodating are excessive (Smith, 2001); (c) the model fails to include focus on different cultural experiences and conditions (Smith, 2001); and (d) the model pays too much attention to learning as an internal process (Gold & Holman, 2001).

Moores et al. (2004), however, pointed out that the early studies did not expound on how best to teach information system (IS) analysis and design courses. As a consequence, Moores et al. (2004) conducted a non-probability study to examine the impact of learning styles on student performance in an IS course. A sample of 106 was

selected from undergraduate students originally enrolled in an IS Analysis and Design (A&D) course that was taught across one semester. However, only 100 students participated in the study because six students dropped out. Based on Kolb's Learning Style Inventory (LSI-1999), the 100 students were classified into four categories, including Accommodators, Assimilators, Convergers, and Divergers. The LSI scores for the samples of students revealed that there were 28 Divergers, 34 Assimilators, 30 Convergers, and 14 Accommodators.

In this study, the researchers adopted Kolb's Learning Style Inventory (LSI-1999) to assess student learning styles based on students' current learning experiences. A 12-item and four responses to each item (CE, RO, AC, and AE) lead to a total of 48 variables. Reliability of LSI-1999 was estimated with Cronbach's alpha ranging from 0.722-0.803, convergent validity of the items were established.

Data collection procedures were clearly described. Course scores were collected at the end of the term, constituting the performance score (overall grade), which included pop-quizzes, homework, and a group project. A total of 106 students took the LSI in the beginning of the course.

Findings partially supported Hypothesis 1a: AC learning mode was the most common learning style of students taking an upper level IS course. Similar results were found in the meta-analytic study by Loo (2002). Hypotheses 2a was supported, using correlation and ANOVA test; the results showed that the AC mode of learning contributed to success in an A&D course. A one-way ANOVA was applying to test learning styles as the independent (grouping) variable and overall score for the course as the dependent variable. Hypothesis 2b was partially supported; there were significant

differences in performance between learning styles (p = 0.001). The results found that Assimilators performing better than Divergers in the A&D course. Furthermore, Hypothesis 3 was not supported, because the sample might insufficiently describe the ideas and concepts of the participants.

The results of this study led to the conclusion that high scores for the abstract conceptualization (AC) mode of learning are significantly related to performance. In addition, the difference between Divergers and Assimilators was the main underlying effect which the results tested using an ANOVA. The researcher further explained that ELT may enable IS major students to recognize how they learn and enhance the conceptions of IS.

Limitations reported by Moores et al. (2004) were that, in the course, the assumption of learning styles were the predominant reason for variances in performance, and three important factors such as overall cognitive ability, student motivation, and pervious attempts of the course, must be taken into account in this study. Moreover, the author suggested that further research should adopt the whole psychometric properties of the LSI-1999 so as to deeply explore which types of experiential exercise can meet particular types of learning performance. Overall, the internal validity strengths of the study by Moores et al. (2004) addressed a significant problem validated in the literature. Moreover, four hypotheses are well-developed based on earlier studies to explore relationships between student learning styles and performance in IS courses. Due to a relatively large sample size in this study, the external validity can be inferred.

Based on earlier studies, the current research focused less on examining the student learning styles in business fields, including accounting, finance, and human

research. Strength of this study was its sample size having a total of 100 participants, so that the results can generalized to the overall population (Frankel & Wallen, 1996).

Loo (2002) conducted a meta-analytic study to identify whether in the larger sample four learning styles, including Accommodator, Assimilator, Converger, and Diverger, are equally distributed. In this study, Loo (2002) briefly described Kolb's experiential learning model and the LSI.

Data collected from the SSCI and ERIC databases from 1976 to June 1999 only included college or universality students who majored in accounting, finance, and marketing courses. The author adopted LSI-1976 or revised LSI-1985 to examine 1,791 cases from 8 related empirical studies. Based on the criteria and Loo's (2002) unpublished study, however, only 7 studies, including 424 cases, were eligible. In consequence, accounting, finance, and marketing sample sizes are 535, 141, and 157, respectively. The Chi-Square test for goodness of fit was used to examine one null hypothesis: "the four learning styles are equally distributed" (Loo, 2002, p. 254).

As a result, findings rejected the null hypothesis because in the whole sample students with an Assimilator type had significantly higher proportion ($p < 0.01$), and ones with an Accommodator style had significantly lower proportion ($p < 0.01$). In the accounting sub-sample, additionally, Convergers had the higher proportion ($p < 0.01$), and Accommodators had the relatively lower proportion ($p < 0.01$). In the finance sub-sample, Assimilators had the higher proportion ($p < 0.01$), and Divergers had the relatively lower proportion ($p < 0.01$). In contrast, there were equal proportions of the four learning styles in the marketing sub-sample.

Based on the findings, Loo (2002) drew two main conclusions. First of all, the proportions of business students with the four learning styles in Kolb's (1976) model were unequal. In this meta-analytic study by Loo (2002), findings indicated a higher proportion of Assimilators and lower proportion of Accommodators. Second, a reliable distribution of learning styles was gained through an appropriately large sample. Further, the author recommended that educators should encourage learners to adopt the four styles rather than only focus on a specific style.

However, there were two main limitations emerging in this study. First, as mentioned earlier, the sub-samples did not include gender as a mediating variable. Second, the "criteria" stated in this study were not clearly described. Strength of this study was that the three sample sizes were large enough to generalize to the overall population. According to Kolb's (1976) experiential learning model and the Learning Style Inventory, the whole framework of this study is well-developed. Therefore, the internal validity can be inferred. However, due to the lack of gender as a mediating variable and each style for multiple majors, external validity may be damaged.

Web-based Learning

Instructors face a formidable task in reinventing schools and the classrooms for a world transformed by information and communication technologies (Jacobsen, 2001). Sadik and Reisman (2004) described that web-based instruction is relatively new educational technology. A web-based learning environment can offer interactive, authentic, self-directed learning opportunities (Perlman et al., 2005). Accessibility, flexibility, and cost-effectiveness are three principal forces driving the online initiative (Oliver, 1999; Zhao, 2003). Innovative learning environments can promote inquiry,

critical thinking, and active participation, which augment motivation and interest for learners (Perlman et al., 2005).

Recently, learners are given opportunities for collaborative learning and learning communities, to access information via the Internet in the web-based courses anytime and anywhere (Burnett, 2001; Miller, 2001; Oliver, 1999; Roblyer, 2003). Technology has created tools to deliver the content of the course and facilitate communication between instructors and students, and students and students (Lou, Bernard, & Abrami, 2006; Thirunarayana & Perez-Prado, 2001). Furthermore, "Educational technology is a combination of the process and tools involved in addressing educational needs and problems, with an emphasis on applying the most current tools: computer and their related technologies" (Roblyer, 2003, p. 6). Instructional technology is one factor improving student learning performance (Klein & Fox, 2004). However, in order to succeed in the twenty-first century, schools must encourage students who are prepared to be lifelong learners.

In fact, modern technologies can now make a virtual environment available for students to explore (Conway, 1997) and provide frameworks and tools to enhance students' critical thinking, problem-solving skills, and improve learning (Kozma, 2003; Roblyer, 2003; Sanders & Morrison-Shetlar, 2001). Like an emerging method of instructional delivery in higher education, and one that continually evolves with growth in technology, it is important to understand the impact of web-based education on learning, instruction, and student learning styles. Moreover, there is a necessity for instructors to observe how instructional technologies can be used more efficiently and effectively to improve teaching and enhance learning (Selim, 2005).

According to the recent survey by the U.S. Department of Education's National Center for Educational Statistics (NCES) found that over 72% of schools in U.S. have been offered online courses for their students (NCES, 1999). An additional 12% of institutions surveyed plan to set up distance education programs within the next three years, and more than 3,077,000 students were enrolled in distance education courses in the 12-month 2000-2001 academic year (NCES, 2003). The recent National Education Technology Plan on the website of the U.S. Department of Education, Office of Educational Technology (2004) indicated:

> A perennial problem for schools, teachers and students is that textbooks are increasingly expensive, quickly outdated and physically cumbersome. A move away from reliance on textbooks to the use of multimedia or online information (digital content) offers many advantages, including cost savings, increased efficiency, improved accessibility, and enhancing learning opportunities in a format that engages today's web-savvy students. (Move Toward Digital Content section, para 2)

However, this plan only gives suggestions for instructors adopting multimedia or online information (digital content) to solve the schools problems with textbooks, but did not clearly provide the ways of how to organize multimedia or online courses and where to reach helpful resources for teaching and learning.

The technology covers an extensive spectrum of options ranging from videotapes to computer-based instructional curriculum that regard to email, PowerPoint, course website, internet, DVD, music CD (Cox, 2004; Roblyer, 2003; Young et al., 2003). *WebCT* and *Blackboard* are two popular web-based educational delivery platforms

designed like franchises for educational institution transmitting information to learners anywhere (Roblyer, 2003). Further, NECS (2003) indicated that during the 12-month 2000–2001 academic year, the Internet and two video technologies were the primary modes of instructional delivery most often used for distance education courses by institutions. Educational technologies are supporting specific teaching and learning techniques to achieve behavioral and cognitive goals (Conway, 1997). Moreover, Jeffries (2005) described that web-based learning is "a current example of technology being used with an emphasis on entire educational principles, web-based theory, and with a good pedagogical design" (p.3). "National benchmarks for the best practices in distance education have been determined based on research evidence in higher education" (Jeffries, 2005, p. 3).

On the other hand, Golden (1998) stated that the danger of applying instructional technology into the classroom is that not all students are able to, or ever want to, receive education exclusively by computer under the assumption that all adapt to the new educational technologies with equal readiness and enthusiasm. Tinker (2001) stated that instructional time is the principal cost in online courses in most schools. This is due to administrators frequently seeking to increase the number of students per teacher, in order to decrease educational costs. "Any attempt to increase the number of students per teacher will reduce the amount of time a teacher can devote to each student" (Tinker, 2001, p. 37). As a result, only few instructors can keep track of the students' interests, accomplishment, and needs. Furthermore, Kiili (2005) described that, "unfortunately, technologies are too often used as substitute teachers that deliver information to learners rather than as learning tools that support that active learning process" (p. 303). Most

learners and instructors do not quickly and easily transit from traditional instruction to technology-supported classrooms. This challenge requires a pedagogical change from delivering a body of expected knowledge that is primarily memorized to one that is mainly process-oriented.

Numerous online teaching methods have been introduced by different scholars. These methods of web-based teaching technologies include the formats of synchronous, asynchronous, and combination (hybrid), have been recognized and adopted worldwide (Gregory, 2003). These delivery methods can benefit schools to reduce instruction costs and increasing large numbers of students (Devedzic, 2002; Tinker, 2001).

Hybrid Teaching Approach

Education is replete with web-based instruction in many forms such as *Online* and *Hybrid* (Roblyer, 2003). Hybrid teaching is a blended teaching approach combining instructional methods which include traditional campus-based and web-based learning methods (Dennis, El-Gayar, & Zhou, 2002; Gregory, 2003; Rivera et al., 2002; Roblyer, 2003; Toor, 2005) that allow students synchronous interactions and encounters with instructor and peers (Dennis et al., 2002). Additionally, Sheridan (2006) explained that, in a hybrid class, students need to attend class and use the website to complete required assignment that was created by the instructor. Moreover, Chen, Shang, and Harris (2006) stressed that hybrid teaching may be an appropriate approach to motivate participation rate while clarifying ambiguous concepts and topics.

Traditional Face-to-Face Teaching Approach

The traditional face-to-face teaching method is an on-campus, textbook-based, and instructor-led format that requires learners to attend lectures and take notes in an

existent place at the same time (Jones, Moeeni, & Ruby, 2005; O' Malley; Jo, Jones, & Cranitch, 2000). Chen et al. (2006) explained that instructors can guide students to solve problems by providing divergent solution paths or help students to analyze the difference. However, Jo et al. (2000) stressed that conventional approaches can be very restrictive. Traditional classroom instructors control the content such as topic, course material, and discussion of the class which does not prepare students as lifelong learners (Zhang & Zhou, 2003). In the traditional art classroom, Cason (1998) indicated that time-honored slide lecture format introduced students to vast unfamiliar images in a dark classroom, which may be more conductive to sleep than intellectual stimulation.

Objectivist and Constructivist Learning Approaches

Behavioral and cognitive sciences, communication theory, and constructivism are the psychological and philosophical foundations of instructional technology (URSINUS College, 2005). In fact, *constructivist* and *objectivist* are two main types of instructional approach (Bellefeuille, 2006). However, instructors must integrate different learning theories and models in the process of instruction design in order to meet a diversity of learning situations (Panasuk & Todd, 2005) and enhance the instructional quality (Bellefeuille, 2006).

In contrast, the principles of learning of constructivist strategies are derived from stems of cognitive science. Educational philosophers, psychologists, and practitioners such like John Dewey (social constructivism), Lev Vygotsky (building a scaffold to learning), Lerome Bruner (learning as discovery), Jean Piaget (cognitive development in children), and Howard Gardner (multiple intelligences) contributed to constructivist theory (Rakes, Fields, & Cox, 2006; Roblyer, 2003). Almala (2005) stated that

constructivist learning theory is a philosophy derived from the principle that experience is the groundwork of knowledge. Based on the constructivist theory, teachers are being viewed as a guide and facilitator to help students generate their own knowledge, learning from collaborative resources, and develop competence by learning different materials (Prater, 2001; Roblyer, 2003).

Roblyer (2003) indicated that the premise of constructivists is to foster learners to progress to development stages through educational experience. Promoting learners' active involvement and improvement of knowledge development is the most important issue of teaching approaches rather than merely the transmission of information (Panasuk & Todd, 2005; Roblyer, 2003). Consequently, Chen et al. (2006) stated that

> From the theory of constructivist learning, it may be important to adopt the hybrid approach, such as using an online discussion forum to improve participation rate but clarifying ambiguous concepts and topics via the traditional F2F approach. ... Finally, the assessment of learning outcomes also could vary with the objective of online learning classes. (p. 84)

Roblyer (2003) compared the fundamental conceptions between objectivist and constructivist and concluded that: (a) objectivists assume that learning occurred when knowledge is transmitted to people and they store it in their mind. Teaching should be teacher-directed, systematic, and structured; and (b) constructivists believe that people have their own unique version of knowledge, and that learners should participate in certain experiences in order to construct all knowledge in their mind. Constructivists encourage students to work and learn from others. Additionally, interactions have been identified as a critical component for successful online course (Lee & Paulus, 2001). A

major weakness of distance learning has considered as lack of interaction (Lee & Paulus, 2001).

Two learning theories, including behavioral theories and information-processing theories, contributed to the development of directed (objectivist) instruction (Roblyer, 2003). Current criticism argues that directed instruction is irrelevant to today's student needs which contribute to students' lack of motivation, abilities to solve problems and to apply skills, and inability to work in collaboration (Roblyer, 2003).

In particular, Almala (2005) and Bellefeuille (2006) proposed that constructivist approach is suited for web-based environment that requires students be responsible for their education and provides opportunities of communication between students to students and students to faculty. Additionally, Roblyer (2003) stated that constructivism is one of the effective learning model suited for the learning circumstances of web-based that requires "less structure set up by the instructor and more conceptual work done by student" (p. 212). For example, Hung, Tan, and Koh (2006) emphasized that the traditional pedagogies only involve students in prearranged experiential procedures. In contrast, a constructivist approach offers opportunities and responsibility for students to decide in which experience they need to be engaged. Prater (2001) stated that "Traditional methods of teaching art have not fit easily with the individualistic, connections-driven learning that interactive hypermedia technologies support" (p. 44). Based on two issues of *Educational Technology* magazine (May and September, 1991), Roblyer (2003) classified the discussions and debates of constructivist learning indicated that include: (a) teachers have difficulty to certifying individual's learning skills; (b) required skills may be deficient; (c) students may not choose the most effective

instructional method; (d) not all subject matters are suited to constructivist methods; and (e) acquired skills may not transfer to realistic situations.

Web-based Learning, Learning Styles, and Student Learning Outcomes

The field of education is rapidly changing toward a pedagogy rich in experiential learning and strongly supported with educational technology. Enhancing learning outcomes by applying technological instruction is a challenge for instructors (Young et al., 2003). In 1994, Seels and Rita (1994) reported that successful use of instructional technology is related to the process of learning and attainment of knowledge. Galbreath (1999) indicated that instructors adopt effective teaching tools to allow students to build networks, complete the course successfully, and gain proficiencies in indispensable skills, principally those are Internet technology related. Essentially, student learning outcomes are influenced by the specific types of instructional technology and the methods of pedagogy (Young et al., 2003). The multiple influences of technology and non-technology factors on learning outcomes results in simultaneous effects (Young et al., 2003).

Numeral empirical studies found that there were no significant differences of students' learning outcomes between students taking traditional face-to-face courses and web-based courses (Gregory, 2003; Hallock et al., 2003; Hong et al., 2003; Johnson et al., 2000; Peterson & Bond, 2004; Rivera et al., 2002; Thirunarayanan & Perez-Prado, 2001; Young et al., 2003). In addition, students presented positive ratings for satisfaction in both traditional face-to-face and online groups with the face-to-face group having more positive support (Johnson et al., 2000; Jones et al., 2005; and Rivera et al., 2002).

A number of studies have identified that learning styles of students taking traditional courses were significantly influenced by many factors, including ethnicity, age, and gender, social and environmental aspects, learners' experiences, instructors' teaching styles (Dinham, 1996; Eble, 1988; Shuler, 1999; Soucy, 1996; Sternberg, 1997), relatively few studies have been contributed on connections between student learning styles and demographics in an on-line environment (Hallock et al., 2003). On the other hand, only few studies explore the relationships between student learning styles and learning outcomes on course delivery systems.

Hallock et al. (2003) conducted a non-probability study, including three hypotheses, to explore student learning styles and demographics in on-line undergraduate business courses. In the study, the target sample consisted of 75 undergraduate students enrolled in on-line business courses using WebCT courseware. Based on the 32 items of the Learning Style Survey for College (LSSC), student learning styles preference was classified into five categories: "visual-non-verbal, visual-verbal, auditory, tactile/kinesthetic, and balanced" (Hallock et al., 2003). Data collected was comprised of recording learning styles, demographics, and final semester grades of students.

Hypothesis 1 and 2 were developed to detect the impact of student learning styles on performance (cumulative undergraduate grade point average and class grade) of students taking on-line undergraduate business courses. Through an analysis of variance (ANOVA), findings indicated significant differences between grades and learning styles. For example, not only did the auditory learners have the highest cumulative grade point average, but also gained significantly higher grades than grades of the visual-verbal, auditory, and balanced learners. In contrast, the tactile learners were apt to have the

lowest. However, there were no significant differences between the learning styles and class grades of the participants. Hypothesis 3 was used to identify significant relationships between learning styles and demographics of the students taking on-line undergraduate business courses was not supported by findings through a chi-square test.

Based on the findings, Hallock et al. (2003) drew two main conclusions. First of all, there were significant differences of cumulative undergraduate grade point average and class grade among the five learning styles. For example, students with an auditory learning style significantly outperformed ones with the other learning styles in overall grade point averages. Second, findings exhibited no significant differences between learning styles and the class grades. Hallock et al. (2003) explained that due to delivering well, students with different learning styles similarly performed.

There were many limitations emerging in this study. First, due to being limited to a small sample size and the research design, results of the study may not extend to the larger population. Second, owing to the failure to offer validity and reliability of the learning styles inventories, as well as the lack of a thorough literature review, findings of this study may not be robust. The researchers recommended that future research should focus on relationships between educators' teaching techniques and on-line course design, educators' teaching methods and student learning styles in on-line courses.

Based on early research by Brokaw and Merz (2000), Clarke et al. (2001), and Strauss and Frost (1999), types of student behaviors and selection of technology instruments have been identified not only to achieve specific student learning outcomes, but also to improve student performance and preferred learning styles of marketing major. However, according to Young et al. (2003), the usefulness of the early studies might be

limited due to the failure to compare differences between technology and non-technology pedagogies, and the lack of exploring the other factors influencing student learning outcomes, measuring multiple items, sampling from technology and non-technology-based courses, and examining a broad set of indicators of performance.

Young et al. (2003) conducted an empirical study about the effects of instructional technology and learning styles on student learning outcomes. In this study, seven hypotheses were logically developed to explore that student learning styles were related to preferred instructional technologies, preferred instructional methods, and learning outcomes. In addition, this study endeavored to identify that each of preferred instructional technologies and preferred instructional methods used would enhance student learning outcomes. Finally, this study sought to examine whether student behaviors have a significant impact on student learning outcomes.

The target population included students who took four marketing course, including Principles of Marketing, Market Analysis, Marketing Planning, and Marketing Management, in a Midwestern 4-year public university during the fall semester in 2001. The students taking Principles of Marketing were not allowed to bring their laptops to class, but used laptops to do their homework assignment outside of class. In contrast, the students taking the remaining three courses were asked to use laptops in class, and class activities typically were based on computer usage. All of the students were required to lease laptop computers and to provide complementary computer projection and communication technology for most classrooms.

Data were collected based on an in-class survey at the end of the fall semester. However, absenteeism rate on the day of the survey fulfilled, the overall response rate

was about 78% and produced 207 participants as an effective sample. Of all students in the sample, 122 (59%), 39 (19%), 29 (14%), and 17 (8%) students took Principles of Marketing, Market Analysis, Marketing Planning, and Marketing Management, respectively.

In the study, there were three independent variables (learning styles, instructional technology, and instructional methods) and three dependent variables (learning performance, pedagogical affect, and course grade). Young et al. (2003) adopted Kolb's Learning Style Inventory to classify learning styles preference of the participants. To investigate instructional technology, based on research by Grasha and Yangarber-Hicks (2000), five instructional technologies, such as e-mail, internet access, PowerPoint presentation, Blackboard course management software, and laptop computers, were rated through a seven-point effective/ineffective semantic differential scale and one question: Young et al., (2003) posed the question as to which technologies students found most effective in helping them learn.

In this study, most students were allowed to bring laptops to the classrooms except the students taking the Principles of Marketing. Due to student learning with different learning materials, the results of this study may be influenced.

According to a study by Davis, Misra, and Van Auken (2000), nine commonly used teaching methods were rated through a seven-point effective/ineffective semantic differential scale as to statement "In general, for any class, which methods of instruction do you find most effective in helping you learn?" (Young et al., 2003). In respect to dependent variables, learning performance was evaluated through six-item scales modified by Young (2001). Pedagogical affect was measured through the four scales,

including effective/ineffective, useful/useless, satisfactory/unsatisfactory, and good/bad, developed by Mitchell and Olsen (1981). The instructor-assigned grade was viewed as the measurement of course grade.

Through one-way analysis of variance (ANOVA), H_{1a} was used to expound whether learning styles can explain differences in preferred instructional technologies, was not supported. In contrast, findings significantly supported H_{1b} detecting whether learning styles can explain differences in preferred instructional methods. H_{1c} was developed to examine differences of student learning outcomes among four learning styles. After using ANOVA and multivariate regression, findings showed that H_{1c} was not support.

Through multivariate regression analysis (MANOVA), findings of Hypothesis 2 showed that student preferred instructional technologies used, can enhance student learning outcomes. Thus, Hypothesis 2 was strongly supported. Hypothesis 3 related to students preferring instructional methods used, can enhance student learning outcomes, was also significantly supported. Finally, findings in H_{4a} indicated that student behaviors supported by courses would have a significantly positive impact on student learning outcomes. Likewise, findings in H_{4b} indicated that student behaviors in competing time activities negatively correlated with student learning outcomes.

Based on the findings, Young et al. (2003) drew three main conclusions. First of all, preferred learning style was not related to differences in preferred instructional technologies. This might be because the preferred learning style of a student was not a factor in deciding preferences for different instructional technologies (Young et al., 2003). Second, subjects' use of preferred instructional technologies and methods

significantly increased student leaning competencies. Through Blackboard, for example, instructors were able to offer on-line syllabi, readings, assignments, and grade information to learners. At the same time, the learners taking on-line courses provided appropriate feedback so as to enhance their performance. Third, due to the impact of instructional methods and students' behaviors on student learning outcomes, Young et al. (2003) concluded that learning was bilateral.

There was one main limitation emerging in this study. Due to data collection being limited to one university, technology exposure was limited. Therefore, the external validity of this study will be questioned.

As a whole, there are two main advantages emerging in this study. First, based on much of early studies, the framework of this study is logically developed to explore relationships between independent variables (learning styles, instructional technologies, and instructional methods) and dependent variables (learning performance, pedagogical affect, and course grade). Second, internal validity strengths of this study are in (a) hypothesis testing of conceptual framework of factors affecting learning outcomes; (b) the reliability and validity of Kolb's LSI, Young's (2001) modified performance scale, Mitchell and Olsen's (1981) pedagogical scale, and Brokaw and Merz's (2000) course grade scale; (c) effective/ineffective semantic differential scale rating instructional technologies; and (d) methods measures of the six variables. These strengths resulted in high levels of data quality, data analysis, and clearly defined procedures allowing replication.

As a result of these findings, the researchers believe that educators need to explore in-depth understanding of student behavior in order to modify instructional

methods. Young et al. (2003) recommended that further research should focus on different levels of instructional technologies and methods across multiple universities in order to gain in-depth understanding of relationships between instructional technologies/methods and student learning performance.

Teaching Art Appreciation Using Technology

Dewey (1934) believed that every individual can become an artist by living in an artful environment. In 1995, Sipley indicated that "The arts can provide significant and pleasurable experiences for children as well as adults" (p. 2). However, Suhrkamp (1996) described that, generally, characteristics of aesthetic taste are a form of thinking. In 1988, a report by The National Endowment of the Art (NEA) determined the importance of art education that includes several reasons: (a) art education can give students a sense of civilization; (b) fosters the effective communication of creativity and teaches; (c) provides tools for critical evaluation of what people read, see, and hear; (d) facilitates students who have had difficulty in traditional standard academic environment; and (e) provides all students a general learning environment.

The National Center for Education Statistics (NCES) (1990) defined general art education as "an instructional program that generally describes art, including its development and practice. Furthermore, the NCES stressed that art education includes instruction in art appreciation, a basic knowledge of art history, fundamental principles of design and color, and an introduction to various media and studio techniques (Classification of Instructional Programs section, 2000). In addition, the National Committee for Standards in the Arts (1994) defined aesthetics as "a branch of philosophy that focuses on the nature of beauty, the nature and value of art, and the inquiry processes

and human responsibility associated with those topic" (Seabolt, 2001). Furthermore, Seabolt (2001) stated that "aesthetics is a general body of knowledge and inquiry about the nature of art" (pp. 44-45). Seabolt (2001) believed that the main purpose of the programs of art appreciation is to educate students understanding and enjoying art.

Roucher and Lovano-Kerr (1995) emphasized that the arts must taught for their own goals, rather than serving as aids to instruction in other disciplines. Furthermore, Sipley (1995) stated that "our students must learn how to digest the arts through a systematic and thorough grounding in critical evaluation" (p. 3). Truly, Sipley (1995) believed that students will become consumers of art in the future, and instructors have responsibility to help them develop the visual literacy skills and knowledge to make value judgments about artworks. To recognize the meaning of the arts is more than to acquaint students with the historical monuments in the arts (Sipley, 1995). Additionally, Sipley (1995) stressed that, unfortunately, most art appreciation courses taught from the historical perspective. In 2006, Sandell stated that in order to enable students to understand the meaning of society's images, ideas, and media of our increasingly complex visual world, enhanced visual literacy skills and knowledge are becoming significant for today's students.

Artists have been experimenting with analog and digital technologies since the 1960's (Colman, 2005). Recently, Taylor (2004) addressed that the traditional instructional circumstances may not be sufficient to support art students' learning. Furthermore, Taylor (2004) stated that multiple technological hyperlinks afforded individuals' behaviors and changed individual thinking. Hence, " a hyper-aesthetics may challenge the traditional production goals of art education in addition to the ways we

critique, assess, and present for exhibition the work of our students" (Taylor, 2004, p. 331).

Choate and Keim (1997) conducted a study to determine instructor characteristics, institutional characteristics, and the methodology used to teach art appreciation courses at an Illinois community college. The authors found that most of instructors used textbooks, and slides presentations in art appreciation courses. Sipley (1995) stated "In order to interact with works of art, students need methods of evaluating them" (p.3). In fact, in colleges and universities, scholars and researchers are involved introducing new technologies to the field of art education (Hope, 1990). Indeed, Cohen (1997) pointed out that the electronic revolution might change instructional tools and teaching methods, and "send our students on virtual field trips to the great works of art around the world" (p. 2).

In recent years, art educators have increasingly integrated traditional and web-based instruction (Erickson, 2005). By using powerful instructional technologies, learners structure their perception of art and art ideas through the connections of art concepts rooted in their interests and questions (Prater, 2001). New technologies entering the art classrooms have become a significant issue to art instructors (Erickson, 2005; Halsey-Dutton, 2002). Akins, et al. (2004) further point out those instructional technologies provide an opportunity to re-imagine and express creatively, and provide a network serving as informational support systems.

Similarly, Scott, Chenette, and Swartz (2002) stressed that new technologies offer rich opportunities for enhancing the skills that liberal education seeks to develop. Moreover, Zheng and Zhou (2006) described that the interactive multimedia can enhance

learners' recalling and maintaining of working information. As Colman (2005) stated that "Artists have been experimenting with analog and digital technologies since the 1960's" (p. 278). Hence, "Artists create virtual works involving safety and/or pleasure where they are able to map out/act out realities and fantasies that might not be possible at work or school" (Akins, et al., 2004, p. 34).

Multimedia

As Trautwein and Werner (2001) stated that "Multimedia educational products are gaining widespread consumer acceptance" (p. 253). Cason (1998) indicated that, in the aspect of art education instructions, the traditional slide lecture format may be more conductive to sleep than intellectual stimulation. Cason (1998) further pointed out that traditional mode of instruction is lacking in achieving the goals of visual literacy which includes the development of critical and analytical skills necessary to understand art works.

The multimedia course delivery method can be defined as the use of communication tools to facilitate interactions by integrating a variety of digital media types such as text, hypertext, audio, animation, and video. (Neo & Neo, 2001; Salter, 2003). Actually, multimedia is a useful educational instrument that facilitates students to experience sounds (auditory information) and images (visual information) (Gall, 2004; Hammer & Kellner, 2001; Haughey & Muirhead, 2005) which present new views into the learning process. As Haseman, Nuipolatoglu, and Ramamurthy (2002) highlighted that the capability of multimedia system enables learner control, interactivity, and hypermedia structure. The multimedia technology provides a more flexible way to learn and increases student engagement (Zhang & Zhou, 2003). In both historical and

instructional contexts, Cason (1998) addressed that a multimedia learning environment "facilitates the creation of multiple representations as students examine various attributes of artworks" (p. 340).

Neo and Neo (2001) described that multi-sensory and motivating the senses of audience are the essential facts of multimedia. Hong, McGee, and Howard (2000) stressed, multimedia learning environments offer a useful tool for engaging learners in scientific investigation. Cason (1998) added that learners gain a more comprehensive knowledge base about art through the linkage of topics, research skills, and problem-solving skills.

Multimedia technologies contain several types of media: text, graphics, video, Internet websites, animation (Hammer & Kellner, 2001; Haughey & Muirhead, 2005; Zhang & Zhou, 2003), PowerPoint, high-end digital phones, personal digital assistants (PDAs), home gaming consoles (Gall, 2004). Likewise, Neo and Neo (2001) defined that multimedia "is the combination of various digital media types such as text, images, sound and video, into an integrated multi-sensory interactive application or presentation to convey a message or information to an audience" (p. 20).

Cason (1998) stated unlike computer-assisted instruction models that "were directed at modifying users' behaviors to achieve predictable outcomes" (p. 338), multimedia approach provide an opportunity for students to be actively involved in the process of learning. In the end, Kearsley (1992) stated that interactive multimedia is highly successful in terms of learning outcomes and student satisfaction.

Various studies indicated that there is a lack of substantial evidence that computer-based instructional methodologies mediate successful outcomes for students

with specific learning styles. Furthermore, the extent of the relationship between student learning outcomes, motivation and instructional technology in the classroom has not been empirically validated (McAndrews, Mullen, & Chadwick, 2005).

McAndrews et al. (2005) conducted a non-probability study to identify whether the new interactive computer program, Computer Interactive Multimedia Program for Learning Enhancement (CIMPLE), can help students enhance performance during an introductory agronomy course (Agron 114). The CIMPLE software included seven components: (a) chapter assessment; (b) video; (c) key concepts; (d) practice; (e) self-check; (f) practice problem-solving; and (g) environmental and ethical issues.

The research consisted of two studies and was fulfilled during Fall semester 2002 at Iowa State University. In study one, five research questions were logically developed, not only to compare differences in CIMPLE use among students whose different learning styles, but also to explore the relationship between motivation and frequency of students' CIMPLE use and course grades. One hundred four out of 143 students enrolled in Agron 114 voluntarily participated in the study. In this study, McAndrews et al. (2005) employed the Kolb's Learning Style Inventory (LSI), including converger, diverger, accommodator, assimilator, and balanced learning styles, to determine a person's preferred combination of task and emotional dimensions. The motivation degrees of students were measured through Beatty and Payne's (1985) student motivation scale.

The purpose of study two was to explore differences between grades of students with suspending CIMPLE use and those who used CIMPLE. During the process of data collection, the same 104 students in study one took were categorized into two groups. One of two groups included 52 students asked to not use CIMPLE during the first week,

but to use the software during the second week. Another group also comprised of 52 students who were asked to use CIMPLE during the first week, but to not use the software during the second week. However, four of the 104 students were incomplete, so 51 and 49 students were finally left in group 1 and group 2, respectively. Forty-three of the original 143 students taking Agron 114 were viewed as the control group and freely used CIMPLE throughout the two weeks.

Through *t*-test, findings of study one indicated that there was no significant difference of CIMPLE use among the 104 students with different learning styles. In respect to grades, students with an Accommodating learning type gained the lowest average grade of 2.40, whereas ones who were Convergers gained the highest average grade of 3.24 ($t = 2.148$, $p = 0.033$). Moreover, grades of Convergers and Assimilators (3.06) were significantly higher than those of Convergers ($t = 5.406$, $p = 0.001$). Among the seven components in CIMPLE, grades were significantly, positively related to the use of chapter assessment and the use of environmental and ethical issues.

Students' motivation to use CIMPLE was found to have positive correlations with the use of each component and the overall CIMPLE components. However, students' motivation to use CIMPLE had less impact on grades than on the use of CIMPLE. On the other hand, students' motivation to use two components, including chapter assessment and environmental and ethical issues, were positively related to grades.

Through ANOVA test, across the two weeks, findings of study two exhibited that there were no significant differences of students' grades among the three groups and within each group. Through post-hoc Tukey tests, additionally, results indicated no

differences between the two groups using CIMPLE during one of the two weeks. In contrast, students in the two groups outperformed students in the control group.

The researchers drew two main conclusions based on findings. First of all, there were no differences of CIMPLE use among students with different learning styles. However, Convergers significantly outperformed Accommodators. Second, grades of students within two groups suspending use of CIMPLE were higher than those of students within the control group.

As a whole, due to the relatively little literature review, the internal validity may be questioned. Likewise, the researchers did not clearly describe the version of Kolb's LSI. The contents of Beatty and Payne's student motivation scale were not mentioned in this study. In light of the two-week research, the results may not be fully reflected performance of students. However, through the topic and the abstract, readers can easily capture the ideas and intents of the researchers. McAndrews et al. (2005) recommended that future studies should focus on the ways of students' using the components of CIMPLE or similar programs.

Based on early research, Cason (1998) described that the effectiveness of traditional pedagogical methods employed in introductory college art courses to meet the goals of visual literacy was questioned by art history professionals and educators. Efland (1995) suggested that curricular models were needed to enhance students' understanding of the complexity of art-work. Therefore, Cason (1998) conducted a non-probability, quantitative study in a counterbalanced design with a pretest which was conducted prior to the initial treatment. The purpose of this study was to investigate the effectiveness of Interactive Multimedia (IM) for the students who enrolled an art history survey course.

This study consisted of two experiments with 48 undergraduate students who were assigned to two treatment groups and three measures. In the period of first course unit of study, subjects were randomly assigned to one of the two groups. This was a cross-over design in which one group of students participated in slide sections and another group employed an IM program outside of class. The groups exchanged treatments in the stage of second unit of study. The posttests were provided at the end of each unit while students were required to write a critical analysis of an unfamiliar work of art depiction of the historical period under study. The instrument of the *Diagnostic Profile of Art Understandings* was used to measure students' achievement.

During the first unit of study, Group A ($n = 25$) served as the control group (slide study); Group B ($n = 23$) was assigned to the experimental group (IM). The findings of the first posttest revealed that Group B showed a higher frequency of lower-order understanding, higher-order understanding, misunderstanding and higher dimensions assessed. Using ANCOVA test, significant group differences were shown on higher-order understanding ($F = 4.30, p = .05$).

In experiment two, Group A utilized the IM program, and Group B was allocated to slide study. Dissimilar results from the first posttest were revealed. Group A gained a higher level of lower-order understanding. Further, Group B still presented more higher-order understandings, misunderstandings, and assessed more dimensions. Analysis indicated that there presented significant differences on misunderstandings ($F = 6.75, p < .05$) and on the number of dimensions accessed ($F = 10.04, p < .05$), using ANCOVA test.

Based on the results of this study, Cason (1998) concluded that IM use had significant impact on students' level of understandings and choice of search strategy, further provided new ways for learning how to learn. Internal validity was achieved by a sufficient literature review and clearly stated procedures of the study. The weakness of external validity was a small sample size. Moreover, the reliability and validity of the instrument, the *Diagnostic Profile of Art Understandings,* were not reported.

Synopsis of the Literature

The purpose of this critical analysis of theoretical and empirical literature was to explore the relationship among instructional technology, learning styles and learning outcomes, and to identify future areas of scholarly inquiry. Through the literature review, many empirical studies have identified the differences of learning outcomes and learning styles between traditional face-to-face and web-based courses in education and business fields, but relatively little research has been conducted in the courses of art appreciation in higher education.

Research into the effectiveness of computer-assisted instruction (Cason, 1998; McAndrews et al., 2005) has produced conflicting results. In particular, the study conducted by McAndrew et al. (2005) indicated that course grade among the three groups were no significant differences. However, the results shown in Cason's study found that significant differences between groups were provided.

The primary findings of this literature review are that the topic of learning outcomes is extremely important in the educational field, and learning outcomes may be directly influenced by difference types of student learning styles; moreover, the influence of instructional technology is secondary.

In particular, examination into the use of technology in art appreciation courses needs further study. This literature review also provides evidence that no research studies were found that explained the relationship of learning styles and student learning outcomes between web-based versus traditional face-to-face in higher education art appreciation courses. Hence, this study focused on the field of art appreciation education to explore the relationships among teaching methods and learning styles on student course satisfaction, course grade, and art appreciation learning gains.

Theoretical Framework

Numerous theories were used to guide this study about relationships among student learning styles, multimedia hybrid and traditional face-to-face teaching on learning outcomes in higher education art appreciation courses. Kolb's theory of ELT identifies four modes of experiential learning based on the experiential learning cycle: (a) concrete experience (CE); (b) reflective observation (RO); (c) abstract conceptualization (AC); and (d) active experimentation (AE) of learning styles, which are offered on a two-axis grid and represent four stages in experiential learning. The ELT model comprises six propositions: (a) learning is best conceived as a process, not an outcome; (b) learning derives from experience; (c) learning requires an individual to resolve dialectically opposed demands; (d) learning is holistic and integrative; (e) learning requires interplay between a person and environment, and (f) learning results in knowledge creation (Kolb, 1984). Kolb (1984) pointed out the concept of the processes of learning was more important than the outcomes. However, learning outcomes are the primary way to measure the success of learning. Poor learning performances may caused by failure of the learning process.

The theory of Outcome-Based Education (OBE) provided fundamental conceptions about the topic of learning outcomes (Spady, 1994). The major propositions of OBE are: (a) all students can learn and succeed, but not on the same day in the same way; (b) successful learning promotes more successful learning; and (c) schools control the conditions that directly affect successful school learning. Additionally, OBE identifies four essential principles that include: (a) clarity of focus; (b) design from the top down; (c) high expectations; and (d) expanded opportunity (Spady, 1994). Expanding opportunity and instructional support for learners was the key components of doing what of Spady's model (McNeir, 1993).

Learners in web-based courses are given opportunities for collaborative learning and learning communities, to access information via Internet in the Web-based courses in anytime and anywhere (Miller, 2001; Roblyer, 2003). In fact, hybrid teaching is a blend teaching approach combining two instructional methods which include traditional campus-based and web-based learning methods (Roblyer, 2003; Toor, 2005, Dennis et al., 2002). Furthermore, from the theory of constructivist learning, Chen et al. (2006) and Roblyer (2003) interpreted that hybrid teaching approach may be a suitable method. Based on the constructivist theory, teachers are viewed as guide and facilitator to help students generate their own knowledge, learn form collaborative resource, and develop competence through learning different materials (Roblyer, 2003).

The application of multimedia is a useful method that facilitates students to experience sounds and images and present new views into the learning process (Gall, 2004; Hammer & Kellner, 2001; Haughey & Muirhead, 2005). Neo and Neo (2001) defined that multimedia "is the combination of various digital media types such as text,

images, sound and video, into an integrated multi-sensory interactive application or presentation to convey a message or information to an audience" (p. 20). As Haseman et al. (2002) stressed, however, the capability of multimedia system enables learner control, interactivity, and hypermedia structure. The multimedia technology provides more flexibility way to learn and increases student engagement (Zhang & Zhou, 2003). Multimedia technologies contain several types of media: text, graphics, video, Internet websites, animation (Hammer & Kellner, 2001; Haughey & Muirhead, 2005; Zhang & Zhou, 2003), PowerPoint, high-end digital phones, personal digital assistants (PDAs), home gaming consoles (Gall, 2004).

Research Questions

1. What are student background characteristics (gender, age, major, and prior computer experience), learning orientations (concrete experience, reflective observation, abstract conceptualization, and active experimentation), learning preferences (abstractness and concreteness), learning style classifications (converging, diverging, assimilating, and accommodating), course satisfaction, course grade, and art appreciation learning gains in traditional day undergraduate students enrolled in multimedia hybrid versus traditional face-to-face art appreciation courses?
2. Are there differences in student background characteristics (gender, age, major, and prior computer experience), learning orientations (concrete experience, reflective observation, abstract conceptualization, and active experimentation), learning preferences (abstractness and concreteness), learning style classifications (converging, diverging, assimilating, and accommodating), course satisfaction, course

grade, and art appreciation learning gains in traditional day undergraduate students enrolled in multimedia hybrid versus traditional face-to-fact art appreciation courses?

Research Hypotheses

Hypothesis 1. Student background characteristics, learning orientations, learning preferences, learning style classifications are significant explanatory variables of course satisfaction for students enrolled in multimedia hybrid and traditional face-to-face art appreciation courses.

H_{1a}. Student background characteristics, learning orientations, learning preferences, learning style classifications, are significant explanatory variables of course satisfaction in students participating in multimedia hybrid art appreciation course delivery.

H_{1b}. Student background characteristics, learning orientations, learning preferences, learning style classifications, are significant explanatory variables of course satisfaction in students participating in traditional face-to-face course delivery of art appreciation courses.

H_{1c}. The percentage of art appreciation course satisfaction variance explained by student background characteristics, learning orientations, learning preferences, learning style classifications is greater in multimedia hybrid course delivery than the percentage of variance explained in traditional face-to-face course delivery.

Hypothesis 2. Student background characteristics (gender, age, major, and prior computer experience), learning orientations (concrete experience, reflective observation, abstract conceptualization, and active experimentation), learning preferences (abstractness and concreteness), learning style classifications

(converging, diverging, assimilating, and accommodating), and course satisfaction are significant explanatory variables of course grade in students participating in multimedia hybrid and traditional face-to-face art appreciation courses.

H_{2a}. Student background characteristics, learning orientations, learning preferences, learning style classifications, and course satisfaction are significant explanatory variables of course grade in students participating in multimedia hybrid art appreciation course delivery.

H_{2b}. Student background characteristics, learning orientations, learning preferences, learning style classifications, and course satisfaction are significant explanatory variables of course grade in students participating in face-to-face delivery of art appreciation courses.

H_{2c}. The percentage of art appreciation course grade variance explained by student background characteristics, learning preferences, learning style classifications, and course satisfaction is greater in multimedia hybrid delivery than the percentage of variance explained in traditional delivery.

Hypothesis 3. Student background characteristics (gender, age, major, and prior computer experience), learning orientations (concrete experience, reflective observation, abstract conceptualization, and active experimentation), learning preferences (abstractness and concreteness), learning style classifications (converging, diverging, assimilating, and accommodating), course satisfaction, and course grade are significant explanatory variables of art appreciation learning gains in multimedia hybrid and traditional face-to-face art appreciation courses.

H_{3a} Student background characteristics, learning orientations, learning preferences, learning style classifications, course satisfaction, and course grade are significant explanatory variables of art appreciation learning gains in students participating in multimedia hybrid art appreciation course delivery.

H_{3b} Student background characteristics, learning orientations, learning preferences, learning style classifications, course satisfaction, and course grade are significant explanatory variables of art appreciation learning gains in students participating in traditional face-to-face delivery of art appreciation courses.

H_{3c}. The percentage of art appreciation learning gains variance explained by student background characteristics, learning orientations, learning preferences, learning style classifications, course satisfaction, and course grade is greater in multimedia hybrid delivery than the percentage of variance explained in traditional delivery.

The next area presents the *Hypothesized Model* (Figure 2-1) which aims to display the explanatory relationship among student background characteristics, learning orientations, learning preferences, learning style classifications, student course satisfaction, course grade, and art appreciation learning gains of students enrolled in either multimedia hybrid or traditional face-to-face sections.

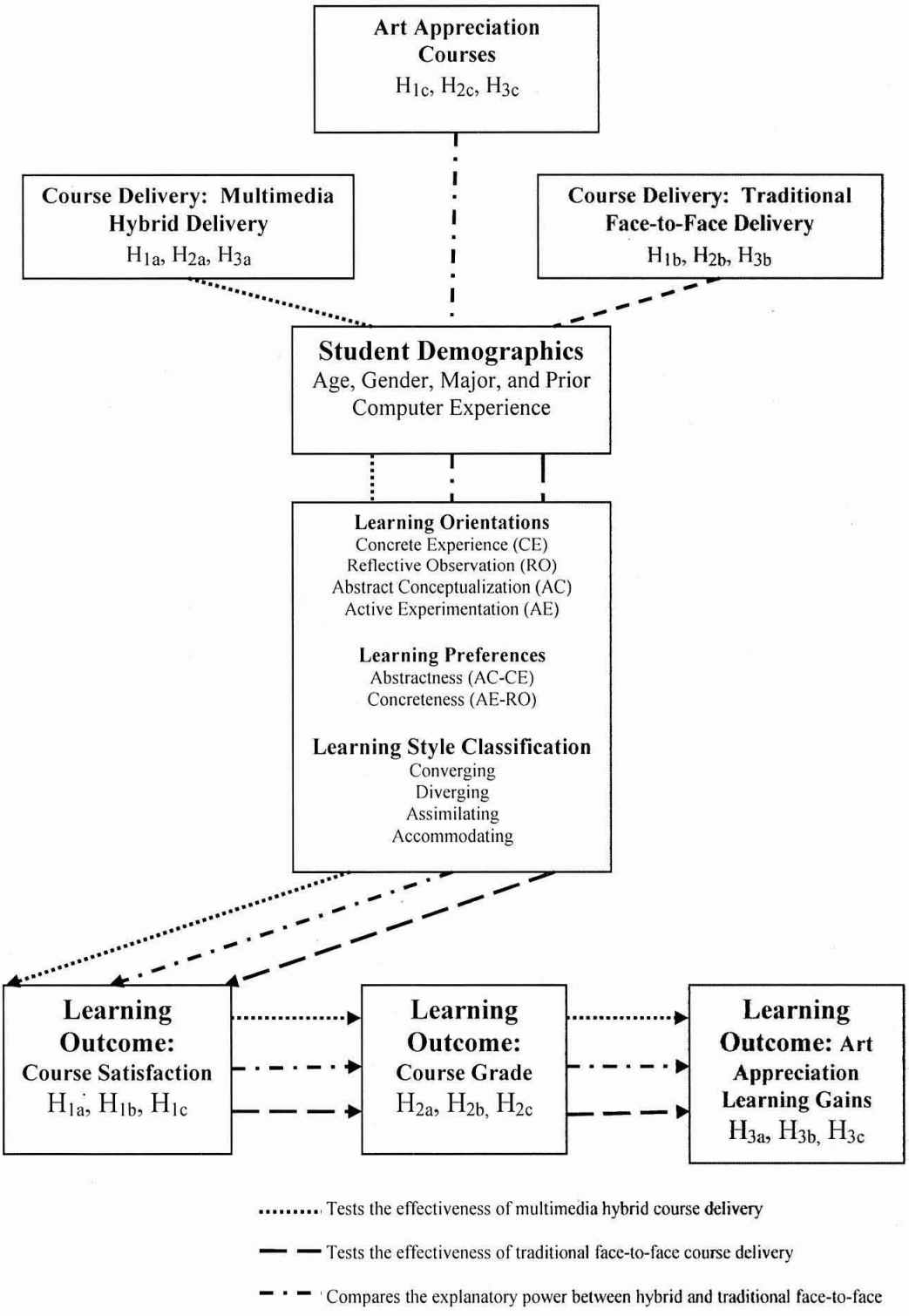

Figure 1. Hypothesized model about student background characteristics, learning styles, course satisfaction, learning outcomes, and course delivery systems.

In Chapter II, several related theories such as Outcome-Based Theory, Experiential Learning Theory, and web-based learning were reviewed. Based on critical analyses of theoretical and empirical literature, the findings lead to the discovery of the literature gap that no single study examined the relationship among course delivery formats, student background characteristics, learning orientations, learning preferences, learning style classifications, course satisfaction, course grade, and art appreciation learning gains in art appreciation courses. In this study, the hypothesized model (Figure 2-1) was proposed to explain the influence of student background characteristics, learning orientations, learning preferences, and learning styles on students' course satisfaction, course grade, and art appreciation learning gains in the two art appreciation course delivery systems (multimedia hybrid and traditional face-to-face). In addition, comparisons were made of the differences between course delivery formats on students' course satisfaction, course grade, and art appreciation learning gains. This hypothesized model (Figure 2-1) identified three hypotheses with nine sub-hypotheses. Furthermore, there are two additional research questions in this study. Chapter III presents the research methodology that was used to answer the research questions and to test hypotheses in this study about the relationships among student background characteristics, course delivery models, course satisfaction, course grade, and learning gains in art appreciation undergraduate courses.

CHAPTER III

RESEARCH METHODOLOGY

Chapter III presents the research methods that were used to answer research questions and hypotheses about the relationship among course delivery formats, student background characteristics, learning styles, course satisfaction, course grade, and art appreciation learning gains in higher education art appreciation courses. This chapter includes a presentation of the research design, population, setting, instrumentation, procedures, data analysis, and evaluation of research methods.

Research Design

A quantitative, non-experimental explanatory (correlational) and prospective (comparative) research design was conducted to examine the relationships among course delivery formats, student background demographics, learning styles, course satisfaction, and learning outcomes (course grade and art appreciation learning gains) for the university undergraduate students enrolled in art appreciation courses in spring semester 2007.

Both multimedia hybrid (HUM 101 A, B, and ZA) and traditional face-to-face (Hum 101 C and D) courses met in the classrooms twice a week, and utilized the same textbook. The primary course delivery method of traditional face-to-face sections involved use of the textbook, active reading, discussion, and slide show presentation. In contrast, the course delivery method of the multimedia hybrid sections included computer-generated slide lectures and discussion, active reading, virtual museum field trips, informal and formal writing, online research assignments, and faculty-student-peer

review. Students in the hybrid sections were required to access course information and submit homework assignments via the Blackboard instructional system.

For the prospective design, data collection took place at the beginning (the first session of weeks one) and end of the course (week 14). At the beginning of the semester, an Initial Survey of the Demographic Profile and the Aesthetic Experience Assessment (pre-test AEA) was conducted in the first session of week one (see Appendix B, Part One), and Learning Style Inventory (KLSI 3.1) was administered in the second session of week one (see Appendix B, Part Two). At the end of the semester (week 14), the same Aesthetic Experience Assessment (post-test) was conducted and a Follow-Up Survey of Course Satisfaction (see Appendix B, Part Three) and Course Grade Report was obtained.

The explanatory (correlational) research design sought to explain the relationships among student background characteristics, learning orientations, learning preferences, and learning style classifications on course satisfaction for students participating in multimedia hybrid course delivery (H_{1a}) and students participating in traditional face-to-face course delivery (H_{1b}). The same explanatory variables in H_{1a} and H_{1b}, in addition to course satisfaction, were examined for their impact on the learning outcome of the course grade for students participating in multimedia course delivery (H_{2a}) and students participating in traditional face-to-face course delivery (H_{2b}). Finally, the same explanatory variables in H_{2a}, H_{2b}, and adding course grade, were examined for their impact on the learning outcome of art appreciation learning gains (post-test minus pre-test) for students participating in multimedia course delivery (H_{3a}) and student participating in traditional face-to-face course delivery (H_{3b}).

The exploratory (comparative) research design sought to compare differences between course delivery systems on a number of variables using two different comparative methods. An additional comparative analyses were: (a) the percentage of explained variance (adjusted R^2) between multimedia hybrid course delivery and traditional face-to face delivery for respective dependent variables of course satisfaction (H_{1c}), course grade (H_{2c}), and art appreciation learning gains (post-test minus pre-test) (H_{3c}).

Art Appreciation Learning Gains (pre-test and post-test), the dependent variable, were measured by *The Aesthetic Experience Assessment* (see Appendix C, Part 1-I) which was an essay test, developed by Anderson et al. (1997), and further modified by the researcher. The Initial Survey distributed week one of the semester, had two parts (see Appendix C, Part one). Part 1-I, the *Demographic Profile*, developed by researcher, measured variables of age, gender, major, and prior computer experience (PCE), and the Part 1-II of pre-test of the AEA, developed by Anderson, Cerbin, DuBois, and Grill in 1997, further modified by the researcher. Part Two of the Initial Survey, *Learning Styles* was measured by the *Leaning Style Inventory* (KLSI 3.1), developed by Kolb (1984), and further revised by Kolb and Kolb (2005). During week 14 of the semester, a three-part, Follow-Up Survey, the AEA, and Grade Report completed the data collection. Part One of the Follow-Up procedures included a *Course Satisfaction Survey* (see Appendix C, Follow-Up Survey: Part One), measured by two items of the course satisfaction, which were used to evaluate overall quality of teaching effectiveness and the course. Part Two included the Follow-Up AEA. This was the same assessment as the pre-test, and art appreciation learning gains were calculated by subtracting the pre-test score from the

post-test score. The Follow-Up outcome of *Course Grade*, which was secondary data, was provided by instructors teaching in both multimedia hybrid and face-to-face art appreciation courses. The students were assigned a code number by instructors at the beginning of the courses. The researcher did not know the names of students, and all data was anonymous to the researcher. Likewise, the course instructors were not able to identify students' response to all survey items.

Frequency distributions, measures of central tendency and variability were reported to answer Research Question One, describing all variables. To answer the research question two, independent *t*-tests were used to analyze all variables, with the exception of demographics which were nominal categories (gender and major), and learning orientations, learning preferences, and style classification were analyzed by Chi-Square.

For hypotheses testing, Eta test, Pearson *r* correlation, and hierarchical multiple regression analyses were used to examine the explanatory relationships among student background demographics, learning orientations, learning preferences, and learning style classifications and the dependent variable of course satisfaction (H_{1a} and H_{1b}). For H_{2a} and H_{2b} testing, Eta test, Pearson *r* correlation, and hierarchical multiple regression analyses were used to examine the explanatory relationships between student background demographics, learning orientations, learning preferences, learning style classifications, course satisfaction and the dependent variable of the course grades. Moreover, Eta test, Pearson *r* correlation, and hierarchical multiple regression analyses were used to test the explanatory relationships among student background demographics, learning orientations, learning preferences, learning style classifications, course satisfaction,

course grades and the dependent variable of art appreciation learning gain (H_{3a} and H_{3b}). Adjusted R^2 results for the regression models were compared for course delivery (multimedia hybrid versus traditional face-to-face) for each dependent variable to determine which model had the greatest explanatory power for course satisfaction (H_{1c} = H_{1a} vs. H_{1b}), course grade (H_{2c} = H_{2a} vs. H_{2b}), and art appreciation learning gains (H_{3c} = H_{3a} vs. H_{3b}).

Population, Sampling Plan, and Setting

Target Population

In this study, the target population were (traditional-aged) day undergraduate students enrolled in art appreciation courses during the 2006-2007 academic year, at a private university in South Florida, United States. There was a total of 129 students (across levels -- freshman, sophomores, juniors, and seniors) enrolled in spring semester 2007. The art appreciation courses were one of four humanities courses required by the university of which undergraduate students must take two, before graduation. The art appreciation course distinguished of HUM 101 A, B and ZA as a "multimedia hybrid" course which was taught in the classroom with web-based instruction. The course distinguished HUM 101 C and D as traditional face-to-face slide show courses in which the instructor met students in the classroom. Students enrolled in both hybrid and traditional face-to-face art appreciation courses met in classrooms twice a week.

Accessible Population

The accessible population in this study was limited to traditional day undergraduate students who were enrolled in either multimedia hybrid or traditional face-to-face art appreciation courses in spring semester 2007 at the University. All other

evening and art major course offerings were excluded in this study. It was estimated that there would be a total of 129 subjects (five courses) who would participate in this study, which included 69 students enrolled in three multimedia hybrid art appreciation courses, and 60 students enrolled in two traditional face-to-face art appreciation courses. In this non-experimental, prospective and longitudinal, explanatory (correlational) and comparative study, the entire accessible population were 71 respondents which included 44 students in a multimedia hybrid group and 27 students enrolled in a traditional face-to-face group. The size of this population was strong enough to produce reliable results (Frankel and Wallen, 1996).

Eligibility Criteria and Exclusion Criteria

Eligibility Criteria

1. Students agreed to participate in this study and to complete pre-test and post-test questionnaires in the beginning (week one) and week 14 in their classrooms.
2. Students were able to read, write, and speak English.
3. All participants were at least 18 years old or older.

Exclusion Criteria

The sample of this study only focused on day undergraduate students. Evening and art major students were excluded.

Setting

The geographic area and setting was limited to the art appreciation courses at a private university in south Florida, United States.

Instrumentation

There were two periods of data collection. At the beginning of the term, the Initial Survey and Art Appreciation Pre-Test (Appendix B, Part One) was administered. At the end of the term, the Follow-Up Survey, Course Grade Report, and Art Appreciation Post-Test (Appendix B, Part Three) was administered. The Initial Survey Part One-I, Student Background Characteristics, developed by the researcher and the Pre-Test AEA, developed by Anderson et al. (1997) and further revised by the researcher took approximately 30 minutes to complete. The Initial Survey Part One-II, the LSI 3.1 (Learning Orientations, Learning Preferences, and Learning Style Classifications) developed by Kolb and Kolb (2005) had 12 items, and was estimated to take 10 minutes to complete. At the end of the term, Part Three, the Follow-Up Survey, Course Satisfaction, two global items were used to measure student course satisfaction (overall quality of the instruction and course) which was created by the researcher and approved by faculty. In addition, the post-test Art Appreciation Assessment was administered (the same test as is used in the pre-test), which took approximately 30 minutes to complete. The Course Grade Report was obtained from the respective course instructors.

Initial Survey, Part One: Pre-test Survey and the Aesthetic Experience Assessment

Part One-I: The Demographic Profile

The *Demographic Profile* contained four items, gender, age, major, and prior computer experience (see Appendix B, Part One-I). The scale and level of category of the student demographic profile is presented in Table 3-1. Gender was measured by checklist, and age, major, and prior computer experience were measured by using a fill-in-the-blank format.

Table 3-1

The Demographic Profile

Item	Scale	Response Categories
Gender	Dichotomous checklist	Male, Female
Age	Fill in the blank	With actual years
Major	Fill in the blank	Arts and Sciences, Communications, Education and Human Services, Business, and Hospitality
Prior Computer Experience	Fill in the blank	

Initial Pre-Test Part One-II: The Aesthetic Experience Assessment (AEA)

Description

The art appreciation learning gains were measured by the *Aesthetic Experience Assessment* (see Appendix B, Part Two) which was a rubric scoring scale (three criteria and three response levels). The *AEA* assessed the degree of the intended students' learning outcomes in art appreciation courses (Anderson et al., 1997). The instrument was further modified by the researcher.

In the assessment, the researcher only selected the art portion of the AEA in this study. The original art assessment was an open-ended essay question. Students viewed a slide of Picasso's "Guernica" and were asked to "Explain how Picasso uses format elements of design, style, content, and subject matter to create this image of pain and destruction" (Anderson, et al., 1997).

In this study, the researcher expanded the assessment to a total of three questions (art works), da Vinci's "Last Supper", a Hellenistic artist's "Venus of Milo", and

Picasso's "Guernica", based on the same criteria. The three questions were: (a) Explain how da Vinci used formal elements of design, style, content and subject matter to create this religious painting, (b) Explain how a Hellenistic artist used formal elements of design, style, content and subject matter to create this classical sculpture, and (c) Explain how Picasso uses format elements of design, style, content, and subject matter to create this image of pain and destruction (see Table 3-2).

Table 3-2

The Aesthetic Experience Assessment Questions

Item	Scale
a) Explain how da Vinci used formal elements of design, style, content and subject matter to create this religious painting. b) Explain how a Hellenistic artist used formal elements of design, style, content and subject matter to create this classical sculpture. c) Explain how Picasso used formal elements of design, style, content and subject matter to create this image of pain and destruction.	3 levels scale (Well Developed Response, Marginal Response, Weak Response)

Note. From "*General Education Art Assessment Report: Art: The Aesthetic Experience Assessment*" by Anderson, J., Cerbin, B., Choy, C., DuBois, K, & Grill, J., 1997. Used with permission of the first author.

A pre-test of the assessment was conducted in week one of the term and a post-test of the same assessment was administered at the end of the semester (week 14). Students were required to view the three different artworks and to explain how the artists used formal elements of design, style, content, and subject matter to create these art works. Two art teachers used the scoring rubric (see Table 3-3) that included three criteria with three levels scale to evaluate student art appreciation learning gains. The three criteria of the assessment were used to evaluate students' understanding of the

development of composition of: (a) form or physical elements; (b) content; and (c) subject matter (see Table 3-2) for the three artworks.

Table 3-3

The Evaluation Rubric of the Art Appreciation Learning Gains

Criteria	Well-developed Response 3	Marginal Response 2	Underdeveloped Response 1
Criterion #1 Development of Composition: Form or Physical Elements	Response is very defined and relates to physical aspects of the art work.	Response related to some of the physical aspects of the art work.	Response is unacceptable in relationship to physical elements.
Criterion #2 Development of Composition Content	Response is very defined in relation to underlying structure of the art work,	Response related to some structure concepts and personal directions.	Response is unacceptable in understanding of inner qualities of the art work.
Criterion #3 Development of Composition Subject Matter	Response is very defined in the concept of art subject and personal aesthetic.	Response related to a partial understanding of the subject defined in the art work.	No response related to the subject.

Note. From "*General Education Art Assessment Report: Art: The Aesthetic Experience Assessment*" by Anderson, J., Cerbin, B., Choy, C., DuBois, K, & Grill, J., 1997. Used with permission of the second author.

For each question, a score from 1 to 3 for each response was given. The maximum score for each question was 9. Thus, for three questions, the score range was 9 to 27. Scores ranged between 9 and 15 = weak response; scales ranging between 16 and 21 = marginal response; and scales between 22 and 27 = well-developed response. The scores from two raters were averaged. In the end, student learning gain was identified as post-test score minus pre-test score. The three art related questions of AEA are described in Table 3-2.

Reliability

The reliability of the AEA was not reported in the study by Anderson et al. (1997). Inter-rater reliability was estimated because two raters were invited to evaluate student tests in this study. In this study, two art teachers were invited to evaluate the assessment. The inter-rater reliability was performed. The result showed that the inter-rater reliability was established at a level of .853.

Validity

Validity of AEA was not reported in Anderson's et al. (1977) study. Concurrent validity by correlating the post-test AEA scores and course grade was performed. The result showed that the post-test scores (r = .245, p = .04) were correlated with course grade. In this study, the concurrent validity was established.

Initial Survey Part Two: LSI 3.1 (Learning Orientations, Learning Preferences, and Learning Style Classification)

Description

Learning Orientations, Learning Preferences, and Learning Style Classification was measured by the *Learning Style Inventory version 3.1 (LSI 3.1).* The *LSI 3.1* (Appendix D, Part One) is a short questionnaire (12 items) that asks respondents to rank four sentence endings that correspond to the four learning modes (Concrete Experience, Reflective Observation, Abstract Conceptualization, and Active Experimentation). The KLSI is "developed as an experiential educational exercise designed to help learners understand the process of experiential learning and their unique individual style of learning from experience" (Kolb & Kolb, 2005, p. 9).

The original Learning Style Inventory (LSI 1) was developed in 1971 and has four different learning modes (CE, RO, AC, and AE) that are determined by nine items. The inventory was further revised into different versions, the Kolb's LSI 2, LSI 2a, and LSI 3, containing 12 items on each learning mode in 1985, 1993, and 1999, respectively. Kolb and Kolb (2005) indicated that the reason for the revision was intended to increase internal consistency reliability (alpha) and test-retest reliability. The last version of Learning Style Inventory (LSI 3.1) was published in 2005 and was utilized in this study.

Based on responses by six groups of users (a total sample of 6977 valid LSI scores from users of the instrument) who completed the randomized LSI 3, Kolb and Kolb (2005) revealed the new norms which were used to convert LSI raw scale scores to percentile scores for the LSI 3.1 (see Table 3-4). Baron (1996) explained that in order to the achieve scale comparability among an individual's LSI scores, the raw scale scores must convert to percentile scores. These scores were then used "to define cut-points for the normative groups" (Kolb & Kolb, 2005, p. 13).

The *LSI 3.1* is created as a self-assessment exercise and tool which is a self-report ipsative (rating) scale consisted of 12 items and four responses to each item lead to a total of 48 variables. The KLSI was used to measure: (a) an individual's relative emphasis on the four learning orientations (four variables---CE, RO, AC, and AE), and an individual's preference for two variables of abstractness over concreteness (AC-CE) and action over reflection (AE-RO). However, the primary four scales of the LSI are adopted the forced-choice design of instrument use ipsative scales. Although, the combination scores AC-CE and AE-RO are not ipsative scales.

Table 3-4

KLSI 3.1 Scores for Normative Groups

Sample	N	CE	RO	AC	AE	AC-CE	AE-RO
Total Norm Group	6977 Mn.	25.39	28.19	32.22	34.14	6.83	5.96
	SD	6.43	7.07	7.29	6.68	11.69	11.63
On-line Users	5023	25.22	27.98	32.43	34.36	7.21	6.38
		6.34	7.03	7.32	6.65	11.64	11.61
Research Univ. Freshmen	288	23.81	29.82	33.49	32.89	9.68	3.07
		6.06	6.71	6.91	6.36	10.91	10.99
Lib. Arts College Students	221	24.51	28.25	32.07	35.05	7.56	6.80
		6.39	7.32	6.22	7.08	10.34	12.37
Art College UG	813	28.02	29.51	29.06	33.17	1.00	3.73
		6.61	7.18	6.94	6.52	11.13	11.49
Research Univ. MBA	328	25.54	26.98	33.92	33.48	8.38	6.49
		6.44	6.94	7.37	7.06	11.77	11.92
Distance E-learning Adult UG	304	23.26	27.64	34.36	34.18	11.10	6.54
		5.73	7.04	6.87	6.28	10.45	11.00

Note: From "*The Kolb Learning Style Inventory---Version 3.1: 2005 Technical Specification*" by Alice Y. Kolb and David A. Kolb, 2005. Used with permission of the first author.

Reliability

Based on seven studies of the randomized KLSI 3.1, Kolb and Kolb (2005) reported these results suggest that the LSI scales offer good internal consistency reliability (average = .70) across a number of different populations. In the study by

Veres, Sims, and Lockllear (1991) for business employees and students, furthermore, findings indicated that test-retest reliabilities of the randomized KLSI 3.1 were much greater than 0.9 in all cases. However, the study administered by Ruble and Stout (1991) reported that the average of the test-retest reliabilities of LSI was estimated 0.54 for the six LSI scales. Based on former related studies, Kolb and Kolb's (2005) reported, test-retest correlation coefficients in those studies were examined and ranged from moderate to excellent. In consequence, the difference between the studies was difficulty explained even though ELT assumed that learning style varies to correspond to environmental demands (Kolb & Kolb, 2005). As Baron (1996) stated, in order to achieve scale comparability, the raw scale scores were converted to percentile scores for the 6 variables (CE, RO, AC, AE, AE-RO, and AC-CE). In this study, coefficient alpha, as a measure of internal consistency reliability, was performed and reported for the learning orientations (CE, RO, AC, and AE).

Validity

First-Order correlation analysis was performed on the scale of the six variables (CE, RO, AC, AE, AE-RO and AC-CE) to further establish internal validity of KLSI 3.1. In addition, Construct validity for KLSI also reported.

Follow-Up Survey, Part One: Course Satisfaction

Description

Two global items were used to measure student course satisfaction (overall quality of the instruction and course). A validated instructor rated the instrument that used multiple Likert type items. The two global items of student course satisfaction

instrument was created by the researcher and approved by faculty. The course satisfaction instrument was a 5-point Likert scale (1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and 5 = Strongly Agree) which was used to evaluate overall quality of teaching effectiveness and the course. With two items, the average score range was from 1 to 5.

Reliability

In this study, a two global-item scale was used to assess student course satisfaction. Coefficient alpha, as a measure of internal consistency reliability, was performed and reported.

Validity

Exploratory factor analysis was performed for course satisfaction and the Aesthetic Experience Assessment to examine the convergent and discriminant validity in this study. The results of concurrent validity were established.

Follow-up Survey, Part Two: Post-Test Art Appreciation and Art Appreciation Learning Gains

The post-test *Art Appreciation Assessment* is the same test as used in the pre-test (see Initial Part One-I, Pre-Test). Art appreciation learning gains were reported as the difference between the post-test score minus the pre-test score. This is a direct measure of student learning performance.

Follow-Up Survey, Part Three: Course Grade Report

Course grade was provided by the instructors at the end of the course. Course grade was measured using GPA associated with each grade (A = 4.00, A- = 3.67, B+ = 3.33, B = 3.00, B- = 2.67, C+ = 2.33, C = 2.00, C- = 1.67, D+ = 1.33, D = 1.00, F = 0.00).

Procedures: Ethical Considerations and Data Collection Methods

The following section describes the data collection procedures and ethical considerations taken to protect study participants:

1. Permission for three instruments (KLSI 3.1, AEA, and Course Satisfaction) to be used in this study was obtained before the proposal defense. The researcher's Lynn University email account was used to contact the instrument developers for permission requirement (see Appendix C, D, E).
2. Permission was obtained from Lynn University to conduct the study at the university prior to the proposal defense (see Appendix A).
3. An application form was submitted to Institutional Review Board (IRB) of Lynn University. IRB request was made to waive documentation of a signed consent;
4. The data collection process began after receiving the approval of the IRB (December 14, 2006), and lasted until April 27, 2007.
5. In order to maintain participants' anonymity, subjects were assigned a code number by the instructors at the beginning of the semester.
6. The researcher explained the purpose of the research and participants' right before the initial survey took place.
7. The students placed the code number on initial survey which included the KLSI 3.1 and pre-test of the AEA.

8. At the end of the term, the instructors gave the students the same code number. The participants placed the code number on follow-up survey and post-test of the AEA.
9. There were two data collection periods: (a) the initial survey of student background and pre-test of the AEA was administrated in the first session of week one of the semester, survey and KLSI 3.1 was conducted in the second session of week one; and (b) the follow-up survey of student satisfaction and AEA learning gains post-test was conducted in the end of the term (week 14).
10. After the researcher distributed the initial survey and pre-test of AEA, the researcher left the classroom.
11. The initial survey and pre-test of the AEA took approximately 30 minutes; the survey including the KLSI 3.1 took approximately 10 minutes, and the follow-up survey and post-test of the AEA took approximately 30 minutes in the classrooms.
12. After all participants finished the survey and tests, the instruments were collected in a separate envelope and sealed. The researcher picked up the envelope at the end of class time.
13. All findings were reported as group data. The participants remained anonymous to the researcher.
14. One month after data collection, Form 8 (Termination of Project) was submitted to IRB (August 9, 2007).
15. A password-protected database was created by the researcher. After the data analysis process, the data were electronically saved with confidentiality (password and identification were required).
16. All of the data will be destroyed after five years.

Methods of Data Analysis

In this study, all data were analyzed using the Statistical Package for Social Sciences (SPSS) version 14 to respond to the research questions and examine hypotheses. Reliability estimates of internal consistency using Cronbach's alpha (a) and convergent validity were used to establish construct validity for the AEA, KLSI 3.1, and Course Satisfaction. Research Question One was answered through descriptive statistics (frequency distributions and measures of central tendency), and variability (range and standard deviation) for all variables in the study: (a) student background characteristics; (b) learning orientations, and learning preferences, and learning style classifications; (c) course satisfaction; (d) course grade; and (e) art appreciation learning gains in multimedia hybrid versus traditional face-to-face art appreciation courses.

For the exploratory (comparative) research design, independent t-test was employed to answer the Research Question Two of any difference in student background characteristics, learning orientations, learning preferences, learning style classifications, course satisfaction, course grade, and art appreciation learning gains between multimedia hybrid and traditional face-to-face courses. However, the student demographics of gender and major, which were nominal categories, were analyzed with Chi-Square.

For the explanatory (correlational) research design, to test Hypothesis One, Eta tests, Pearson r correlation, and hierarchical multiple regression analyses were used to examine the explanatory relationships of student background characteristics, learning orientations, learning preferences, learning style classifications, and course satisfaction with students enrolled in multimedia hybrid (H_{1a}) and traditional face-to-face (H_{1b}) art appreciation courses. The adjusted R-Squares, produced by hierarchical multiple

regression analyses for two groups of students enrolled in multimedia hybrid (H_{1a}) and traditional face-to-face (H_{1b}), were compared in H_{1c} to determine if the percentage of explained variance of course satisfaction (adjusted R^2) was greater for students enrolled in multimedia hybrid art appreciation courses compared with students enrolled in traditional face-to-face art appreciation courses.

To test Hypotheses Two, the same steps which utilized in hypothesis one were used. Eta tests, Pearson *r* correlation analyses, and hierarchical multiple regression analyses were used to examine the explanatory relationships of student background demographic characteristics, learning orientations, learning preferences, learning styles, course satisfaction, and course grade with students enrolled in multimedia hybrid (H_{2a}) and traditional face-to-face (H_{2b}) art appreciation courses. The adjusted R-Squares, produced by hierarchical multiple regression analyses for two groups of students enrolled in traditional face-to-face (H_{2a}) and multimedia hybrid (H_{2b}), were compared in H_{2c} to determine if the percentage of variance of course grade (adjusted R^2) was greater in students enrolled in multimedia hybrid art appreciation courses compared with students enrolled in face-to-face art appreciation courses.

To test Hypotheses Three, Eta tests, Pearson *r* correlation analyses, and hierarchical multiple regression analyses were used to examine the explanatory relationships of student background demographic characteristics, learning orientations, learning preferences, learning styles, course satisfaction, course grade, and art appreciation learning gains with students enrolled in multimedia hybrid (H_{3a}) and traditional face-to-face (H_{3b}) art appreciation courses. The adjusted R-Squares, produced by hierarchical multiple regression analyses for two groups of students enrolled in

multimedia hybrid (H_{3a}) and traditional face-to-face (H_{3b}), were compared in H_{3c} to determine if the percentage of explained variance of learning gains (adjusted R^2) was greater in students enrolled in multimedia hybrid art appreciation courses compared with students enrolled in face-to-face art appreciation courses.

Evaluation of Research Methods

The strengths and weaknesses of internal validity and external validity of this study methodology design are discussed in this section.

Internal Validity (Strengths)

1. A quantitative, non-experimental, causal-comparative (exploratory) and correlational (explanatory), and prospective (longitudinal) survey research design with multiple regression analysis is stronger than an exploratory or descriptive design.
2. A quantitative research design has higher internal validity than a qualitative design.
3. The descriptive and inferential statistical procedures are considered appropriate to answer research questions and test hypotheses.
4. A pre-test and post-test was conducted for Aesthetic Experience Assessment to measure learning gains, rather than a post-test only design.

Internal Validity (Weaknesses)

1. The instrument of course satisfaction was created by the researcher, and AEA was modified by the researcher. Reliability and validity was established.

2. Two instructors taught in different course formats.
3. The sample size of this study is considered too small to generalize the results to other disciplines or diverse populations.
4. Participants were not randomly assigned to the traditional or hybrid groups.

External Validity (Strengths)

1. All participants in this study were homogenous. All participants were traditional day undergraduate students at least 18 years old.

External Validity (Weaknesses)

1. The population of this study only focused on students attending a single private university in South Florida. Results cannot be generalized beyond students taking art appreciation (population validity), to other settings (other universities) or to other disciplines.
2. All students enrolled in both multimedia hybrid and traditional face-to-face sections were tested, resulting in a convenience sample.

Chapter III described the research methods which were used to answer research questions and test the hypotheses about the relationships among learning styles course delivery formats on student learning outcomes in higher education art appreciation courses. In addition, the research design, the sampling plan, the instruments, procedures, data collection methods, and data analysis methods were discussed in this chapter. Chapter IV offers the findings of this study.

CHAPTER IV

RESULTS

In this chapter, the statistical results are presented in three sections for the study about the relationships among learning styles, hybrid, and traditional face-to-face teaching on learning outcomes in higher education art appreciation courses. First, descriptive analyses of student background characteristics, learning styles, and all other variables were summarized. Second, the Pearson *r* correlation and reliability of the measurement scales of course satisfaction and aesthetic experience assessment were examined and reported. Finally, the results of inferential statistics of independent *t*-test, Eta, hierarchical multiple regressions, and chi-square, used as methods of data analyses and to answer the hypotheses testing, were presented.

Research Question One

What were student background characteristics (gender, age, major, and prior computer experience), learning orientations (concrete experience, reflective observation, abstract conceptualization, and active experimentation), learning preferences (abstractness and concreteness), learning style classifications (converging, diverging, assimilating, and accommodating), course satisfaction, course grades, and art appreciation learning gains in traditional day undergraduate students enrolled in multimedia hybrid versus traditional face-to-face art appreciation courses?

Descriptive Analysis of Student Background Characteristics

The *Student Background Characteristic* provided information about the background of each respondent. The respondents consisted of 37 (52.1%) males and 34 (47.9%) females, with an age range from 18 to 22 years of age. As shown in Table 4-1,

the largest age group of respondents was 18 years old (35.2%) and the smallest age group was 21 years old and above (9.9%). The mean of respondents' age was 2.06 with a standard deviation of .984. The majority group of respondents' major was business and management (31.0%), followed by Hospitality Management (19.7%), International Communication (16.9%), Art and Science (14.1%), Undecided (12.7%), and Education (5.6%). Moreover, the findings showed that most of respondents (81.8%) had not taken any web-based or on-line courses before spring semester 2007. The mean of prior computer experience was .38 with a standard deviation of .704. Table 4-1 presents the frequency distribution of the respondents' gender, age, major, and prior computer experience (PCE).

Table 4-1

Descriptive Statistical Analysis of Student Background Characteristics: Total Sample

Variables	Hybrid		Traditional		Total	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Gender (n = 71)						
Male	23	52.3%	14	51.9%	37	52.1%
Female	21	47.7%	13	48.1%	34	47.9%
Age (n = 71)						
18	15	34.1%	10	38.5%	25	35.2%
19	17	38.6%	7	26.9%	24	33.8%
20	9	20.5%	5	19.2%	15	21.1%
21 and above	3	6.8%	4	15.4%	7	9.9%

Table 4-1 *(Continued)*

Variables	Hybrid		Traditional		Total	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Major (n = 71)						
Arts & Sciences	5	11.4%	5	18.5%	10	14.3%
International Communication	4	9.1%	8	29.6%	12	16.9%
Education	2	4.5%	2	7.4%	4	5.6%
Business & Management	14	31.8%	8	29.6%	22	31.0%
Hospitality Management	11	25.0%	3	11.1%	14	19.7%
Undecided	8	18.2%	1	3.7%	9	12.7%
PCE (n = 71)						
None-experience	36	81.8%	16	59.3%	52	73.2%
Once	7	15.9%	5	18.5%	12	16.9%
Twice	1	2.3%	5	18.5%	6	8.5%
Three times and more	0	0%	1	3.7%	1	1.4%

Descriptive Analysis of Learning Orientations, Learning Preferences, and Learning Style Classifications

The frequency distribution of the respondents' learning orientations (LO), learning preferences (LP), and learning style classifications (LSC) are presented in Table 4-2. Within multimedia hybrid section, the majority groups of LO, LP, and LSC were Active Experimentation (43.2%), Concreteness (52.3%), and Diverging (38.6%), respectively. In contrast, in traditional face-to-face section, the majority groups of LO, LP, and LSC were Reflective Observation (40.7%), Abstractness (51.9%), and Diverging (74.1%), respectively. In total, the majority groups of LO, LP, and LSC were Reflective Observation (39.4%), Concreteness (50.7%), and Diverging (52.1%), respectively.

Finally, in total, the majority group for learning orientations, learning preferences, and learning style classifications was Diverging (52.1%), Concreteness (50.7%), and Reflective Observation (39.4%) respectively.

Table 4-2

Descriptive Statistical Analysis of Learning Orientations, Learning Preferences, and Learning Style Classifications: Total Sample

Variables	Hybrid		Traditional		Total	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
LO (*n* = 71)						
Concrete Experience	4	9.1%	4	14.8%	8	11.3%
Reflective Observation	17	38.6%	11	40.7%	28	39.4%
Abstract Conceptualization	4	9.1%	6	22.2%	10	14.1%
Active Experimentation	19	43.2%	6	22.2%	25	35.2%
LP (*n* = 71)						
Abstractness	21	47.7%	14	51.9%	35	49.3%
Concreteness	23	52.3%	13	48.1%	36	50.7%
LSC (*n* = 71)						
Accommodating	15	34.1%	4	14.8%	19	26.8%
Assimilating	9	20.5%	2	7.4%	11	15.5%
Diverging	17	38.6%	20	74.1%	37	52.1%
Converging	3	6.8%	1	3.7%	4	5.6%

Descriptive Analysis of Course Satisfaction

As the findings shown in Table 4-3, most respondents were strongly satisfied with the quality of the course (61.4%) and the teaching quality of the course (68.2%) in multimedia hybrid section. Only one response was rating strongly unsatisfied with the quality of the course and the quality of teaching in multimedia hybrid section. In the section of traditional (M = 3.94, SD = .824), the findings indicated that the majority groups, 11 students (42.3%) and 10 students (38.5%), were satisfied with the quality of the course and the teaching quality, respectively. In addition, only one respondent was reported strongly unsatisfied with the overall quality of the course and instruction in multimedia hybrid section (M = 4.55, SD = .761), and two students (7.7%) were not satisfied with the teaching quality in traditional section.

Table 4-3

Descriptive Statistical Analysis of Course Satisfaction between Groups: Total Sample

			Strongly Disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly Agree 5	*M*	*SD*
Hybrid (*n*=44)	Q1	Frequency	1	0	2	14	27	4.50	.792
		Percentage	2.3%	0%	4.5%	31.8%	61.4%		
	Q2	Frequency	1	0	1	12	30	4.59	.757
		Percentage	2.3%	0%	2.3%	27.3%	68.2%		
Traditional (*n*=27)	Q1	Frequency	0	0	9	11	6	3.88	.766
		Percentage	0%	0%	34.6%	42.3%	23.1%		
	Q2	Frequency	0	2	6	10	8	3.92	.935
		Percentage	0%	7.7%	23.8%	38.5%	30.8%		
Total (*n*=71)	Q1	Frequency	1	0	11	25	33	4.27	.833
		Percentage	1.4%	0%	15.7%	35.7%	47.1%		
	Q2	Frequency	1	2	7	22	38	4.34	.883
		Percentage	1.4%	2.9%	10.0%	31.4%	54.3%		

As the results showed in Table 4-4, the largest group of course satisfaction scores of respondents was 5.0 (47.9%) followed by 4.0 (26.8%), with item mean and standard deviation of 4.317 and 0.833, respectively. Moreover, the findings of this study found that respondents enrolled in both traditional and multimedia hybrid groups positively rated course satisfaction with ratings higher in the hybrid (M = 4.55, SD = .761) group than the traditional group (M = 3.94, SD = .824). Significant difference (t = 3.13, p = .003) was existed between the two groups on course satisfaction.

Table 4-4

Descriptive Statistical Analysis of Course Satisfaction: Total Sample (n=71)

	1.0	**2.5**	**3.0**	**3.5**	**4.0**	**4.5**	**5.0**	**Total**
Frequency	1	2	6	4	19	5	34	71
Valid Percent	1.4%	2.8%	8.5%	5.6%	26.8%	7.0%	47.9%	100%

M= 4.317, SD= .833

Descriptive Analysis of Course Grade

Table 4-5 presents the frequency distribution of student course grade (GPA). The largest group in multimedia hybrid section was 24 respondents (54.5%) who earned an A grade. In contrast, the primary group in traditional face-to-face section was 9 respondents (33.3%) who earned a B grade. In total, 28 respondents (39.4%) who earned an A grade were in the largest group followed by a B grade (18.3%). The results of this study revealed that significant difference (t = 4.73, p = .003) was found between the two groups on students' course grade, which was higher in the hybrid group (M = 8.80, SD = 1.90) than the traditional group (M = 6.11, SD = 2.89).

Table 4-5

Descriptive Statistical Analysis of Course Grade between Groups (n=71)

	Hybrid (*n*=44)		Traditional (*n*=27)		Total (*n*=71)	
	Frequency	**Valid Percent**	**Frequency**	**Valid Percent**	**Frequency**	**Valid Percent**
A	24	54.5%	4	14.8%	28	39.4%
A-	6	13.6%	2	7.4%	8	11.3%
B+	7	15.9%	2	7.4%	9	12.7%
B	4	9.1%	9	33.3%	13	18.3%
B-	0	0%	0	0%	0	0%
C+	0	0%	0	0%	0	0%
C	1	2.3%	3	11.1%	4	5.6%
C-	1	2.3%	5	18.5%	6	8.5%
D+	1	2.3%	0	0%	1	1.4%
D	0	0%	1	3.8%	1	1.4%
F	0	0%	1	3.8%	1	1.4%

Descriptive Analysis of Art Appreciation Learning Gains

Student learning gain (post-test minus pre-test) were presented in Table 4-6 based on the average scores of the AEA rated by two art teachers. The largest score group is 0 (25.4%), next by -1 (18.3%) and 1 (16.9%). Student learning gain has a mean of -0.17 with standard deviation of 2.635. Table 4-6 showed that students' learning gains were lower. Nonetheless, student learning gain between the two groups appeared significantly different ($t = 3.57$, $p = .001$) which was higher in the hybrid group ($M = .830$, $SD = 2.65$) than the traditional group ($M = -1.63$, $SD = 3.075$).

Table 4-6

Descriptive Statistical Analysis of Art Appreciation Learning Gains (n=71)

Scores	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7
Frequency	1	3	1	1	5	4	13	18	12	6	2	1	1	2	1
Valid Percent	1.4	4.2	1.4	1.4	7.0	8.5	18.3	25.4	16.9	8.5	2.8	1.4	1.4	2.8	1.4

Moreover, in Table 4-7, the average scores of pre-test and post-test between groups were presented. As the result showed in Table 4-7, the findings indicated that means of pre-test and post-test were higher in traditional group than in hybrid group.

Table 4-7

Descriptive Statistical Analysis of Pre-Test and Post-Test Scores of Art Appreciation Learning Gains (n=71)

		N	*M*	*SD*
Hybrid	Pre-Test AEA	44	12.023	2.9432
	Post-Test AEA	44	12.875	2.2751
Traditional	Pre-Test AEA	27	15.185	3.2319
	Post-Test TAEA	27	14.074	2.8172

Research Question 2

Are there differences in student background characteristics (gender, age, major, and prior computer experience), learning orientations (concrete experience, reflective observation, abstract conceptualization, and active experimentation), learning preferences (abstractness and concreteness), learning style classifications (converging, diverging, assimilating, and accommodating), course satisfaction, course grade, and art appreciation

learning gains in traditional day undergraduate students enrolled in multimedia hybrid versus traditional face-to-fact art appreciation courses?

The differences between two groups in student background characteristics, learning orientations, learning preferences, learning style classifications, course satisfaction, course grade, and art appreciation learning gains were compared in this section. Before running independent sample *t*-test, the six nominal variables of learning orientations (CE, RO, AC, and AE) and learning preferences (Abstractness and Concreteness) needed to be converted to percentile scores, and learning style classifications (Converging, Diverging, Assimilating, and Accommodating) needed to recoded as dummy variables.

Through independent *t*-test analysis, in Table 4-8, the results showed that AE (t = 2.24, $p < .05$); course satisfaction (t = 3.13, $p < .01$); GPA (t = 4.30, $p = .000$); and art appreciation learning gains (t = 3.57, $p < .01$) demonstrated positive significant differences between the two groups. Moreover, Prior Computer Experience (t = -2.81, $p < .01$), Diverging (t = -3.047, $p < .01$), and AC (t = -2.58, $p < .05$) were demonstrated as negative significant differences between the two groups. However, no significant differences were found in variables of age, Accommodating, Assimilating, Converging, CE, RO, AE-RO, and AC-CE between the two groups.

Table 4-8

Independent Sample t-test of Groups by Age, Prior Computer Experience, Learning Orientations, Learning Preferences, Learning Style Classifications, Course Satisfaction, Course Grade, Art Appreciation Learning Gains (n=71)

	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	*t*	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Age	2.93	.091	-.61	69	.542	-.15	.242	-.630	.334
Prior Computer Experience	25.55	.000	-2.43	34.16	.021	-.46	.190	-.847	-.076
CE	.505	.480	-.853	69	.397	-6.06	7.10	-20.23	8.11
RO	.604	.440	.704	69	.484	5.01	7.12	-9.19	19.21
AC	.144	.705	-2.55	69	.013	-17.42	6.83	-31.05	-3.80
AE	2.008	.161	2.15	69	.035	14.90	6.92	1.10	28.70
AE-RO	5.614	.021	.943	65.03	.349	6.31	6.70	-7.06	19.69
AC-CE	2.717	.104	-.960	69	.340	-6.82	7.10	-20.99	7.35
Accommodating	16.664	.000	1.92	65.92	.059	.19	.10	-.008	.393
Assimilating	10.664	.002	1.63	68.66	.108	.13	.08	-.029	.290
Diverging	5.382	.023	-3.12	59.32	.003	-.35	.11	-.582	-.127
Converging	1.232	.271	.546	69	.587	.03	.06	-.083	.145
Course Satisfaction	.743	.392	3.13	69	.003	.60	.19	.22	.98
GPA	10.67	.002	4.29	39.95	.000	2.68	.63	1.42	4.0
Learning Gains	.487	.488	3.57	69	.001	2.46	.69	1.09	3.83

The differences in gender and major between two groups were examined using Chi-Square test. The results showed in Table 4-9 indicated no significant differences on gender (p = .973) and major (p = .092) were found between the two groups. However,

for 1-tailed test, the result indicated significant difference between the two groups was found on major ($p < .05$).

Table 4-9

Chi-Square Table of Groups by Gender and Major (n=71)

Variables		N	Value (χ^2)	df	Asymp. Sig. (2-tailed)
Gender	**Male**	37	.001	1	.973
	Female	34			
Major	**Arts & Sciences**	10	9.457	5	.092
	International Communication	12			
	Education	4			
	Business & Management	22			
	Hospitality Management	14			
	Undecided	9			

Validity and Reliability of Measurement Scales

Exploratory Factor Analysis and Internal Consistency Reliability of Learning Style Inventory

Respondents' learning style was assessed using Kolb's Learning Style Inventory (KLSI 3.1) in this study. Principal components analysis using varimax rotation was employed to examine construct validity for learning style orientation (CE, RO, AC and AE) which was the primary scores of LSI that consisted of 12 forced-choice items, leading to a total of 48 items. The results of exploratory factor analysis for LSI were presented in Table 4-10.

Table 4-10

Factor Item Loadings for Learning Style Inventory (LSI)

	Factor			
	1=AC	**2=RO**	**3=CE**	**4=CE**
AC7	**.652**	.128	-.092	-.167
AC2	**.651**	.158	.287	.130
AC6	**.585**	.141	-.084	.106
AC11	**.531**	-.177	-.024	-.113
AC8	**.524**	.102	-.040	.011
AC4	**.509**	-.168	-.092	.002
AC10	**.506**	.086	-.158	-.167
AC9	**-.465**	.311	.028	.003
AC12	**.343**	.061	.101	-.028
AC1	**.223**	.033	.147	.001
AC3	.378	.004	**.523**	.148
AC5	.230	-.202	-.020	**-.436**
RO4	-.142	**-.725**	.050	.025
RO6	-.102	**-.686**	.272	.034
RO7	-.004	**-.659**	.207	.249
RO1	-.069	**-.640**	-.018	.326
RO9	.024	**-.605**	-.009	-.108
RO11	-.256	**-.585**	-.039	.301
RO2	-.373	**-.469**	.215	-.077
RO10	.165	**-.293**	-.198	.137
RO3	-.089	-.251	**-.327**	.294
RO12	-.342	-.177	**-.544**	-.092
RO8	-.230	-.069	-.151	**.517**
RO5	**-.497**	.054	-.073	-.013
CE8	-.150	.114	-.144	**-.740**
CE1	-.015	.257	-.151	**-.523**
CE3	.035	.161	-.282	**-.476**
CE7	-.317	.213	-.288	**-.449**
CE11	-.119	.185	.093	**-.305**
CE9	-.004	.205	**-.610**	-.157
CE12	-.090	-.078	**.554**	-.135
CE10	-.289	.191	**.410**	-.071
CE2	.092	.380	**-.616**	.065
CE6	.081	.118	**-.482**	.062
CE4	.108	**-.572**	-.459	-.007
CE5	**-.352**	-.029	.331	-.007

Table 4-10 (Continued)

	Factors			
	1	**2**	**3**	**4**
AE1	-.273	**.453**	.317	.184
AE2	**-.283**	-.040	.048	-.036
AE3	**-.340**	.130	.129	.045
AE4	-.439	.320	**.518**	.101
AE5	-.337	.199	-.240	**.496**
AE6	**-535**	.373	.246	-.240
AE7	-341	.306	.183	**.416**
AE8	-.058	-.105	**-.334**	.236
AE9	-.437	.124	**.461**	.260
AE10	**-.442**	.091	-.028	.136
AE11	-.094	**.635**	-.014	.029
AE12	.102	.223	-.145	**.294**

Exploratory factor analysis (EFA) was executed to test construct validity for LSI, and results shown in Table 4-10, revealed four factors within the 48 items. The total variance explained was 36.431, and Eigenvalues ranged from 5.716 to 12.723. Based on the rotated components matrix, the results of factor loading presented that (a) AC loaded mostly on factor 1; (b) RO loaded mostly on factor 2; (c) CE loaded mostly on factor 4 but also factor 3; and (d) AE did not load on one primary factor. According to the results, factor 1 was named as AC, factor 2 was named as RO, and CE is split between two factors (factor 3 and factor 4). As the result, the construct validity for factor 1 (AC) and factor 2 (RO) were established.

Table 4-11

Cronbach's Alpha of Learning Style Inventory (KLSI)

	Factor 1	**Factor 2**	**Factor 3**	**Factor 4**
Cronbach's Alpha (α) (original)	.714 (12 items)	.689 (12 items)	-.059 (5 items)	.507 (12 items)
New			.555 (3 items)	

Cronbach's Alpha as a measure of internal consistency reliability for LSI was preformed. The result shown in Table 4-11 indicated the internal consistency reliability of factor 1 (AC) and factor 2 (RO) were established.

Inter Correlation of Learning Style Inventory (KLSI)

According to Kolb and Kolb (2005), validity of KLSI was examined in two ways which include a first-order correlation matrix for the six LSI scales and factor analysis of the four primary LSI scales and/or inventory items. In this study, only first-order correlation was performed and reported in Table 4-12. All raw scale scores of the six variables of KLSI were converted to percentile scores before running the correlation.

Table 4-12

First-Order Correlation Matrix for Learning Style Inventory (KLSI)

		CE	RO	AC	AE	AE-RO	AC-CE
CE	Pearson Correlation						
	Sig. (1-tailed)						
RO	Pearson Correlation	-.480					
	Sig. (1-tailed)	.000***					
AC	Pearson Correlation	-.147	-.251				
	Sig. (1-tailed)	.111	.017*				
AE	Pearson Correlation	-.111	-.341	-.550			
	Sig. (1-tailed)	.178	.002**	.000***			
AE-RO	Pearson Correlation	.199	-.737	-.195	.781		
	Sig. (1-tailed)	.048*	.000***	.052	.000***		
AC-CE	Pearson Correlation	-.685	.151	.683	-.308	-.248	
	Sig. (1-tailed)	.000***	.104	.000***	.004**	.019**	

* $p < .05$, ** $p < .01$, *** $p < .001$

Predictions have been made from ELT about the relationships among the LSI scales (Kolb & Kolb, 2005). ELT suggested that AC-CE and AE-RO should be

uncorrelated. In addition, CE and AC scales should not correlate with AE-RO. Further, the AE and RO scales should not correlate with AC-CE. Finally, AC-CE and AE-RO should be negatively correlated.

These study results supported the ELT predictions: (a) the correlation of AE-RO with AC-CE was negative (r = -.248, p = .019) and low; (b) correlation of RO with AC-CE was very low (r = .151, p = .104); (c) correlation of AC with AE-RO (r = -.195, p = .052) was low; (d) AE was highly negatively correlated with RO (r = -.341, p = .002); (e) the cross-dimensional scales of CE/AE (r = .-111, p = .178), and AC/RO (r = -.251, p = .017) had low correlation; (f) and the cross-dimensional scales of CE/RO (r = -.480, p = .000), AC/AE (r = -.550, p =.000) had higher correlations.

The ELT propositions were not similar with the results in this study that included (a) correlation of AC with CE (r = -.147, p = .111); (b) correlations of AE with AC-CE (r =-.308, p = .004). These significance levels for CE, RO, AC, and AE are not reported, because method-induced negative correlations render them meaningless (Kolb & Kolb, 2005).

Exploratory Factor Analysis and Internal Consistency Reliability of Course Satisfaction Instrument and Aesthetic Experience Assessment

In this study, exploratory factor analysis (EFA) was performed to test construct validity for course satisfaction and the Aesthetic Experience Assessment.

Table 4-13

Factor Item Loadings for Course Satisfaction Instrument and the Aesthetic Experience Assessment (AEA)

	Factors	
	Factor 1	**Factor 2**
Course Satisfaction (Q1)	-.033	**.917**
Course Satisfaction (Q2)	-.033	**.978**
Aesthetic Experience Assessment (Q1)	**.842**	-.067
Aesthetic Experience Assessment (Q2)	**.822**	-.026
Aesthetic Experience Assessment (Q3)	**.870**	.046

The results of EFA showed that the total variance explained was 78.993, and Eigenvalues ranged from 37.895 to 48.723. The results of factor loadings for course satisfaction and AEA were displayed in Table 4-13, indicated that the question 1 to question 3 of AEA were all loaded in factor 1, and the question 1 and question 2 of course satisfaction were all loaded in factor 2. The factor 1 was named as AEA, and the factor 2 was named as course satisfaction. As the results, the construct validity for course satisfaction and AEA were established.

Cronbach's alpha as measure internal consistency reliability for factor 1 (course satisfaction) and factor 2 (AEA) were executed. The result of Pearson *r* correlation shown in Table 4-14 indicated the Cronbach's alpha for factor 1 ($\alpha = .881$) and factor 2 ($\alpha = .945$) were higher than .7. In the end, the internal consistency reliability of factor 1 (AEA) and factor 2 (Course Satisfaction) were established.

Table 4-14

Cronbach's Alpha of Aesthetic Experience Assessment (AEA)

	Factor 1 (AEA)	**Factor 2 (Course Satisfaction)**
Cronbach's Alpha (α)	.881 (3 items)	.945 (2 items)

Convergent and Discriminant Validity for Course Satisfaction and the Aesthetic Experience Assessment (AEA)

Convergent validity refers to the degree to which the operationalization converges on (is similar to) the other operationalizations. Hence, convergent validity is established when a correlation matrix shows that the association is high between other items. Additionally, discriminant validity is established when the association between the two items is low.

In this study, the converging validity and discriminant validity were tested by using Pearson *r* correlation. The correlation matrix shown in Table 4-15 indicated the higher association was found between at a level of .898 (p = .000). Furthermore, the results showed higher correlation among AEA1 and AEA2 (r = .695, p = .000), AEA1 and AEA3 (r = .730, p = .000), and AEA2 and AEA3 (r = .713, p = .000) were demonstrated. Therefore, convergent validity of course satisfaction and learning gains (AEA) was established. The correlation between course satisfaction instrument (questions 1 and 2) and Aesthetic Experience Assessment (AEA1, AEA2, and AEA3) was lower, the discriminant validity also established.

Table 4-15

Correlation Matrix of Course Satisfaction and Aesthetic Experience Assessment (AEA)

		CS1	CS1	AEA1	AEA2	AEA3
Course Satisfaction Question 1 (CS1)	Pearson Correlation					
	Sig. (1-tailed)					
Course Satisfaction Question 2 (CS1)	Pearson Correlation	.898				
	Sig. (1-tailed)	.000***				
AEA Question 1 (AEA1)	Pearson Correlation	-.059	-.097			
	Sig. (1-tailed)	.313	.210			
AEA Question 2 (AEA2)	Pearson Correlation	-.070	-.010	.695		
	Sig. (1-tailed)	.281	.466	.000***		
AEA Question 3 (AEA3)	Pearson Correlation	.003	.054	.730	.713	
	Sig. (1-tailed)	.491	.328	.000***	.000***	

* $p < .05$, ** $p < .01$, *** $p < .001$

Concurrent Validity Estimates of Aesthetic Experience Assessment (AEA)

Since the validity of AEA was not reported in Anderson et al.'s (1997) article, concurrent validity (correlation) was performed by correlating the post-test learning gain scores and course grade. Table 4-16 presented the result of correlation test between post-test learning gain scores and course grade. The result indicated that post-test AEA scores (r = .245, p = .04) were significantly correlated with course grade. Therefore, the concurrent validity of learning gains was established.

Table 4-16

Concurrent Validity (Correlation) of Post-Test Art Appreciation Learning Gains and Course Grade

		Course Grade
Post-Test (Art Appreciation Learning Gains)	Pearson *r* Correlation	.245
	Sig. (1-tailed)	.020*

* $p < .05$

Inter-Rater Reliability Estimates of Aesthetic Experience Assessment

In this study, two art teachers were invited to score both pre-test and post-test AEA. Inter-rater reliability intends to assess whether measurement results are consistent by rater one and rater two. While the AEA contains three essay-questions, in this study, Pearson correlation was performed to estimate inter-rater reliability. In Table 4-17, significant positive correlation (r = .853) existed between the two raters, with a Significant level of $p < .000$. Hence, the measure of AEA was considered reliable through inter-rater reliability of AEA.

Table 4-17

Inter-Rater Reliability of Aesthetic Experience Assessment (AEA)

Variable	Correlation *r*	Sig. (*p*)
AEA	.853	.000**

** $p < .001$

Research Hypotheses

Statistical methods of Eta correlation analyses, Pearson *r* correlation tests, and hierarchical multiple regressions were utilized to test the explanatory relationship between independent variables and dependent variables for H_{1a}, H_{1b}, H_{2a}, H_{2b}, H_{3a}, and H_{3b} in the two groups. To determine the variables to enter into the multiple regressions, the following steps were taken for both two groups: (a) For categorical variables (gender, major, and learning style classifications) Eta correlation analyses were conducted with dependent variables (course satisfaction, course grade, and learning gains); (b) significant categorical variables with dependent variables were changed to dummy variables; (c) significant categorical variables and continuous variables were examined for the relationships with the dependent variables using Pearson *r* correlations; and (d) only significant Pearson *r* correlations were entered into the multiple regression models, and were entered into the order at more significant to less significant.

Additionally, in order to answer the H_{1c}, H_{2c}, and H_{3c}, the statistical method of hierarchical multiple regression analyses was executed to compare the adjusted R-Square of the two groups, to determine whether the percentage of art appreciation variances of course satisfaction (H_{1c}), course grade (H_{2c}), and learning gain (H_{3c}), explained by independent variables was greater in the multimedia hybrid course delivery than the percentage of variance explained in traditional face-to-face course delivery. However, based on the results of Pearson *r* correlation analyses, only significant independent variables were entered into the multiple regression models.

Research Hypothesis 1

Student background characteristics, learning orientations, learning preferences, learning style classifications are significant explanatory variables of course satisfaction for students enrolled in multimedia hybrid and traditional face-to-face art appreciation courses.

H_{1a}. Student background characteristics, learning orientations, learning preferences, learning style classifications are significant explanatory variables of course satisfaction in students participating in multimedia hybrid art appreciation course delivery.

In order to answer Hypothesis $_{1a}$, Eta correlation analysis, Pearson *r* correlation, and hierarchical multiple regression were executed to examine the explanatory relationships between explanatory variables and course satisfaction in the multimedia hybrid section. The results of Eta correlation analyses were presented in Table 4-18. The findings of Eta correlation analysis indicated only one categorical variable of learning style classifications ($p = .035$) was significantly related to course satisfaction in students participating in the multimedia hybrid art appreciation course delivery.

Table 4-18

Eta Correlation Test of Course Satisfaction in Multimedia Hybrid Group (n=44)

Categorical Variable	Eta (η)	Eta Squared (η^2)	*F*	Sig. (*p*)
Gender	.184	.034	1.475	.231
Major	.270	.073	.598	.701
Learning Style Classification	.438	.192	3.166	.035*

* $p < .05$

Before actually running Pearson *r* correlations, the categorical variable of learning style classifications were recoded as dummy variables and then Pearson *r* correlations with other continuous explanatory variables and the dependent variable of course satisfaction were conducted. The Pearson *r* correlation result shown in Table 4-18 indicated there were five significant variables correlated with course satisfaction, *AE* (r = -.493, p = .000); *Accommodating* (r = -.426, p =.002); *AE-RO* (r = -.355, p = .009); *AC* (r = .274, p = .036); and Diverging (r = .262, p = .043), for students participating in the multimedia hybrid art appreciation courses. Furthermore, based on the results of Pearson *r* correlation analysis shown in Table 4-19, the significant variables of AE, Accommodating, AE-RO, AC, and Diverging were entered into hierarchical multiple regression model in the order of most significant to least significant.

Table 4-19

Pearson r Correlation Analysis of Course Satisfaction in Multimedia Hybrid Group (n=44)

Variables	Correlation *r*	Sig. (*p*)
Age	.067	.333
PCE	-.027	.431
CE	-.034	.412
RO	.208	.088
AC	.274	.036*
AE	-.493	.000***
AE-RO	-.355	.009**
AC-CE	.239	.059
Accommodating	-.426	.002**
Assimilating	.082	.299
Diverging	.262	.043*
Converging	.163	.145

* $p < .05$, ** $p < .01$, *** $p < .001$

Five different models were produced from hierarchical regression. Collinearity statistics were also examined. The inflation factor (VIF) were not more than 10 (range 3.557 to 1.0) and the tolerance was more than .10 (range 1.0 to .281). Therefore, multicollinearity was not a problem. The hierarchical multiple regression results presented in Table 4-20 indicated each of the five different models had significant F values, testing for the significance of R^2, which is the significant model as a whole. Model 5 (F = 2.808, p = .030) with five explanatory variables containing AE, Accommodating, AC-CE, AC, and Diverging, produced the highest R^2 (.270) compared with the other models. Model 5 was selected as most significant model to explain course satisfaction in the multimedia hybrid group.

Table 4-20

Model Summary of Hierarchical Multiple Regression of Course Satisfaction in Multimedia Hybrid Group (n=44)

Model		*B*	*SE*	*β*	*t*	*p -value*	*F (p)*	R^2	Adjusted R^2
1	(Constant)	6.506	.543		11.983	.000			
	AE	-.059	.016	-.493	-3.675	.001			
							13.506 (.001)	.243	.225
2	(Constant)	6.142	.672		9.145	.000			
	AE	-.045	.022	-.379	-2.070	.045			
	Accommodating	-.268	.290	-.169	-.924	.361			
							7.156 (.002)	.259	.223
3	(Constant)	6.148	.712		8.637	.000			
	AE	-.045	.023	-.380	-1.983	.054			
	Accommodating	-.270	.298	-.170	-.905	.371			
	AC_CE	.000	.012	-.005	-.029	.977	4.655 (.007)	.259	.203
4	(Constant)	6.143	1.271		4.835	.000			
	AE	-.045	.024	-.380	-1.863	.070			
	Accommodating	-.270	.303	-.170	-.892	.378			
	AC_CE	.000	.019	-.005	-.022	.983			
	AC	.000	.030	.001	.005	.996			
							3.404 (.018)	.259	.183
5	(Constant)	5.886	1.322		4.452	.000			
	AE	-.045	.024	-.382	-1.862	.070			
	Accommodating	-.046	.424	-.029	-.108	.915			
	AC_CE	.005	.020	.070	.261	.796			
	AC	.003	.030	.030	.113	.911			
	Diverging	.261	.345	.169	.757	.453			
							2.808 (.030)	.270	.174

Hypothesis $_{1a}$ was partially supported in Model 5 as a significant explanatory model of course satisfaction in the hybrid group. AE (inverse relationship), Accommodating (inverse relationship), AC-CE (positive relationship), AC (positive relationship), and Diverging (positive relationship) provided a significant explanatory

model to explain course satisfaction in the multimedia hybrid group, explaining a range of 17.4% to 27.0% of the variation in course satisfaction for the hybrid group. The inverse relationship means the lower the AE, the higher the course satisfaction. *Age, PCE, CE, RO, AC-CE, Assimilating,* and *Converging* were not correlated with course satisfaction and thus not entered into the regression model. The best explanatory model found was:

Course Satisfaction = 5.886 (constant) -.382 (AE) - .029 (Accommodating) + .073(AC-CE) +- .030 (AC) + .169 (Diverging) + e

H_{1b}. Student background characteristics, learning orientations, learning preferences, and learning style classifications are significant explanatory variables of course satisfaction in students participating in traditional face-to-face course delivery of art appreciation courses.

The same statistical methodology performed in H_{1a} was used to answer the H_{1b}. Eta correlation analysis, Pearson *r* correlation, and hierarchical multiple regression were used to examine the explanatory relationship between explanatory and dependent variable of course satisfaction in traditional face-to-face group.

Table 4-21

Eta Correlation Test of Course Satisfaction in Traditional Group (n=27)

Categorical Variable	Eta (η)	Eta Squared (η^2)	*F*	Sig. (*p*)
Gender	.163	.027	.682	.417
Major	.631	.398	2.775	.045*
Learning Style Classification	.374	.140	1.244	.317

* $p < .05$

Table 4-21 presented results of Eta correlation analyses that pointed out only the categorical variable of major was a significant explanatory variable (p = .045). The variable of major was recoded as a dummy variable before being entered into a Pearson r correlation test. In Table 4-22, the results of Pearson r correlation demonstrated that major variables of Hospitality (r = -.413, p = .016) and Education (r = -.330, p = .046) were two significant variables that correlated with course satisfaction in students participating in traditional face-to-face art appreciation course delivery.

Table 4-22

Pearson r Correlation Analysis of Course Satisfaction in Traditional Group (n=27)

Variables	Correlation *r*	Sig. (*p*)
Age	.052	.399
Arts & Sciences	.268	.088
International Communication	.295	.067
Education	-.330	.046*
Business	-.106	.300
Hospitality	-.413	.016*
Undecided	.135	.251
PCE	-.051	.401
CE	-.281	.077
RO	.235	.119
AC	-.115	.283
AE	.019	.463
AE-RO	-.163	.209
AC-CE	.171	.197

* $p < .05$, ** $p < .01$, *** $p < .001$

Based on the results shown in Table 4-22, the significant variables of *Hospitality* and *Education* were entered into hierarchical multiple regression model in the order of most significant to least significant.

Table 4-23

Model Summary of Hierarchical Multiple Regression of Course Satisfaction in Traditional Group (n=27)

Model		***B***	***SE***	***β***	***t***	***p -value***	***F (p)***	***R^2***	**Adjusted *R^2***
1	(Constant)	4.063	.156		25.993	.000			
	Hospitality	-1.063	.469	-.413	-2.266	.032			
							5.135 (.032)	.170	.137
2	(Constant)	4.159	.152		27.369	.000			
	Hospitality	-1.159	.439	-.450	-2.642	.014			
	Education	-1.159	.526	-.375	-2.202	.038			
							5.387 (.012)	.310	.252

Two different models produced from hierarchical multiple regression. collinearity statistics were also observed. The variance inflation factor (VIF) ranged from 1.01 to 1.0 and the tolerance ranged from 1.0 to .99. Therefore, multicollinearity was not a problem. The results shown in Table 4-23 demonstrated that both Model 1 and Model 2 had significant F values, testing for the significant of R^2, which is the significance model as a whole. Model 2 (F = 5.387, p = .012) with two explanatory variables containing Hospitality and Education, produced the highest R^2 (.310) and adjusted R^2 (.252) compared with Model 1. Model 2 was selected as most significant model to explain course satisfaction in the traditional group.

Hypothesis $_{1b}$ was partially supported in Model 2 as a significant explanatory model of course satisfaction in traditional group. Hospitality (inverse relationship) and Education (inverse relationship) provided a significant explanatory model to explain course satisfaction in traditional group, explaining a range of 25.2% to 31.0% of the variation in course satisfaction for traditional group. The inverse relationship means the Hospitality and Education major students were more unsatisfied with the traditional art appreciation courses. The best explanatory model found was:

Course Satisfaction = 4.159 (constant) - .450 (Hospitality) - .375 (Education) + e

H_{1c}. The percentage of art appreciation course satisfaction variance explained by student background characteristics, learning orientations, learning preferences, and learning style classifications is greater in multimedia hybrid course delivery than the percentage of variance explained in traditional face-to-face course delivery.

To answer Hypothesis $_{1c}$, the adjusted R^2 of course satisfaction results produced from hierarchical multiple regression analysis in H_{1a} and H_{1b} was compared in Table 4-24. Based on the scores of adjusted R-Square presented in Table 4-24, the percentage of art appreciation student course satisfaction variance explained by student background characteristics, learning orientations, learning preferences, and learning style classifications was greater in the traditional group (adjusted R^2 = .252) than the multimedia hybrid group (adjusted R^2 = .186). Hypothesis $_{1c}$ was not supported.

Table 4-24

Model Summary of Hierarchical Multiple Regression of Course Satisfaction between Groups (n=71)

Group	*R*	R^2	Adjusted R^2	Std. Error of the Estimate	*F*	Sig. (*p*)
Hybrid	.530	.281	.186	.6865	2.808	.030*
Traditional	.557	.310	.252	.7128	5.387	.012*

* $p < .05$

Research Hypothesis 2

Student background characteristics, learning orientations, learning preferences, learning style classifications, and course satisfaction are significant explanatory variables of course grade in students participating in multimedia hybrid and traditional face-to-face art appreciation courses.

H_{2a}. Student background characteristics, learning orientations, learning preferences, learning style classifications, and course satisfaction are significant explanatory variables of course grade in students participating in multimedia hybrid art appreciation course delivery.

In order to answer the Hypothesis $_{2a}$, the same statistical methodology used in H_{1a} was executed. Eta correlation analysis, Pearson *r* correlation, and hierarchical multiple regression were used to estimate the explanatory relationships between explanatory variables and the dependent variable of course grade in the multimedia hybrid section. The results of Eta correlation analysis were presented in Table 4-25. The findings of Eta correlation analysis indicated that only the categorical variable of *gender* ($F = 6.688$, $p = .013$) was significantly correlated to course grade in students participating in the multimedia hybrid art appreciation course delivery.

Table 4-25

Eta Correlations Test of Course Grade in Multimedia Hybrid Group (n=44)

Categorical Variable	Eta (η)	Eta Squared (η^2)	F	Sig. (p)
Gender	.371	.137	6.688	.013*
Major	.359	.129	1.123	.365
Learning Style Classification	.222	.049	.694	.561

* $p < .05$

Before actually running Pearson r correlations, the categorical variable of gender was recorded as a dummy variable to enter into correlation model with other continuous independent variables and the dependent variable of course grade.

Table 4-26

Pearson r Correlation Analysis of Course Grade in Multimedia Hybrid Group (n=44)

Variables	Correlation r	Sig. (p)
Age	.027	.432
Gender	-.371	.007**
CE	-.069	.329
RO	.071	.324
AC	-.278	.034*
AE	.289	.029*
AE-RO	.081	.301
AC-CE	-.127	.205

* $p < .05$, ** $p < .01$, *** $p < .001$

The correlation results were shown in Table 4-26 found that *gender* (r = -.371, p = .007); *AE* (r = .289, p = .029); and *AC* (r = -.278, p = .034) were three significant variables that correlated with course grade for students participating in the multimedia hybrid art appreciation courses. The significant variables of gender, AE, and AC were entered into a multiple regression model in the order of most significant to least significant.

Three different models produced from hierarchical multiple regression. Collinearity statistics were also observed. The variance inflation factor (VIF) ranged from 1.552 to 1.0 and tolerance ranged from 1.0 to .644. Therefore, multicollinearity was not a problem.

Table 4-27

Model Summary of Hierarchical Multiple Regression of Course Grade in Multimedia Hybrid Group (n=44)

Model		***B***	***SE***	***β***	***t***	***p -value***	***F (p)***	R^2	**Adjusted R^2**
1	(Constant)	9.524	.390		24.448	.000			
	Gender	-1.393	.539	-.371	-2.586	.013			
							6.688 (.013)	.137	.117
2	(Constant)	6.616	1.411		4.688	.000			
	Gender	-1.410	.517	-.375	-2.725	.009			
	AE	.087	.041	.294	2.137	.039			
							5.912 (.006)	.224	.186
3	(Constant)	7.157	2.613		2.739	.009			
	Gender	-1.369	.548	-.364	-2.498	.017			
	AE	.080	.050	.271	1.609	.116			
	AC	-.012	.049	-.043	-.248	.806			
							3.871 (.016)	.225	.167

As shown in Table 4-27, each of three separate models had significant *F* values, testing for the significance of R^2, which is the significant model as a whole. With each entry of variables into the model, the R^2 continued to increase in the three models, and the adjusted R^2 of the Model 2 was higher than Model 1 and Model 3. The R^2 increased 0.1% in Model 3 (22.5%), and the adjusted R^2 reduced 9% compared with Model 2. Model 2 was selected as the best explanatory model of course grade in multimedia hybrid group. Model 2 with two explanatory variables including *gender* (inverse relationship)

and *AE* (positive relationship), produced a significant explanatory model of course grade, explaining a range of 18.6% to 22.4% of the variation in course grade of hybrid group. The inverse relationship means females had higher course grades than males. *Age, CE, RO, AE-RO,* and *AC-CE* were not correlated with course grade and therefore not entered into the regression model. Hypothesis $_{2a}$ was partially supported ($F = 5.912$, $p = .006$). The best explanatory model found was:

Course Grade = 9.524 (constant) -.375 (Gender) + .294 (AE) + e

H_{2b}. Student background characteristics, learning orientations, learning preferences, learning style classifications, and course satisfaction are significant explanatory variables of course grade in students participating in traditional face-to-face delivery of art appreciation courses.

To answer Hypothesis $_{2b,}$ Eta correlation analysis was used to examine the explanatory relationships between categorical variables and dependent variable of course grade in the traditional face-to-face group. Table 4-28 presented results of Eta correlation analysis which indicated there was no significant categorical variable. Hence, only continuous variables and the dependent variable of course grade were entered to run the Pearson *r* correlations.

Table 4-28

Eta Correlations Test for Course Grade in Traditional Group (n=27)

Categorical Variable	Eta (η)	Eta Squared (η^2)	*F*	Sig. (*p*)
Gender	.195	.038	.986	.330
Major	.391	.153	.759	.589
Learning Style Classification	.436	.190	1.798	.176

According to the results of Pearson *r* correlation shown in Table 4-29, only age ($r = .431$, $p = .012$) was a significant variable that correlated with course grade for students participating in the traditional face-to-face art appreciation course delivery.

Table 4-29

Pearson r Correlations of Course Grade in Traditional Group (n=27)

Variables	Correlation *r*	Sig. (*p*)
Age	.431	.012*
PCE	.304	.061
CE	.054	.394
RO	.061	.380
AC	.010	.480
AE	-.173	.194
AE-RO	-.149	.229
AC-CE	-.113	.287

* $p < .05$

Based on the results of Pearson *r* correlations shown in Table 4-29, the significant variable of age was entered into multiple regression model. The hierarchical multiple regression result shown in Table 4-30 indicated that Model 1 had significant *F* value, testing for the significant of R^2. Age was a positive explanatory variable of course grade.

Table 4-30

Model Summary of Hierarchical Multiple Regression for Course Grade in Traditional Group (n=27)

Model		*B*	*SE*	*β*	*t*	*p -value*	*F* (*p*)	R^2	Adjusted R^2
1	(Constant)	3.679	1.139		3.229	.003			
	Age	1.132	.474	.431	2.388	.025			
							5.704 (.025)	.186	.153

According to the finding, Hypothesis $_{2b}$ was partially supported (F = 5.704, p = .025); Model 1 (age) was a significant explanatory variable of course grade in the traditional group, explaining a range of 15.3% to 18.6%.

H_{2c}. The percentage of art appreciation course grade variance explained by student background characteristics, learning orientations, learning preferences, learning style classifications, and course satisfaction is greater in multimedia hybrid delivery than the percentage of variance explained in traditional delivery.

In Table 4-31, the results of multiple regression analysis of course grade in both groups were presented. The adjusted R-Square as predictor of the percentage to explain the variance of course grade between two groups was provided. The results indicated that the percentage to explain the variance of course grade was higher in the multimedia hybrid section (adjusted R^2 = .167) than the traditional section (adjusted R^2 = .153). As the result, the variance of course grade was explained better in the hybrid section than in the traditional section. Hypothesis $_{2c}$ was supported.

Table 4-31

Model Summary of Hierarchical Multiple Regression of Course Grade between Groups (n=71)

Group	*R*	R^2	Adjusted R^2	Std. Error of the Estimate	*F*	*Sig. (p)*
Hybrid	474	.225	.167	1.734	3.871	.016*
Traditional	.431	.186	.153	2.656	5.704	.025*

* $p < .05$

Research Hypothesis 3

Student background characteristics, learning orientations, learning preferences, learning style classifications, course satisfaction, and course grade are significant explanatory variables of art appreciation learning gains in multimedia hybrid and traditional face-to-face art appreciation courses.

$H_{3a.}$ Student background characteristics, learning orientations, learning preferences, learning style classifications, course satisfaction, and course grade are significant explanatory variables of art appreciation learning gains in students participating in multimedia hybrid art appreciation course delivery.

In order to answer Hypothesis $_{3a}$, Eta correlation analysis, Pearson *r* correlations, and hierarchical multiple regression were used to analysis the explanatory relationship between explanatory variables and the dependent variable of learning gains in the multimedia hybrid courses. The results of Eta correlation analysis were presented in Table 4-32, and indicated there was no categorical variable shown as a significant explanatory variable of learning gains in students participating in the multimedia hybrid art appreciation courses.

Table 4-32

Eta Correlation Test of Art Appreciation Learning Gains in Multimedia Hybrid Group (n=44)

Categorical Variable	Eta (η)	Eta Squared (η^2)	*F*	Sig. (*p*)
Gender	.088	.008	.329	.569
Major	.316	.100	.843	.528
Learning Style Classification	.329	.108	1.616	.201

Based on the Eta correlation results, only continuous independent variables and the dependent variable of learning gains were needed to enter into Pearson *r* correlations model. The correlation result shown in Table 4-33, indicated CE (r = -.348, p = .010) was the only significant explanatory variable of learning gains for students participating in multimedia hybrid art appreciation course.

Table 4-33

Pearson r Correlation Analysis of Learning Gains in Multimedia Hybrid Group (n=44)

Variables	Correlation *r*	Sig. (*p*)
Age	.024	.439
Prior Computer Experience	-.009	.477
CE	-.348	.010*
RO	.231	.066
AC	-.071	.324
AE	.127	.205
AE-RO	-.102	.254
AC-CE	.062	.345

* $p < .05$

The hierarchical multiple regression results presented in Table 4-34 demonstrated the Model 1 had significant F value, testing for the significant of R^2. Model 1 (F = 5.795, p = .021) with the explanatory variable of CE showed a significant explanatory variable of learning gains of the multimedia hybrid group, with a range of 10.0% to 12.1%. Hypothesis $_{3a}$ was partially supported (F = 5.795, p = .021).

Table 4-34

Model Summary of Hierarchical Multiple Regression of Learning Gains in Multimedia Hybrid Group (n=44)

Model		*B*	*SE*	*β*	*t*	*p -value*	*F (p)*	R^2	Adjusted R^2
1	(Constant)	5.537	1.992		2.780	.008			
	CE	-.169	.070	-.348	-2.407	.021			
							5.795 (.021)	.121	.100

$H_{3b.}$ Student background characteristics, learning orientations, learning preferences, learning style classifications, course satisfaction, and course grade are significant explanatory variables of art appreciation learning gains in students participating in multimedia hybrid delivery of art appreciation courses.

To answer Hypothesis $_{3b,}$ Eta correlation analysis was used to examine the explanatory relationships between categorical independent variables and dependent variable of learning gains in the traditional face-to-face group. Table 4-35 displayed results of Eta correlation analysis which indicated only one categorical variable of learning style classifications showed significance.

Table 4-35

Eta Correlation Test of Art Appreciation Learning Gains in Traditional Group (n=27)

Categorical Variable	Eta (η)	Eta Squared (η^2)	*F*	Sig. (*p*)
Gender	.131	.017	.434	.516
Major	.310	.096	.446	.811
Learning Style Classifications	.575	.331	3.794	.024*

* $p < .05$

Before actually running Pearson *r* correlations, the categorical variable of learning style classifications was recorded as a dummy variable and then entered into a Pearson *r* correlation model with other continuous independent variables and the dependent variable of learning gains.

Table 4-36

Pearson r Correlation Analysis of Art Appreciation Learning Gains in Traditional Group (n=27)

Variables	Correlation *r*	Sig. (*p*)
Age	.285	.198
PCE	.039	.424
CE	.189	.172
RO	-.342	.040*
AC	-.061	.381
AE	.357	.034*
AE-RO	.468	.007**
AC-CE	-.182	.181
Accommodating	.484	.005**
Assimilating	-.035	.432
Diverging	-.221	.133
Converging	-.349	.037*

* $p < .05$, ** $p < .01$

According to the results of Pearson *r* correlation shown in Table 4-36, *Accommodating* ($r = 484$, $p = .005$); *AE-RO* ($r = 468$, $p = .007$); *AE* ($r = 357$, $p = .034$); *Converging* ($r = -.349$, $p = .037$); and *RO* ($r = -.342$, $p = .040$) were five significant variables of learning gains for students participating in the traditional face-to-face art appreciation courses. In addition, based on the results of Pearson *r* correlation, the

significant variables of Accommodating, AE-RO, AE, Converging, and RO were entered into hierarchical multiple regression in the order of most significant to least significant.

The results of hierarchical multiple regression models presented in Table 4-37 showed five different models were provided. Collinearity statistics were also examined. Each of the five difference models had significant F values, testing for the significant R^2. The variance inflation factor (VIF) of Model 1 to Model 4 ranged from 1 to 1.228, and the tolerance of Model 1 to Model 4 ranged from 1 to .295. Although, for the Model 5, the VIF of AE-RO, AE, and RO was higher than 10 and the tolerance of AE-RO, AE, and RO was lower than .10, Model 5 was not a significant model in this study. Consequently, Model 4 ($F = 4.538$, $p = .008$) with four variables containing Accommodating, AE-RO, AE, and Converging were selected as best explanatory model of learning gains in the traditional group.

Table 4-37

Model Summary of Hierarchical Multiple Regression of Art Appreciation Learning Gains in Traditional Group (n=27)

Model		*B*	*SE*	*β*	*t*	*p -value*	*F (p)*	R^2	Adjusted R^2
1	(Constant)	-2.239	.572		-3.915	.001	7.664 (.010)	.235	.204
	Accommodating	4.114	1.486	.484	2.768	.010			
2	(Constant)	-1.996	.616		-3.242	.003			
	Accommodating	2.617	2.056	.308	1.273	.215	4.401 (.024)	.268	.207
	AE-RO	.095	.090	.255	1.052	.303			
3	(Constant)	-2.954	4.666		-.633	.533			
	Accommodating	2.615	2.098	.308	1.246	.225	2.831 (.061)	.270	.174
	AE-RO	.081	.113	.218	.718	.480			
	AE	.031	.152	.052	.207	.838			
4	(Constant)	-1.825	4.154		-.439	.665			
	Accommodating	.662	1.994	.078	.332	.743			
	AE-RO	.191	.108	.515	1.771	.090	4.536 (.008)	.452	.352
	AE	.014	.135	.023	.103	.919			
	Converging	-7.559	2.795	-.473	-2.705	.013			
5	(Constant)	-4.431	4.517		-.981	.338			
	Accommodating	1.106	1.986	.130	.557	.584			
	AE-RO	2.793	1.938	7.510	1.441	.164	4.123 (.009)	.495	.375
	AE	-2.557	1.917	-4.235	-1.334	.196			
	Converging	-7.092	2.767	-.444	-2.563	.018			
	RO	2.647	1.969	5.043	1.345	.193			

According to these findings, Hypothesis $_{3b}$ was partially supported ($F = 4.538$, $p = .008$): Accommodating, Converging, AE-RO, and AE were significant variables of learning gains in the traditional group, explaining a range of 35.2% to 45.2% of the variation in learning gains in the traditional group. The four variables were positive

explanatory variables of learning gains of traditional group. The best explanatory model found was:

Learning Gains = -1.825 (constant) + .078 (Accommodating) + .515 (AE-RO) + .023 (AE) - .473 (Converging) + e

H_{3c}. The percentage of art appreciation learning gains variance explained by student background characteristics, learning orientations, learning preferences, learning style classifications, course satisfaction, and course grade is greater in multimedia hybrid delivery than the percentage of variance explained in traditional delivery.

According to the results of multiple regressions analyses, the adjusted R-Square of the two groups were compared in Table 4-38. The percentage of variance to explain the dependent variable of learning gains by student background characteristics, learning orientations, learning preferences, learning style classifications, course satisfaction, and course grade was greater in the traditional group (adjusted $R^2 = .352$) than the multimedia hybrid group (adjusted $R^2 = .100$), Hypothesis $_{3c}$ was not supported.

Table 4-38

Model Summary of Hierarchical Multiple Regressions Analysis for Learning Gains between Groups (n=71)

Group	*R*	R^2	Adjusted R^2	Std. Error of the Estimate	*F*	Sig. (*p*)
Hybrid	.348	.121	.100	2.5136	5.795	.021*
Traditional	.704	.495	.375	2.4303	4.123	.009**

* $p < .05$, ** $p < .01$

Summary of Results

Table 4-39 presents the results of each hypothesis in the study to indicate whether or not each hypothesis received support, and a comment regarding that support or lack of support. In Chapter V, the significance of the hypotheses that are supported was discussed.

Table 4-39

Summary of Hypotheses and Extent Supported

HYPOTHESIS	SUPPORTED	COMMENT
H_{1a}. Student background characteristics, learning orientations, learning preferences, learning style classifications are significant explanatory variables of course satisfaction in students participating in multimedia hybrid art appreciation course delivery	Partially	Model 5 ($F = 2.808$, $p = .030$) with five explanatory variables containing AE (inverse relationship), Accommodating (inverse relationship), AC-CE (positive relationship), AC (positive relationship), and Diverging (positive relationship) provided a significant explanatory model to explain course satisfaction in hybrid group, explaining a range of 17.4% to 27.0% of the variation in course satisfaction for hybrid group.
H_{1b}. Student background characteristics, learning orientations, learning preferences, and learning style classifications are significant explanatory variables of course satisfaction in students participating in traditional face-to-face course delivery of art appreciation courses.	Partially	Model 2 ($F = 5.387$, $p = .012$) with two explanatory variables containing Hospitality and Education provided a significant explanatory model to explain course satisfaction in traditional group, explaining a range of 25.2% to 31.0% of the variation in course satisfaction for traditional group.

Table 4-39 (Continued)

HYPOTHESIS	SUPPORTED	COMMENT
H_{1c}. The percentage of art appreciation course satisfaction variance explained by student background characteristics, learning orientations, learning preferences, and learning style classifications is greater in multimedia hybrid course delivery than the percentage of variance explained in traditional face-to-face course delivery.	NO	The percentage of variances explained by independent variables was greater in traditional group (adjusted R^2=.252) than hybrid group (adjusted R^2=.186).
H_{2a}. Student background characteristics, learning orientations, learning preferences, learning style classifications, and course satisfaction are significant explanatory variables of course grade in students participating in multimedia hybrid art appreciation course delivery.	Partially	Model 2 with two explanatory variables including *gender* (inverse relationship) and *AE* (positive relationship), produced a significant explanatory model of course grade, explaining a range of 18.6% to 22.4% of the variation in course grade of hybrid group.
H_{2b}. Student background characteristics, learning orientations, learning preferences, learning style classifications, and course satisfaction are significant explanatory variables of course grade in students participating in face-to-face delivery of art appreciation courses.	Partially	Model 1 (age) was a significant explanatory variable of course grade in traditional group, explaining a range of 15.3% to 18.6%
H_{2c}. The percentage of art appreciation course grade variance explained by student background characteristics, learning orientations, learning preferences, learning style classifications, and course satisfaction is greater in multimedia hybrid delivery than the percentage of variance explained in traditional delivery.	YES	The percentage to explain the variance of course grade by independent variables was higher in hybrid section (adjusted R^2 = .167) than traditional section (adjusted R^2 = .153).

Table 4-39 (Continued)

HYPOTHESIS	SUPPORTED	COMMENT
H_{3a}. Student background characteristics, learning orientations, learning preferences, learning style classifications, course satisfaction, and course grade are significant explanatory variables of art appreciation learning gains in students participating in multimedia hybrid art appreciation course delivery.	Partially	Model 1 ($F = 5.795, p = .021$) with the explanatory variable of CE showed a significant explanatory variable of learning gains of hybrid group, with a range of 10.0% to 12.1%.
H_{3b} Student background characteristics, learning orientations, learning preferences, learning style classifications, course satisfaction, and course grade are significant explanatory variables of art appreciation learning gains in students participating in traditional face-to-face delivery of art appreciation courses.	Partially	Model 4 ($F = 4.538, p = .008$) with four variables containing Accommodating, AE-RO, AE, and Converging were significant variables of learning gains in traditional group, explaining a range of 35.2% to 45.2% of the variation in learning gains in traditional group.
H_{3c}. The percentage of art appreciation learning gains variance explained by student background characteristics, learning orientations, learning preferences, learning style classifications, course satisfaction, and course grade is greater in multimedia hybrid delivery than the percentage of variance explained in traditional delivery.	NO	The percentage of variance to explain the dependent variable of course grade was greater in traditional group (adjusted $R^2 = .352$) than hybrid group (adjusted $R^2 = .100$).

In Chapter V, a discussion of the findings which included interpretations, limitations, practical implications, conclusions, and recommendation for future study about the relationships among learning styles, course delivery formats, and learning outcomes in higher education art appreciation courses was presented.

CHAPTER V

DISCUSSION

Summary

Several studies have been examined that compared the effectiveness between course delivery formats in specific areas. However, no study was found to compare the differences of effectiveness between teaching formats in Art Appreciation courses. This study was the first to examine and compare the relationships among student background characteristics, learning styles, and learning outcomes in art appreciation courses between course delivery formats.

The specific purpose of this explanatory (correlational) and prospective (comparative) research design was conducted (a) to describe art appreciation courses in terms of student background demographics, learning styles, course satisfaction, course grade, and learning gains; (b) to compare the differences of learning outcomes (course satisfaction, course grade, and learning gains) between multimedia hybrid and traditional face-to-face teaching methodologies; and (c) to explore the influences of student background characteristics, learning orientations, learning preferences, learning style classifications on course satisfaction, course grade, and learning gains in art appreciation courses. A total of two research questions and three hypotheses with nine sub-hypotheses were developed and tested.

In this study, student course satisfaction was measured by a two global-item course satisfaction instrument, created by the researcher. Kolb's learning style inventory (KLSI) was employed to assess students' learning orientations, learning preferences, and learning style classifications. In addition, a pre-test and post-test research design by

using the Aesthetic Experience Assessment (AEA) to investigate student learning gains was performed in this research. Furthermore, student course grades were provided by the two instructors at the end of the semester. A total of 129 subjects participated. However, at the end of the term, only 71 valid respondents, including 44 students enrolled in multimedia hybrid courses and 27 students enrolled in traditional face-to-face courses, were received. Chapter V begins with an interpretation of the statistically significant findings, followed by practical implications, conclusions, limitations, as well as recommendations for future study.

Interpretations

Based on data analysis in Chapter IV, in this study, the findings were used to compare with current literature and to explain all variables in this section. Results from this study supported and contradicted findings of past research.

Student Background Characteristics

First of the all, based on the data collected in the *Student Background Characteristics*, findings showed no significant differences existed between student enrolled in multimedia hybrid or traditional face-to-face art appreciation courses. However, the findings displayed that (a) the majority group of respondents was male; (b) the largest age group was 18 years old ($M = 2.06$, $SD = .984$) with an age range from 18 to 22 years of age, the average of age was 19.06 years old; (c) the majority major groups was business and management; and (d) most of respondents had not taken any web-based or online courses before spring semester 2007. Moreover, the results of this study indicated no significant differences on gender ($p = .973$), and a significant difference between the two groups was found on major ($p < .05$).

Learning Orientations (LO), Learning Preferences (LP), and Learning Style Classifications (LSC)

Based on the results presented in Chapter IV, the respondents' learning orientations, learning preferences, and learning style classifications were discussed in this section. For students enrolled in multimedia hybrid courses, the majority group of LO, LP, and LSC were AE, Concreteness, and Diverging style, respectively. In contrast, RO, Abstractness, and Diverging were the largest groups of LO, LP, and LSC for student enrolled in traditional face-to-face courses, respectively. For the whole group, the majority groups of LO, LP, and LSC were RO, Concreteness, and Diverging, respectively. The findings revealed that LO, LP, and LSC were unequally distributed in both multimedia hybrid and traditional face-to-face sections. These results were inconsistent with the previous meta-analytic study conducted by Loo (2002).

According to the findings by Loo (2002) and Moore et al. (2004), AC learning mode was the most common learning style of student taking business courses. The results of this study did not support the findings of Loo (2002) and Moore et al. (2004). In addition, the finding of this study revealed that Diverging learning mode was the most common learning style. This finding also did not support the results found in Loo's (2002) study, which indicated higher proportions of Assimilating style. The differences of subjects' major maybe the influent factor to product the inconsistent results between the researches by Loo (2002) and this study. Additionally, Kolb and Kolb (2005) stressed that the learning style of humanities, social sciences, and the arts prefer the Diverging learning style. In this study, students with Diverging style earned higher scores in

learning gains (pre-test and post-test) which supported the assumption of Kolb and Kolb (2005).

Course Satisfaction

In this study, course satisfaction was analyzed by a two global-item course satisfaction instrument, to determine whether students' perceptions of the quality of the course and teaching effectiveness. This instrument was developed by the researcher. Numerous previous studies reported that respondents had positive ratings of course satisfaction in both traditional and web-based groups (Johnson et al., 2000; Thirunarayanan & Perez-Prado, 2001; Young et al., 2003).

Nevertheless, course satisfaction found no significant difference for overall course quality ratings between groups (Johnson et al., 2000). The findings of this study found that respondents enrolled in both traditional face-to-face (M = 3.94, SD = .824) and multimedia hybrid (M = 4.55, SD = .761) groups were positively rating of course satisfaction, which was supported by current literature (Johnson's et al., 2000; Thirunarayanan & Perez-Prado, 2001; Young et al., 2003).

Furthermore, a previous study conducted by Rivera (2002) supported the findings in which no significant differences were found on course satisfaction for students within the web-based courses when compared with traditional face-to-face courses. However, the finding of this study reported student course satisfaction was higher in the multimedia hybrid group than the traditional group, which contrasted with current literature (Johnson et al., 2000; Rivera (2002), Thirunarayanan & Perez-Prado, 2001; Young et al., 2003).

Course Grade

In this study, course grades were received from the two instructors in the end of the term. Based on the findings of previous researches conducted by Gregory (2003), Hallock et al. (2003), Hong et al. (2003), Johnson et al. (2000), Peterson and Bond (2004), and Young et al. (2003), no significant differences of students' learning outcomes were found when comparing traditional face-to-face and web-based groups. However, the results produced by this study revealed that significant difference ($F = 9.795$, $p = .003$) was found between two groups on students' course grade, which was higher in the multimedia hybrid group ($M = 8.80$, $SD = 1.90$) than in the traditional group ($M = 6.11$, $SD = 2.89$). Findings of this study did not support the current literature.

Art Appreciation Learning Gains

The AEA was a three-essay question survey used to examine student art appreciation learning gains in this study. No study was found to compare student learning gains between multimedia hybrid and traditional face-to-face groups in art appreciation courses. In this study, student learning gains between the two groups appeared significantly different ($F = 12.746$, $p = .001$) which was higher in the multimedia hybrid group ($M = .830$, $SD = 2.65$) than the traditional group ($M = -1.63$, $SD = 3.075$).

Hypotheses Testing

For explanatory purposes, three research hypotheses with six of nine sub-hypotheses were tested by applying the statistic methodologies of Eta test, Pearson r correlation, and hierarchical multiple regression to explain the relationships among independent and attribute variables on dependent variables for two groups. Additionally,

for comparison purposes, the regression results were used to compare the percentage of the variances which were explained by independent and attribute variables for the other three sub-hypotheses.

Course Satisfaction Explained by Student Background Characteristics, Learning Orientations, Learning Preferences, and Learning Style Classifications in Multimedia Hybrid and Traditional Face-to-Face Courses

This section explored the explanatory power by independent and attribute variables on the variance of course satisfaction for the two groups. First of all, based on the findings of Hypothesis $_{1a,}$ Model 5 (F = 2.808, p = .030) was selected as the most significant model to explain course satisfaction in the hybrid group, with five explanatory variables containing AE, Accommodating, AC-CE, AC, and Diverging, produced the highest R^2 (.270) compared with the other models. Hypothesis $_{1a}$ was partially supported in Model 5 as a significant explanatory model to explain course satisfaction in the multimedia hybrid group, explaining a range of 17.4% to 27.0% of the variation in course satisfaction for the multimedia hybrid group.

Second, the results of Hypothesis $_{1b}$ showed that the Model 2 (F = 5.387, p = .012) with two explanatory variables containing Hospitality and Education, produced the highest R^2 (.310) and adjusted R^2 (.252) compared with Model 1. Model 2 was selected as the most significant model to explain course satisfaction in the traditional group. Hypothesis $_{1b}$ was partially supported in the Model 2 as a significant explanatory model of course satisfaction in the traditional group, explaining a range of 25.2% to 31.0%.

Finally, the explanatory power between the two groups was compared by adjusted R^2 (H_{1a} vs. H_{1b}) in H_{1c}; the result indicated the percentage of explanatory power for course satisfaction variance explained by independent variables was greater in the traditional group (adjusted R^2 = .252) than the multimedia hybrid group (adjusted R^2 = .186).

Course Grade Explained by Student Background Characteristics, Learning Orientations, Learning Preferences, Learning Style Classifications, and Course Satisfaction in Multimedia Hybrid and Traditional Face-to-Face Courses

The explanatory power of independent and attribute variables as well as course satisfaction on course grade variance was provided. First, according to the result of Hypothesis $_{2a}$, Model 2 was selected as the best explanatory model of course grade in the multimedia hybrid group. The Model 2 with two explanatory variables including *gender* (inverse relationship) and *AE* (positive relationship), produced a significant explanatory model of course grade in the multimedia hybrid group, explaining a range of 18.6% to 22.4% of the variation in course grade of the hybrid group. Hypothesis $_{2a}$ was partially supported ($F = 5.912, p = .006$).

Second, the result of Hypothesis $_{2b}$ showed that Model 1 (age) was a significant explanatory variable of course grade in the traditional group, explaining a range of 15.3% to 18.6%. Hypothesis $_{2b}$ was partially supported ($F = 5.704, p = .025$).

Finally, the explanatory power between the two groups was compared by adjusted R^2 (H_{2a} vs. H_{2b}) in Hypothesis $_{2c}$. The percentage to explain the variance of course grade

by independent variables was higher in the multimedia hybrid section (adjusted $R^2 = .167$) than the traditional section (adjusted $R^2 = .153$).

Art Appreciation Learning Gains Explained by Student Background Characteristics, Learning Styles, and Course Grade in Multimedia Hybrid and Traditional Face-to-Face Courses

Based on the results shown in Hypothesis $_{3a}$, Model 1 ($F = 5.795$, $p = .021$) with the explanatory variable of CE, showed a significant explanatory variable of learning gains of the multimedia hybrid group, with a range of 10.0% to 12.1%. Hypothesis $_{3a}$ was partially supported ($F = 5.795$, $p = .021$).

Furthermore, the result of Hypothesis $_{3b}$ demonstrated that Model 4 ($F = 4.538$, $p = .008$) with four variables containing Accommodating, AE-RO, AE, and Converging was selected as the best explanatory model of learning gains of the traditional group, explaining a range of 35.2% to 45.2% of the variation in learning gains in the traditional group. In consequence, the percentage of variance to explain the dependent variable of learning gains by student background characteristics, learning orientations, learning preferences, learning style classifications, course satisfaction, and course grade was greater in the traditional group (adjusted $R^2 = .352$) than the multimedia hybrid group (adjusted $R^2 = .100$), Hypothesis $_{3c}$ was not supported.

Practical Implications

1. Based on the differences of student learning outcomes, to provide students their preferred learning environment may facilitate learning and increase course satisfaction and learning performance.

2. To understand students' learning style may facilitate instructors to manage their classes more effectively.
3. To enhance the usage of instructional technologies to facilitate instructors' teaching, and further improve teaching effectiveness.
4. The results of this study may facilitate instructional innovation in higher education art appreciation courses.

Conclusions

1. Student course satisfaction and learning outcomes may be influenced by different course delivery formats offered in art appreciation courses.
2. Student background characteristics were not significantly different between the two groups.
3. Student learning orientations and learning preferences were not significantly different between the groups. However, students' learning style classifications appeared significant between the groups.
4. Students with a specific learning style as a mediating factor may have an effect on learning efficiency of the courses. For instance, student with a Diverging learning mode may favor and perform well in art related courses.
5. Student background characteristics and learning styles were not significant to explain the variances of student course satisfaction and learning outcomes in the art appreciation courses.

6. The scores of post-test AEA were lower, which may be due to participants spending less time in answering questions compared with the pretest, and the post test did not count toward grading. .

Limitations

This study seems to be the only research to explore the influences of student background and learning styles on student learning outcomes between two course delivery formats in art appreciation courses. Moreover, this study on course satisfaction, course grade, and art appreciation learning gains between students enrolled in two different course delivery approaches of art appreciation courses was conducted at a private university in the U. S. However, since the similar researches were not found in literature, and no art related instrument was created or discussed in scholar literature to assess learning outcomes for art appreciation courses, several limitations were appeared in this study, and are stated below:

1. Due to data collection being limited to one private university in South Florida, technology exposure was limited and the results may not be generalized to other populations.
2. A relatively small sample size of this study limits findings being generalized to the target population.
3. Although the textbook and the course evaluate criteria were the same for both groups, one instructor taught multimedia and one instructor taught traditional. Thus, instructor characteristics may have influenced the findings.

4. Due to low reliability of KLSI, and poor construct validity, findings of this study may not be robust.

5. It was a limitation has the AEA not counted toward the student final grade.

Recommendations for Future Study

In this section, several recommendations are provided for future study based on the findings of this study:

1. Further examine the differences of student learning outcomes between traditional and web-based art appreciation courses using a larger population, across universities and counties is needed.
2. This study should be replicated to different level of institutions, such as high school, by using larger samples and across semesters.
3. To include the factors of the characteristics of the institutions and participants; i.e., length of stay in the U.S. and the capability of writing in English, is needed.
4. Future studies should have the same instructor teaching both course delivery methods.
5. Future studies should have the AEA test be part of the final course grade so that students are motivated to put forth their best effort.
6. Continue to develop a reliable instrument to evaluate student learning gains for art appreciation is necessary.
7. Employ useful instructional technologies in art appreciation courses for future study, may increase student course satisfaction and learning outcomes, furthermore to facilitate students' learning.
8. Multiple mediated regression analysis could be used with learning styles as the mediating variable between course delivery and learning outcomes.

9. All variables using in this study could be examined with structural equations modeling.

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Appendix A

Authorization for Informed Consent

Lynn University

THIS DOCUMENT SHALL ONLY BE USED TO PROVIDE AUTHORIZATION FOR VOLUNTARY CONSENT

PROJECT TITLE: ***Relationships Between Learning Styles, Hybrid, and Face-to-Face Teaching on Learning Outcomes in Higher Education Art Appreciation Courses***

Project IRB Number: _____ Lynn University 3601 N. Military Trail Boca Raton, Florida 33431 2006-049

I Ching-Chuan (Thomas) Chan, am a doctoral student at Lynn University. I am studying Global Leadership, with a specialization in education. One of my degree requirements is to conduct a research study.

DIRECTIONS FOR THE PARTICIPANT:

You are being asked to participate in my research study. Please read this carefully. This form provides you with information about the study. The Principal Investigator Ching-Chuan (Thomas) Chan will answer all of your questions. Ask questions about anything you don't understand before deciding whether or not to participate. You are free to ask questions at any time before, during, or after your participation in this study. Your participation is entirely voluntary and you can refuse to participate without penalty or loss of benefits to which you are otherwise entitled. You acknowledge that you are at least 18 years of age, and that you do not have medical problems or language or educational barriers that precludes understanding of explanations contained in this authorization for voluntary consent.

PURPOSE OF THIS RESEARCH STUDY: The study is about the influence of course delivery formats on learning styles and learning outcomes in art appreciation courses. There will be approximately 150 number of people invited to participate in this study. All participants are enrolled in art appreciation courses in the spring semester 2007 at a private University in south Florida.

PROCEDURES:

If you agree to participate in this study, you will be asked to complete the following:

1. Initial Survey --- Week one-1st session (30 minutes) and Week one-2nd session (10 minutes)
2. Follow-Up Survey --- Week 15-1st session (30 minutes)

The initial survey will be conducted during week one of the course; you will first complete a Demographic Profile Survey. Then you will be asked to complete an Aesthetic Experience Assessment (AEA). These two surveys should take about 30 minutes to complete. During the second session of week one, you will be asked to complete a Learning Style Inventory (KLSI 3.1). The inventory should take about 10 minutes to complete.

The follow-up survey will be conducted during week 15; you will complete the same AEA again. In addition, you will be asked to complete a Course Satisfaction survey. These two surveys should take about 30 minutes to complete.

You should place the survey in the box left in the room after completing.

POSSIBLE RISKS OR DISCOMFORT: This study involves minimal risk. You may find that some of the questions are sensitive in nature. In addition, participation in this study requires a minimal amount of your time and effort. You might experience anxiety during the survey process. The researcher will do everything possible to minimize any discomfort. There is no impact on your course grade if you choose not to participate.

POSSIBLE BENEFITS: There may be no direct benefit to you in participating in this research. But knowledge may be gained which may facilitate instructional innovation in the field of art appreciation education.

FINANCIAL CONSIDERATIONS: There is no financial compensation for your participation in this research. There are no costs to you as a result of your participation in this study.

ANONYMITY

Surveys will be anonymous. You will not be identified and data will be reported as "group" responses. Participation in this survey is voluntary and return of the completed survey will constitute your informed consent to participate.

Every effort will be made to maintain anonymity. Your identity in this study will be treated as confidential. During the beginning of the course, you will be given a code number. Data will be coded with that code number.

The results of this study may be published in a dissertation, scientific journals or presented at professional meetings. In addition, your individual privacy will be maintained in all publications or presentations resulting from this study.

All the data gathered during this study, which were previously described, will be kept strictly confidential by the researcher. Data will be stored in locked files and destroyed at the end of the research. All information will be held in strict confidence and will not be disclosed unless required by law or regulation.

RIGHT TO WITHDRAW: You are free to choose whether or not to participate in this study. There will be no penalty or loss of benefits to which you are otherwise entitled if you choose not to participate. If you decide not to participate, there is no impact on your course grade.

CONTACTS FOR QUESTIONS/ACCESS TO CONSENT FORM: Any further questions you have about this study or your participation in it, either now or any time in the future, will be answered by Ching-Chuan (Thomas) Chan who may be reached at: [redacted] or [redacted], and Dr. Andreas, faculty advisor who may be reached at: [redacted] or [redacted] For any questions regarding your rights as a research subject, you may call Dr. Farazmand, Chair of the Lynn University Institutional Review Board for the Protection of Human Subjects, at [redacted] If any problems arise as a result of your participation in this study, please call the Principal Investigator (Ching-Chuan Chan) and the faculty advisor (Dr. Andreas) immediately.
A copy of this consent form will be given to you.

Lynn University
3601 North Military Trail
Boca Raton, Florida 33431-5598

INVESTIGATOR'S AFFIDAVIT:

I hereby certify that a written explanation of the nature of the above project has been provided to the person participating in this project. A copy of the written documentation provided is attached hereto. By the person's consent to voluntary participate in this study, the person has represented that he/she is at least 18 years of age, and that he/she does not have a medical problem or language or educational barrier that precludes his/her understanding of my explanation. Therefore, I hereby certify that to the best of my knowledge the person participating in this project understands clearly the nature, demands, benefits, and risks involved in his/her participation.

[redacted]

Signature of Investigator

Date of IRB Approval: 12/14/06 7.7.

LYNN UNIVERSITY
Valid
one year
from date of
approval

Lynn University
3601 North Military Trail
Boca Raton, Florida 33431-5598

Appendix B

Permission Letter from Lynn University

Ching-Chuan Chan
[redacted]

11/10/06

Dr. Cynthia Patterson
Dean of College of Arts and Sciences
Lynn University
3601 N. Military Trail
Boca Raton, FL 33431

Dear Dr. Cynthia Patterson:

My name is Ching-Chuan Chan [redacted] I am a doctoral candidate in a Ph.D. program at Lynn University. My major is Global Leadership, with a specialization in education. The topic of my dissertation proposal is *Effects of Hybrid and Traditional Face-to-Face Teaching on Learning Styles and Learning Outcomes in Higher Education Art Appreciation Courses*. My research is bridging theoretical and empirical gaps about web based instruction and learning styles, specifically in art appreciation courses. My dissertation Advisor is Dr. Cynthia Andrea, a full time Art Appreciation faculty at Lynn University. I am writing to request permission to conduct my research in spring semester 2007 at Lynn University. The multimedia hybrid sections (HUM 101 A, B, & ZA) are taught by Dr. Andreas, and the traditional face-to-face sections (HUM 101 C & D) are taught by Dr. Kauffman, with an estimated 150 students.

Purpose

This is an explanatory (correlational) as well as comparative (exploratory) study to examine the relationships between student characteristics, learning preference, style, orientation, student satisfaction, course grade, and art appreciation learning gains, in students that participate in either a hybrid or traditional face-to-face art appreciation course.

Data Collection

There are two periods of data collection. At the beginning of the term (the first period of data collection) is the Initial Survey and Art Appreciation Pre-Test and at the end of the term (second period of data collection) is the Follow-Up Survey, Course Grade Report, and Art Appreciation Post-Test.

Initial Survey and Pre-Test

The Initial Survey for this study has three parts, which are completed by students at the beginning of the term.

- Part One, Background Characteristics, developed by researcher, measures demographic variables of age, gender, major and prior computer experience.
- Part Two, Pre-Test Art Appreciation *The Aesthetic Experience Assessment*, developed by Anderson, Cerbin, Choy, DuBois, and Grill (1997), and further modified by researcher.
- Part Three: *Learning Orientations, Learning Preferences, and Learning Styles* will be measured by the *Leaning Style Inventory (KLSI 3.1)*, developed by Kolb (1971), and further revised by Kolb and Kolb (2005).

Follow-Up Survey, Post-Test, and Grade Report

- Part One, Student Satisfaction will be measured by two global items of student satisfaction (overall quality of instruction & course) on the University's *Instructor and Course Evaluation System* (ICES) modified by the University of Illinois at Urbana-Champaign and further revised by the researcher.
- Part Two: Follow-up Post-Test Art Appreciation (then compare pre and post tests for Art Appreciation Learning Gains).
- Part Three: Course Grade Report will provide by the instructors in the end of the term.

Sample

In this study, the target population will be (traditional-aged) day undergraduate students who are enrolled art appreciation courses during the 2006-2007 academic year, at Lynn University. There will be a total of 150 students (across levels -- freshman, sophomores, juniors, & seniors) enrolled in spring semester 2007. The accessible population in this study will be limited to traditional day undergraduate students who are enrolled in either multimedia hybrid or traditional face-to-face art

appreciation courses in spring semester 2007 at Lynn University. The multimedia hybrid sections (HUM 101 A, B, & ZA) are taught by Dr. Andreas, and the traditional face-to-face sections (HUM 101 C & D) are taught by Dr. Kauffman.

Anonymity of Students

In order to maintain the anonymity of students from the researcher (Ching-Chuan Chan), each student will be provided a code number by the course faculty. This code number will be placed on all assessments or the two periods of data collection. The course grade likewise will be by code number and anonymous to the researcher. The entire methodology will be submitted to Lynn University IRB for approval.

I would greatly appreciate your consent to my request. If you require any additional information, please do not hesitate to contact me. I can be reached at the above postal mail [redacted] My dissertation Chair is Dr. Cynthia Andreas, who may be reached at: [redacted] and [redacted]

A duplicate copy of this request has been provided for your records. If you agree with the terms as described above, please sign the release form below and send one copy with the self-addressed return envelope I have provided.

Sincerely,

Ching-Chuan Chan

Permission is granted to conduct your study at Lynn University following approval by Lynn University's Institutional Review Board, with Art Appreciation students enrolled in HUM 101 Spring, 2007

[redacted]

Date: 11/13/06

Appendix C

Survey Instruments

Initial Survey, Part 1: The Demographic Profile and Pre-test of Art Appreciation Learning Gains

I. Demographic Profile

INSTRUCTIONS: Please choose the category or fill in the blind for each question that best describes you.

1. Your gander: □ Male □ Female

2. Your age: _____

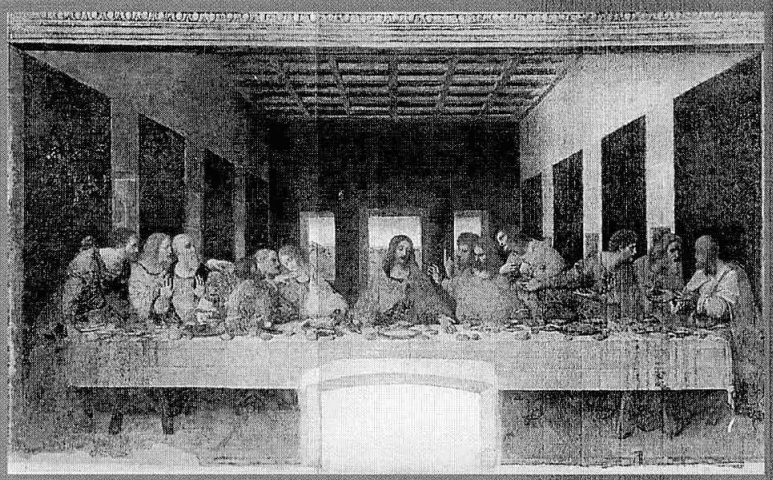
3. Your major: _____

4. Prior Computer experience: _____

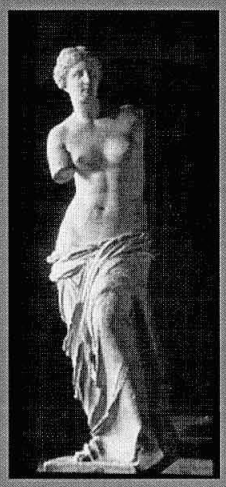
II. Art Appreciation Learning Gains

INSTRUCTIONS: Please review the artists' artworks carefully, then to explain how each artist use formal elements of design, style, content, and subject to create the art work respectively.

1) Explain how da Vinci used formal elements of design, style, content and subject matter to create this religious painting.



2) Explain how a Hellenistic artist used formal elements of design, style, content and subject matter to create this classical sculpture.



3) Explain how Picasso used formal elements of design, style, content and subject matter to create this image of pain and destruction.

Initial Survey, Part 2: Learning Orientations, Learning Preferences, and Learning Style Classifications

Follow-Up Survey: Part 1, Course Satisfaction

Directions: The following statement relate to your perceptions of the course format. Please circle your choice to each statement.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

1.	I was satisfied with the quality of this course.	1	2	3	4	5
2.	I was satisfied with the teaching quality in this course.	1	2	3	4	5

Appendix D

Permission to Use Learning Style Inventory (KLSI 3.1)

From: [redacted] Sent: Mon 9/11/2006 9:19 AM

To: Ching-Chuan Chan

Cc:

Subject: LSI Research Approval

Attachments: MCB 200C.PDF(62KB) Mcb200d.pdf(1MB)

Congratulations! Your research request regarding use of the Learning Style Inventory (LSI) has been approved. Attached you will find two documents (.pdf files--Adobe Acrobat 4.05):

* LSItest.pdf - This is a copy of the LSI test. You may print or copy this document as needed for your research.

* LSIprofile.pdf - The profile sheet contains the answer key for the test as well as the profiling graphs for plotting scores. This document may also be reproduced as necessary for your research. The AC-CE score on the Learning Style Type Grid is obtained by subtracting the CE score from the AC score. Similarly, the AE-RO score = AE minus RO.

These files are for data collection only. This permission does not extend to including a copy of these files in your research paper. It should be sufficient to source it.

We wish you luck with your project and look forward to hearing about your results. Please email a copy of your completed research paper to [redacted] or mail it to the following address:

LSI Research Contracts
c/o Abby Geller
HayGroup
116 Huntington Avenue, 4th floor
Boston, MA 02116

If you have any further questions, please let me know.

Regards,
Abby Geller
Hay Resources Direct(See attached file: MCB 200C.PDF)(See attached file: Mcb200d.pdf)

Appendix E

Permission to Use the Aesthetic Experience Assessment

From: Cerbin William J [redacted] Sent: Mon 9/11/2006 4:35 PM

To: Ching-Chuan Chan

Cc:

Subject: RE: [Marked as Spam] From: Ching-Chuan (Thomas) Chan

Attachments:

Dear Chan,

I signed and mailed the permission form to use the requested materials related to Art Assessment. No purchase is necessary. The entire report including appendices is online at

http://www.uwlax.edu/provost/assessment/A_GEart.htm

Best regards,

Bill Cerbin

9/10/06

Ching-Chuan Chan
[redacted]

Dear Dr. Cerbin:

My name is Chan, Ching-Chuan. I am a doctoral candidate in a Ph.D. program at Lynn University in Boca Raton, Florida. My major is Global Leadership, with a specialization in education. My dissertation proposal focuses on the effects of Web-based teaching methods, and the topic is *A Comparison of the Effects of Multimedia Hybrid and Face-to-Face Teaching on Learning Styles and Learning Outcomes in Art Appreciation.* I plan to examine these teaching approaches in undergraduate Art Appreciation classes taught at a private college in Florida. A sample of 200 is planned.

While doing my literature search for the dissertation, I read the excellent article by Dr. Anderson, Dr. Cerbin, Dr. Choy, Dr. DuBois and Dr. Grill, "General Education Art Assessment Art: The Aesthetic Experience Assessment", published in 1997.

I am writing to request permission to obtain (and purchase if necessary) the following the materials:

The evaluation rubric for the question # 2 (Appendix B--Art).

I am also requesting permission to reproduce the above scales and related materials in my dissertation. In addition, I am requesting permission to modify the above scales for my research study. Furthermore, ProQuest Information and Learning may supply copies of the dissertation on demand and may make the dissertation accessible in electronic formats.

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I would greatly appreciate your consent to my request. If you require any additional information, please do not hesitate to contact me., I can be reached at the above postal mail address, [redacted]. My dissertation Chair is Dr. Cynthia Andreas, who may be reached at: [redacted] and [redacted].

A duplicate copy of this request has been provided for your records. If you agree with the terms as described above, please sign the release form below and send one copy with the self-addressed return envelope I have provided.

Sincerely,

Ching-Chuan Chan

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EVALUATION RUBRIC QUESTION #2 (APPENDIX B-ART)
REPRODUCTION OF SCALES & RELATED MATERIALS

Agreed to: [redacted]

Name & Title: WILLIAM CERBIN, ASSISTANT TO THE PROVOST

Date: 09-11-06

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