FACTORS INFLUENCING AFRICAN AMERICAN STUDENTS’ ATTITUDE, COMPREHENSION, AND COURSE COMPLETION IN COMPUTERIZED MATHEMATICS COURSES

Marquise Leonette Loving
University of Southern Mississippi

Follow this and additional works at: https://aquila.usm.edu/dissertations

Part of the Curriculum and Instruction Commons, Educational Methods Commons, and the Science and Mathematics Education Commons

Recommended Citation
Loving, Marquise Leonette, "FACTORS INFLUENCING AFRICAN AMERICAN STUDENTS' ATTITUDE, COMPREHENSION, AND COURSE COMPLETION IN COMPUTERIZED MATHEMATICS COURSES" (2007). Dissertations. 1267.
https://aquila.usm.edu/dissertations/1267

This Dissertation is brought to you for free and open access by The Aquila Digital Community. It has been accepted for inclusion in Dissertations by an authorized administrator of The Aquila Digital Community. For more information, please contact Joshua.Cromwell@usm.edu.
FACTORS INFLUENCING AFRICAN AMERICAN STUDENTS' ATTITUDE, COMPREHENSION, AND COURSE COMPLETION IN COMPUTERIZED MATHEMATICS COURSES

by

Marquise Leonette Loving

A Dissertation
Submitted to the Graduate Studies Office of The University of Southern Mississippi in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy

Approved:

August 2007
FACTORS INFLUENCING AFRICAN AMERICAN STUDENTS' ATTITUDE,
COMPREHENSION, AND COURSE COMPLETION IN
COMPUTERIZED MATHEMATICS COURSES

by

Marquise Leonette Loving

Abstract of a Dissertation
Submitted to the Graduate Studies Office
of The University of Southern Mississippi
in Partial Fulfillment of the Requirements
for the Degree of Doctor of Philosophy

August 2007
ABSTRACT

FACTORS INFLUENCING AFRICAN AMERICAN STUDENTS' ATTITUDE, COMPREHENSION, AND COURSE COMPLETION IN COMPUTERIZED MATHEMATICS COURSES

by Marquise Leonette Loving

August 2007

This study is an exploration of the affects of two levels of computer-assisted instruction on the attitudes, comprehension, and persistence to course completion for students enrolled in three developmental mathematics courses at a community college. Research indicates that African-American students’ attitudes toward mathematics are consistently low which inhibits comprehension of objectives and success in academic pursuits. The application of two extremes of computerized instruction is the independent variable for the analyses of variance in attitude, comprehension, and course completion. The research supports the conclusion that there exists a significant difference between comprehension levels for the two cohorts of students.

A regression analysis was conducted to assess whether attitudes toward mathematics and level of computerized instruction would predict comprehension of subject matter. Results indicate that the linear combination of predictors is significant.
ACKNOWLEDGEMENTS

I thank my professors, my colleagues, my family, and my friends for their invaluable support and understanding. I am greatly indebted to each of you for your assistance along this journey.

A special thanks to Dr. Wanda Maulding, chairperson of my dissertation committee and my mentor, for your unwavering support, patience, and advice. Thanks for allowing me the freedom to grow and prosper under your tutelage.

I thank Dr. Kyna Shelley, Dr. Terrell Tisdale, and Dr. Debra Gentry, all of whom served on my dissertation committee. Your guidance, encouragement, counsel, support are greatly appreciated.

I thank Dr. Leroy Levy and Dr. Sue Powell for believing in my abilities and investing in the same. I also thank Dr. Tor Kwembe and Dr. Marie O’Banner-Jackson for encouraging me to pursue my educational goals.

I thank my pastor, Reverend John O. McNeal, Sr. and the Black’s Chapel M. B. Church Family for their love, support, and prayers.

To my mother, Mrs. Frankie S. Loving, thank you for sacrificing so much and agreeing to ride along on this often weary journey! I never would have lasted without your friendship, counsel, and support. You are my jewel, and I love you!

To my dad, Mr. Herbert L. Loving, Sr., thank you for the continuous encouragement to remain diligent. You always knew what to say when situations became more than I could handle. I am eternally grateful for your calm perspective and enduring spirit, I love you!

To my brothers, Herbert Jr., Harold, and Howard, my sister-in-law, Saundra, and my niece Courtney, thank you for agreeing to sacrifice so much of our family time for my educational pursuits. (Harold, we did it!)

To my precious Chloe, you are my inspiration! You have been by my side for the duration, and I thank you for understanding and assisting me in reaching the goal that I set for myself so long ago. Remember, the best is yet to come for us!

Most of all, I thank You, Oh God, for Your omnipotence, omnipresence, and peace of mind... Isaiah 26:3 (Amplified Bible) says, “You will guard him and keep him in perfect and constant peace whose mind is stayed on You, because he commits himself to You, leans on You, and hopes confidently in You.” You are the keeper of my soul!!!
TABLE OF CONTENTS

ABSTRACT ..........................................................................................................................ii
ACKNOWLEDGEMENTS ................................................................................................iii
LIST OF ILLUSTRATIONS ................................................................................................vi
LIST OF TABLES ..............................................................................................................vii

CHAPTER

I. INTRODUCTION ......................................................................................1

Statement of the Problem
Purpose of Study
Specific Purposes
Hypotheses
Delimitations
Assumptions
Definition of Terms
Justification of the Study

II. REVIEW OF LITERATURE ............................................................11

Developmental Mathematics in Higher Education
Attitudes Toward Mathematics
Comprehension and Persistence to Completion
Integration of Computer-Assisted Instruction
Summary

III. METHODOLOGY .....................................................................................31

Participants
Variables
Data Collection
Methods of Analyses

IV. RESULTS .................................................................................................35

Presentation of Descriptive Data
Test of Hypotheses
Summary
V. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS .................................................. 49

Subjects
Procedure
Results
Summary of Major Findings
Discussion
Recommendations for Future Research

APPENDIXES ................................................................................................................. 60

A. HUMAN SUBJECTS REVIEW COMMITTEE LETTER
B. SURVEY INSTRUMENT
C. PERMISSION LETTER FROM COLLEGE ADMINISTRATORS

REFERENCES .................................................................................................................... 66
LIST OF ILLUSTRATIONS

Figure

1. Mathematics Attitudes of Participants in Study ........................................44
2. Final Grade Distribution ............................................................................45
# LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Demographic Information of Participants</td>
<td>37</td>
</tr>
<tr>
<td></td>
<td>(N = 101 unless indicated by *)</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Descriptives for Instrument Items: Self-Confidence</td>
<td>39</td>
</tr>
<tr>
<td>3.</td>
<td>Descriptives for Instrument Items: Value</td>
<td>40</td>
</tr>
<tr>
<td>4.</td>
<td>Descriptives for Instrument Items: Enjoyment</td>
<td>41</td>
</tr>
<tr>
<td>5.</td>
<td>Descriptives for Instrument Items: Motivation</td>
<td>42</td>
</tr>
<tr>
<td>6.</td>
<td>Descriptives for Computer Attitude</td>
<td>42</td>
</tr>
<tr>
<td>7.</td>
<td>Mathematics Attitude Construct</td>
<td>44</td>
</tr>
<tr>
<td>8.</td>
<td>ANOVAs for Mathematics Attitude, Comprehension, and Course Completion</td>
<td>47</td>
</tr>
<tr>
<td>9.</td>
<td>Summary of Simultaneous Linear Regression Analysis for Variables</td>
<td>48</td>
</tr>
<tr>
<td></td>
<td>Predicting Course Completion (n = 101)</td>
<td></td>
</tr>
</tbody>
</table>
CHAPTER I
INTRODUCTION

The use of technology in mathematics education has become widespread over recent decades. Early forms of technological intervention came through video and audio media, calculators, television, and film (Okojie, Olinzock, & Okojie-Boulder, 2006). By exposing students to different technology mediums, instructors have endeavored to broaden their students' awareness of foundational concepts while extensively reinforcing content coverage. Technology alternatives have offered methods that were adaptable to all forms of learning, and mathematics educators have been swift to embrace methods that will allow them to become more effective and increase their students' proficiency in the subject area (Manochehri & Young, 2006).

The introduction of computer use in the classroom offered educators added measures for intervention. The 1980s witnessed the incorporation of over two million microcomputers into United States schools (Cotton, 1991). Resources were presented to mathematics educators which enabled them to introduce concepts, impart instruction, render tutorial services, and increase their students' overall mathematics proficiency via more efficient and innovative strategies. The most commonly used function of computer use in education has been through computer-assisted instruction (CAI) applications which, in their basic form, have specifically assisted educators in distinguishing identifiable sets of learning objectives for their students (Koschmann, 1996). The applications then break down these objectives into tasks and offer a progression of learning activities geared toward mastery of the objectives. Software innovations, such as
learning adaptive, interactive computer programs, and integrated learning systems, are recent improvements to the traditional CAI design.

Koschmann (1996) asserts that there are many forms of CAI, each based on its own pedagogical philosophy. Pedagogy is defined as the art, science, or profession of teaching (Holmes & Abington-Cooper, 2000). Methods of implementation include traditional computer-based problem-solving tutorials, drill-and-practice algorithmically generated programs, and interactive learner-adaptive environments. As explained by Roblyer (1989), significant effects of CAI were found at elementary, secondary, and post-secondary education levels. These effects, however, were contingent on the condition that education practitioners utilize specific applications for specific content areas relative to student use. Wenglinsky (2005) maintains that there are two categories of computer pedagogy. Didactic learning initializes with basic skills training and proceeds to higher order thinking, while constructivist instructional techniques channel learning from abstract concepts and conceptual challenges to concrete knowledge and strategic solutions. Assessment data from the National Association of Educational Progress (NAEP, 1997) presented evidence that students from different demographic groups show substantial differences in their patterns of computer use. All students performed better when computers were used in a constructivist methodology, but grade level variation influenced the effect of computer use on didactic methods of instruction.

Research literature supports the use of CAI as an instructional supplement to traditional, teacher-based instruction. According to Cotton (1991), instruction is the coordination of arranging a stimulus, demanding a response, receiving feedback, offering positive reinforcement, and repeating the cycle for incorrect responses or introducing a
new cycle when correct responses are propounded. Cotton further elaborates that the use of CAI as an enhancement tool to standard instructional techniques generates higher achievement than standard instruction alone. Effective computer-based education should have several capabilities which include the initiation of powerful instructional interactions, close observation of learner progress, the development of effective teachers, accommodation for learner differences, and the promotion of cooperative learning. Maier, Barnett, Warren, and Brunner (1998) state that the educational community is broadening the scope of computer use to entail more than traditional instructional supplements. Recent innovations in mathematics software allow for computers to be the sole delivery medium and instructional format for teaching and learning. Willett (2001) believes that the two main benefits for such dramatic instructional modifications in higher education are to increase access to underserved populations and to enhance learning outcomes. For academic programs to remain viable, educators must continue to be intuitive and implement modules that will offer students enhanced learning opportunities, whether complementing or replacing traditional instruction.

As a result of computerized adaptations to traditional instruction, researchers hasten to explore student attitudes toward mathematics after exposure to such technological modifications (Kramarski & Mizrachi, 2006). Attitude is defined as a learned predilection or response to an object, circumstance, or situation (Yushua, 2006). Students with positive attitudes toward mathematics have a tendency to perform better in the subject, and students with negative attitudes toward mathematics have tendencies to perform below average. Yushua further explains that there is a strong correlation between mathematics achievement and students' attitudes toward the subject. The instructional
innovations arising via CAI should be geared toward making mathematics attractive to underperforming students, increasing their awareness of the challenges involved, and cultivating interest in subject matter.

Like Yushua, Rech (1994) contends that there is a distinct association between students' attitudes toward mathematics and subsequent performance in mathematics pursuits. Specifically, Rech reports that African American students’ negative attitudes toward mathematics persist from elementary school through college and that, as a cultural group, African Americans do not perform well in mathematics. As a result, African American students are ushered into careers with little or no demand for mathematical application and are traditionally the most underrepresented ethnic group in science-related fields of study. Contributing factors may include the inability to see the usefulness of mathematics in life, the failure to receive positive career counseling in fields that require mathematics, and lack of success in previous mathematics endeavors. As a result, Johnson (1997) concluded that the failure to nurture the skills of so many students will result in poor state and national economic health and the inadequate use of human potential. Attempts to address the curricular shortfalls of mathematics programs in higher education have given rise to developmental, or skill-building, mathematics courses. These courses are specifically designed to re-teach and review basic competencies in preparation for courses on the college level or expanded career opportunities (Boylan, 1995a).

When discussing the future use of computer technology in developmental education, Nickerson and Zodhiates (1988) allude to the impact of the earlier technology expressed simply as “pen and paper” and the mass literacy that ensued from its
adaptation. Education has long been the main source of seeking intellectual enrichment through advanced learning opportunities. CAI has proven to be an amplifier of substantial proportions and expands the degree to which many mathematically-related educational tasks can be performed. The transformational potential of CAI is also phenomenal in that it has the flexibility to allow for instructional processes to be rendered in altogether different formats while addressing the individual learning styles and needs of the student populace. It is the aim of this discourse to explore the impact of two types of CAI on the attitudes, comprehension, and persistence to course completion of African American students in developmental mathematics courses.

Statement of the Problem

African American students have consistently been found to demonstrate low rates of mathematics literacy (Moses & Cobb Jr., 2001; Rech, 1994; USDE, 2003). With recent technological innovations designated specifically for math-learning, exploration should focus on this special population and the short-term and long-term effects of exposure to new forms of instructional media. This investigation will explore the stimulus of two computer-assisted instructional programs on the attitudes toward mathematics, levels of comprehension, and completion rates of African American students in three developmental mathematics courses.

Purpose of the Study

The purpose of this study is to compare the effects on African American students’ attitudes toward mathematics, comprehension, and course completion as impacted by two computer-assisted instructional formats and to explore whether attitude and
comprehension are predictors of completion relative to the format of computer-assisted instruction.

This study will focus on the following questions:

- Is there a statistically significant difference between African American students’ attitudes toward mathematics relative to completion of a course with supplemental or sole computer-assisted instruction?
- Is there a statistically significant difference between the levels of comprehension of African American students exposed to one of the two computer-assisted instructional formats?
- Is there a statistically significant difference between persistence to course completion of African American students enrolled in developmental mathematics courses with supplemental computer-assisted instruction as compared to students enrolled in developmental mathematics courses where computer-assisted instruction is the main instructional delivery system?
- Are attitude and exposure to different levels of computer-assisted instruction significant predictors of African American students’ comprehension in developmental mathematics?

The ultimate goal of the study is to provide data exploring the attitudes and progress of African American students as they complete the mathematics modules respective to their academic programs of study. Such data may offer insight into and provide opportunities to analyze placement procedures, instructional formats, and retention mechanisms currently utilized in higher education and geared toward African American students.
Specific Purposes

The study will compare the effects on African American students’ attitudes toward mathematics, comprehension, and persistence to course completion as impacted by two computer-assisted instructional (CAI) formats. One cohort of students will receive traditional instruction with supplemental computer assistance via tutorial software while another cohort of students will receive computer-assisted instruction as the sole means of instruction. Additional variables to be considered are age, gender, socioeconomic status, computer confidence, and choice of major. The data will be analyzed to explore the effects that the aforementioned computer-assisted instructional formats have on African Americans in their mathematics pursuits.

Hypotheses

The study will focus on the following hypotheses:

\( H_1: \) There is a significant difference between attitudes toward mathematics of African American students enrolled in developmental mathematics courses with supplemental computer-assisted instruction as compared to students enrolled in developmental mathematics courses where computer-assisted instruction is the main instructional delivery system.

\( H_2: \) There is a significant difference between the levels of comprehension of African American students enrolled in developmental mathematics courses with supplemental computer-assisted instruction as compared to students enrolled in developmental mathematics courses where computer-assisted instruction is the main instructional delivery system.
H₃: There is a significant difference between persistence to course completion of African American students enrolled in developmental mathematics courses with supplemental computer-assisted instruction as compared to students enrolled in developmental mathematics courses where computer-assisted instruction is the main instructional delivery system.

H₄: Attitudes toward mathematics and computer-assisted instruction can significantly predict comprehension.

Delimitations

The results of the present study are delimited to a population of students enrolled in three developmental mathematics courses: Basic Mathematics, Elementary Algebra, and Intermediate Algebra. The study will be time restricted to only include the fall semester, five-month frame. All subjects, variables, and conditions not so specified were considered beyond the scope of the study.

Assumptions

The computerized instructional programs will provide unique levels of student interaction as distinguished from traditional instructional programs without any form of computer-assisted instruction. The respondents will provide accurate information on the survey instrument. Final examination grades will be accurate estimates of student enhancement. Semester grades will be an overall representation of student participation and success for the duration of the course.

Definition of Terms

This study will utilize the following terminology:
African American students – students of the Black race

Attitude – a learned predilection or response to an object, circumstance, or situation

Computer-Assisted Instruction – also referred to as CAI; computer serves as primary mode of knowledge delivery

Comprehension – an ability to understand the meaning of something; passing grade relative to subject content and end-of-semester exam

Instruction – the coordination of arranging a stimulus, demanding a response, receiving feedback, and offering reinforcement; the cycle is repeated for incorrect responses; new cycles are introduced when correct responses are given

Pedagogy – the art, science, or profession of teaching

Course completion – receipt of an “A”, “B”, or “C” final grade evaluation demonstrates successful completion; receipt of an “F” demonstrates unsuccessful completion

Traditional Instruction – instructor serves as the primary mode of knowledge delivery

Selected Student Demographics

Age Range – traditional age, 18-21 years old; non-traditional age, 22 years old and older

Choice of Major – career choice

Classification – first or second year of study

Computer Confidence – measure of importance, enjoyment, and anxiety with respect to computer use

Gender – male or female

Race – ethnicity

Socioeconomic Status – anticipated yearly income
Justification of the Study

Research indicates that shortages of African Americans in mathematics and science related professions is due, in part, to student disinterest, curricular shortfalls, and community irrelevance attributed to mathematics on the secondary and postsecondary levels (Moses & Cobb Jr., 2003). As technological innovations continue to offer opportunities for advancement in higher education, research should explore the possibilities of increasing the mathematics potential of African Americans. The goal of this study is to explore the factors associated with African American students’ mathematics attitudes, comprehension, and course completion by considering the impact of computer-assisted instructional programs.
CHAPTER II
REVIEW OF RELATED LITERATURE

Mathematics achievement is contingent on many characteristics credited to the educational process. Reeder, Cassel, Reynolds, and Fleener (2006) contend that successful students in mathematics are exposed to innovative and effective teaching and demonstrate a firm work ethic, excellent study habits, good number sense and problem solving ability, and positive attitudes toward mathematics. Instructional pedagogy in its basic format incorporates a person-to-person ethic indicative of a traditional classroom configuration. A paradigm shift has occurred in higher education in which added emphasis is being placed on students' learning needs and productivity, and less emphasis is being placed on educators' instructional inclinations (Koschmann, 1996). Classrooms have rapidly transitioned into learning communities in which students are encouraged to interact more intimately with each other, the subject matter, and their instructors. The traditional instructor is replacing the lecture-test instructional design with innovative methods of interaction in efforts to promote improved student engagement in the subject area (Rakes, Fields, & Cox, 2006). As the traditional educational format is transformed by increased technology integration, education practitioners are utilizing technology to implement new strategies for increasing their students' success.

Success among special populations, specifically women's and minorities' mathematics pursuits, became topics of academic inquiry in the mid-1970s (Matthews, 1984). Representative literature exists which discusses the educational differences and cognitive abilities of African Americans and students of other races (Borman & Overman, 2004; Chavous, Bernat, Schmeelk-Cone, Caldwell, Kohn-Wood,

...this social-psychological phenomenon is evidence of a form of "learned helplessness," whereupon Black students, debilitated by their poor performance in mathematics, conclude that their failure is the result of low intelligence and subsequently give up trying to succeed in the subject. (p. 346)

Patterns of helplessness severely limit students' educational potential and career opportunities and erode the national science and technological economic and resource base. Sweetland (1996) references the theory of human capital and suggests that there are individual and collective societal benefits that may be derived from investments into the educational potential of a citizenry. Two advantages addressed by Sweetland include the impact of continuing education on quality of life and personal contribution factor.

According to the U. S. Bureau of Labor Statistics (2005), occupations such as management, business, finance, computers, engineering, education, and healthcare proffer annual salaries ranging from $40,000 to $120,000. The minimum qualification for these career choices is an associate or a baccalaureate degree from an accredited post-secondary education institution. For students whose educational pursuits are tapered to a high school education or equivalency degree, occupations for which they qualify entail food preparation, maintenance, and office administrative positions which have annual salaries of $15,000 to $28,000.
Government initiated programs such as the No Child Left Behind Act (NCLB, 2001) have implemented national standards revisions in order to assist educators with fulfillment of the aforementioned arenas. The goals of NCLB have been to close achievement gaps among high and low poverty students and between White students and minorities. These goals have far-reaching ramifications for the future economy in that the national labor force will be strengthened and the United States will continue to be a thriving, globally competitive entity.

In a study conducted by Rech (1994), data indicated that African American students' perceptions of mathematics and its value in society were much lower than White students of the same age group. The study explored the mathematics attitudes and academic achievement of students from three fourth-grade classes with African American student enrollments of 65.5%, 61.5%, and 77%, respectively, and one eighth-grade class with an African American student enrollment of 40%. Beginning as early as 4th grade, students' attitudes toward mathematics directly influence their academic pursuits and contributions. To this end, educators are consistently challenged to cultivate positive mathematics learning experiences and interactions for their students. Vaughan (2002) concurs that mathematics attitude and achievement are directly related. Among students of color, educators must consider learning preferences, values, and cultural characteristics as they coordinate instructional programs geared toward elevating student awareness and appreciation for the subject matter. At the 28th Conference of the International Group for the Psychology of Mathematics Education, Forgasz (2004) expressed concerns as to whether widespread computer use in mathematics classes will positively impact students' attitudes towards mathematics and long-term participation in mathematical studies.
Concerns were also expressed as to the effect of computers on patterns of disadvantage with respect to mathematics learning outcomes.

According to Hembree (1990), mathematics anxiety among students is a prevalent cause for their lack of success and self-confidence. Capable students often avoid the study of mathematics due to awareness of poor past performance, concern about criticism of their task-related efforts, or general dread of mathematics. Statistics from the National Science Foundation (1998) revealed that minority students' declarations of science and engineering majors increased throughout the 1990s, yet these students' actual degree completions were in fields unrelated to the sciences. For instance, in 1995, of the minority freshmen planning to major in science or engineering, over 38% self-reported a need for mathematics remediation. In 1996, 9% of the nation's African American freshmen declared a major in engineering, but only 3% followed through and earned their degree in the field. Experienced educators concur that students' esteem needs must be consistently addressed through positive engagement and interaction. In a study that addressed anxiety levels by course level, Hembree (1990) found that students in remedial mathematics courses exhibited higher anxiety levels than those in advanced courses. The study also revealed that improved mathematics performance significantly relieved students' anxiety issues.

Within-group studies of the African American student population are necessary in order to fully gauge students' analytic and cognitive learning differences (Rech, 1994). While the comparison of African American students' learning styles and outcomes to those belonging to students of other races is a worthwhile research endeavor, the
variations in learning preferences that exist within the African American student population are also worthy of study.

Developmental Mathematics in Higher Education

The process known as developmental education is derived from the concept of remedial education. Remedial education courses were designed specifically to compensate for students' deficiencies in prior reading, writing, and mathematics learning (Boylan, 1995a). The combination of remedial instruction with personal and academic development gave rise to the practice of developmental education. According to Boylan (1995a):

Modern developmental education involves a range of services designed to promote personal and academic development. These services may include counseling; advising; tutoring; topical workshops; individualized instruction; and courses to enhance study skills and strategies, promote critical thinking, or introduce students to the rewards and expectations of college. They may also include pre-college basic skills or remedial courses. (p.2)

The need for developmental education courses is evident in the massive number of institutions that offer them. In 1991, the National Center for Education Statistics (NCES) reported that over 74% of the nation's post-secondary education institutions provided developmental courses (Boylan, 1995b). The same commentary by NCES reported that 30% of all entering freshmen took at least one developmental reading, writing, or mathematics course; this entails approximately 2,209,079 students who participated in developmental education in 1991. In 1995, NCES reported that 41% of
first-time students took at least one remedial course in reading, writing, or mathematics (Education Commission of the States & Center for Community College Policy, 2002). McCabe (2001), however, reported that only half of the academically deficient students who enrolled in developmental courses successfully completed their remediation programs.

With over 30% of the nation's students requiring remedial education courses upon initiation of their higher education career (Boylan, 1999), public and private institutional reports designate two reasons for non-selective status as relates to the student populace (Boylan, 1995a). First, these institutions' mission statements designate that higher education should be accessible to all citizens of their state and region. Second, many of these institutions were created with the specific purpose of providing a highly literate and functional workforce to promote the financial and societal expansion of their state or region. Demographically, students who enroll in and take developmental mathematics courses come from every race and ethnicity, every socioeconomic status, and every age group. These courses address the needs of varied segments of the student population including the traditional freshman who has recently graduated high school, the non-traditional student in need of basic skills review, and the displaced worker in need of obtaining a new skill. Boylan (1999) further states that the future economic security of our nation is dependent upon how institutions and communities receive and recognize the importance of developmental education and its purpose.

There are three main levels of developmental mathematics courses on the post-secondary level: Basic Mathematics, Elementary Algebra, and Intermediate Algebra. One example of the function of developmental mathematics is the intervention into students'
mathematics awareness of counting strategies and number theory (Gersten, Jordan, & Flojo, 2005). Addressing the inadequacies, such as the inability to do fast retrieval of arithmetic combinations, is critical in that students cannot fully comprehend any dialogue about number concepts or problem-solving without immediate recognition of these competencies. Examples of the deficiencies are cases where students use their fingers to count combinations, such as $9 + 6$ or $3 \times 8$; these students are likely to be perplexed or anxious when their instructors assume they can readily recall this information and proceed to explain new concepts and problem-solving techniques based on these processes. Allowing students to enroll in classes for which they are unprepared results in high failure rates and decreased student expectations (McCabe, 2001).

In a research brief prepared by St. Philip’s College, successful completion of developmental courses is the focus of the “Achieving the Dream” (AtD) initiative (Burmeister, 2005). The AtD initiative is a multi-year project which addresses the challenge of providing low income students and students of color with opportunities for academic success. Data from the 2002 and 2003 student cohorts at the community college indicate that greater percentages of minority students attempted developmental mathematics courses as compared to White students but White students outperformed minority students in rates of successful completion. The fall 2002 cohort demonstrated success rates no higher than 58% for any race or ethnicity, and the fall 2003 cohort demonstrated success rates no higher than 51% for any race or ethnicity.

In a statistical analysis report issued by NCES (2003), data show that 71% of degree-granting institutions offered remedial mathematics courses in the fall 2000 semester. These courses were offered by 97% of all public 2-year institutions and 78% of
all public 4-year institutions. The report also indicated that 60% of degree-granting institutions offered at least two courses in remedial mathematics. Between 75% and 82% of institutions required students to enroll in remedial mathematics courses, and over 80% of all institutions placed restrictions on the regular mathematics courses in which students could enroll until completion of their developmental sequence.

Each year, post-secondary education professionals seek new and innovative methods for knowledge distribution via their developmental mathematics courses (Reeder, Cassel, Reynolds, & Fleener, 2006). The technological revolution has increased the distinction between skilled and unskilled labor, and only students who demonstrate a solid mathematics foundation will be able to compete in the higher-paying technical careers. Job requirements have become more stringent, and minorities are struggling to establish their position as a dominant force in the nation’s labor pool (Handel, 2003). Without programs in developmental mathematics which are tailored to the needs of minorities and designed to stimulate learning, many students would not be afforded the opportunity to better themselves and elevate their standing in society (Mendez, 2006). The theory of human capital illustrates the necessity for programs geared toward accomplishing these objectives (Sweetland, 1996).

Attitudes Toward Mathematics

Student perspectives of mathematics have been a topic of much inquiry over the past century in that researchers have significant evidence that positive attitudes yield increased confidence and higher grades in the area (Aiken, 2002). According to Hidi and Harackiewicz (2000), as students get older, interests and attitudes toward mathematics, art and science, and school in general tend to deteriorate. The assessment of student
attitude has been differentiated as a composite of several underlying constructs. In the Attitude Toward Mathematics Inventory (ATMI), an instrument developed to measure attitudes toward mathematics, Tapia (1996) alludes to four factors: self-confidence, value, enjoyment, and motivation, which may be used to capture the core of measuring attitudes toward mathematics. Factor analyses of item scores provided evidence that the instrument reliably measures the four constructs with reliability measures ranging from 0.88 to 0.95. Methodological sufficiency has confirmed these findings in many evaluation studies in higher education throughout the past decade (Chapman, 2003).

**Self-confidence**

Self-confidence is a personal measure of students' concept of their abilities in mathematics. Self-perceptions have been found to strongly influence subsequent performance in any topic area and significantly affect learning in general (Fadali, Velasquez-Bryant, & Robinson, 2004). In fields such as engineering, where a strong mathematics background is crucial to success, questions abound as to whether students are deficient in mathematics or whether their attitudes are inhibiting their contributions to their academic success in the area. A sense of belonging and acceptance by peer groups is an important factor in students' mathematics self-awareness (Wighting, 2006). Equally important to mathematics perceptions were the levels of trust and community that exist between students, teachers, and peers. Turner and Meyer (2004) concur and issue the following summation:

> Classrooms that offer appropriately challenging mathematics should support students' achievement as well as their self-efficacy as learners and their preference for future challenges.
However, classrooms in which challenges overwhelm students cognitively and motivationally also are likely to overpower them emotionally. Such experiences may encourage students to develop mathematics anxiety, to devalue mathematics as a discipline, or to adopt avoidance behaviors, such as self-handicapping or avoiding help when needed. (p. 312) Two central features of a classroom’s culture, influential in learning and motivation, are its learning activities and discourse. Creating a culture in which challenging learning is the norm, mathematical understanding is a goal, and positive dispositions toward mathematics are developed is in itself a challenging task. (p. 313)

Value

Value should measure how students view the relevance of mathematics pursuits with regard to their career aspirations and life choices. Mathematics methods provide logical, rational means to solving problems in society, and mathematical knowledge is available to all who desire to obtain it (Bills & Husbands, 2005). The complexity of mathematics is easily revealed as students pursue higher-level mathematics courses. However, Matthews (1984) affirmed from evaluative studies in higher education that minority students are less likely to identify with the perceived utility of mathematics in their future jobs and fail to understand how mathematics is useful in everyday life, thus, never opt to enroll in or pursue advanced mathematics. The social importance and
usefulness of mathematics to survival is directly associated with the influence, expectations, and attitudes of teachers, peers, and parents (Wilkins & Ma, 2003).

**Enjoyment**

Enjoyment is an attribute that measures students' sense of fulfillment and satisfaction with their mathematics effort (Perin, 2004). Course selection by African American students in higher education reflects a tendency away from mathematics and science courses and a lack of enjoyment in their pursuits. Ultimately, students avoid majors and careers involving advanced courses in mathematics. According to Perin (2004), some institutions do not have the authority to dictate that underprepared students take developmental or remedial mathematics courses because they do not count as graduation credit, and many students who admittedly are in need of remediation will not opt to take these courses. Only students who do not meet entrance requirements are forced to take developmental mathematics courses, which induces a level of discontent and negates the enjoyment factor.

**Motivation**

Motivation is contingent on students' interest in the subject area and subsequent pursuits in mathematics-related professions. Schweinle, Meyer, and Turner (2006) indicated that there are several instructional practices that directly influence student motivation in mathematics pursuits. Feedback and evaluation may serve as useful motivators when used to link success with effort and to offer basic observation about goal progress. This inherently enhances students' self-efficacy, interest, and persistence. Autonomy increases students' independence and allows them to set personal academic goals and make choices relative to their academic pursuits. Schweinle, Meyer, and Turner
(2006) further suggest that there should be a balance between challenge and skill level in order to minimize feelings of anxiety and that mistakes should be treated as mastery experiences to minimize feelings of ineptitude. Instructor use of compassion and insight has been found to be a much better motivator than sarcasm, directives, and threats.

Recent innovations in mathematics technology have been perceived as consistent approaches to increasing student success (Averett, 2005; Ertmer, 2005; Leonard, Davis, & Sidler, 2005; Moskal, Dziuban, Upchurch, Hartman, & Truman, 2006). Exposure to computerized instruction and tutoring has proven to positively influence student perspectives toward and performance in mathematics. As traditional approaches to mathematics instruction are being enhanced and replaced by computerized instructional programs, students' perceptions of mathematics self-confidence, value, enjoyment, and motivation are evolving (Tapia, 1996).

Comprehension and Persistence to Completion

Comprehension is the in-depth ability to understand the nature of mathematics and apply the concepts learned (Ryan & Ryan, 2005). Measuring comprehension entails the constant assessment of students' understanding and content knowledge and is indicated by a passing grade relative to content addressed throughout the semester and on the end-of-semester exam. Wilkins and Ma (2003) define comprehension as a process of change emanating from a person's experiences. They propose that mathematical dispositions about and attitudes toward mathematics are as equally important as acquiring content knowledge and the ability to transfer this knowledge to daily experiences. Students are quantitatively literate if they possess a functional knowledge of mathematics, sufficient mathematics reasoning skills, recognition of mathematics utility,
perspective on the historical contexts of mathematics, and positive dispositions toward mathematics.

Student completion rates are affected by cognitive and social factors. Hidi and Harackiewicz (2000) offer two explanations for substandard academic performance, namely, lack of ability and lack of effort. Students who deem academic work too difficult, challenging, or boring may not have the background necessary to accomplish the assigned tasks. Teachers who set high standards for their students may negatively impact student success if goals and objectives are misunderstood and ambiguous. Not surprisingly, many students simply prefer non-academic tasks and only excel in areas not related to cognitive pursuits.

Studies show that environment plays an important role in a student’s resiliency in mathematics pursuits (Borman & Overman, 2004). Classroom environments should provide structure and protection against obstacles that impede student progress, induce stress and adversity, and place students at greater risk of academic failure. There exists a psychosocial connection between program structure and African American students’ persistence to completion. Borman and Overman (2004) concluded that student persistence is heightened by the need for caring and supportive faculty, a safe and orderly environment, positive expectations, realistic goals, and opportunities for direct student engagement. The coordination of these essentials within the mathematics classroom setting is not immediate but, eventually, will lead to increased student acclimatization and persistence despite cognitive challenges and lengthy mathematics undertakings.

The concept of persistence to completion is also a direct outcome of instructors’ perspectives of their involvement and interaction with students (Patrick, Turner, Meyer,
& Midgley, 2003). Instructors’ tendencies profoundly contribute to mathematics classroom environments and adaptive patterns of engagement; they promote or inhibit how students approach academic tasks, expend their effort in class and outside of class, and use appropriate learning strategies. Supportive instructors express enthusiasm for learning, are respectful, use humor, and voice expectations that all students can and will learn the subject matter. Ambiguous instructors are inconsistent in their support and focus on learning and exercise contradictory forms of management. Non-supportive instructors exercise authoritarian control and emphasize extrinsic reasons for learning, forewarn students that learning will be difficult to impossible, and forewarn that students might cheat or misbehave. Because of the public nature of the mathematics classroom, the idea of failure elicits negative anxieties from students (Turner & Meyer, 2004). Few if any students will be motivated in situations where they believe they have only a 50 percent or less chance of achieving success.

Borman and Overman (2004) conclude that increased engagement in mathematics activities, a stronger sense of efficacy, a more positive outlook toward school, and higher self-confidence directly relate to students’ resilience and determination in mathematics pursuits. Hidi and Harackiewicz (2000) further elaborate that the designation of mastery goals assists in orienting students toward acquiring new skills, more thorough understanding of coursework, and improvement in competency levels. Education practitioners are charged with developing student work ethic with respect to persistence in the face of difficulty or failure as well as heightening student recognition that effort and risk-taking are fundamental aspects of achieving mathematics success. Wilkins and Ma (2003) identify an educational productivity and persistence construct which entails
prior achievement, motivation, age, amount and quality of instruction, home 
environment, instructor and peer influence, and exposure to technology.

Integration of Computer-Assisted Instruction

Computer use in curricular undertakings has increased dramatically over the past 
decade (Eddy & Spaulding, 1996). Student engagement in mathematics pursuits has 
become the focus of educators throughout the nation as they seek to find new ways of 
implementing computerized instruction. The focus is no longer on the computer but has 
shifted to the development of learning environments entailing complex interactions 
(Hopson, 1998). Research reveals that richer and more comprehensive interactions 
between student and subject matter yield increased learning outcomes and performance. 
The effective use of computer technology is apparent when the application shifts from 
teaching to learning with consistently more learning coming under the manipulation of 
the learner. The classroom is no longer a stage for the instructor to actively disseminate 
information and the student to passively assume it. Rather, the classroom experience must 
be an active interaction between student and subject content where students are expected 
to initiate, activate, and perform knowledge. Students have expressed heightened interest 
in mathematics with the increased integration of computer technology (Florence, 2003; 
Nash, Rudman, & Ward, 2002; Thompson, 2004; Wighting, 2006). Students exposed to 
high computer use in class responded more favorably to its use and demonstrated higher 
motivation for learning than students with minimal computer exposure.

Computerized instructional programs which serve as supplemental and primary 
modes of instruction have been made available for the educational community (ALEKS, 
2006; I CAN Learn © Education Systems, 2006; MyMathLab, 2006). Many of them are
internet based and are accessible over the World Wide Web on any suitable computer. Online systems provide individual student assessment and individualized mathematics programs based on student performance on a pre-test or instructor designation of topic coverage. These systems have adaptive assessment engines which are able to determine quickly and precisely what each student knows and develop programs to complement their potential. After years of research and structural change based on mathematics educators' recommendations, software designers uniformly design mathematics software with several essential applications which will explain content coverage, offer review material, offer collaborative assistance, algorithmically generate practice problems, and assess student knowledge throughout the course.

The pedagogically effective use of computers should be geared toward improvement of students' conceptual understanding (Becker, 1998). Student learning should exhibit an improved ability to investigate a problem and research the means to solve the problem. The facilitation of learning for the sake of knowledge enhancement and personal fulfillment are the goals of every instructional program, and computer-assisted instructional programs should motivate students to accomplish the same end. Educators, therefore, are charged with the task of rethinking instructional models in order to provide adequate and resourceful paradigms for the integration of technology into the traditional instructional configuration. Li (2005) contends that meaningful technology integration cultivates higher-order thinking skills. Since technologies may be used to coordinate content knowledge and pedagogy, pros and cons should be explored before implementation. Consideration should always be given as to how traditional instruction and computerized settings complement each other. Becker (1998) stated that curriculum...
improvements must operate in accordance with faculty development strategies and institutional advancement devices in order to receive the full benefit of any type of technological medium.

After examining the differences between computer delivery methods in the instructional course design, Maki and Maki (2003) concluded that the framework of the instructional technology is the true source of more enhanced student interaction and learning. The structure of traditional courses is contingent on the instructor’s ability to balance and coordinate lecture and homework, offer feedback, and render supplemental service. Computerized programs are designed to implement these tasks and increase student engagement simultaneously. Shaffer and Kaput (1999) asserted that computers expand the availability of students’ approaches to generating, collecting, processing, and interpreting information. The mathematical experience is thus more intimately connected with students’ experiences, and mathematical learning is more lively and compelling and correlates directly with real-life functions. Huffaker and Calvert (2003) refer to this as the new science of learning where the education community has recognized the importance of allowing students to take more control of their own learning experiences. They justify their position with the following statement:

...in traditional classroom settings, it can be challenging for teachers to activate the potential of all of their students, particularly if the classroom is overpopulated and has children of varying skill levels. In these situations, the teacher tends to teach to the middle, and the slower children can’t keep up while the faster ones aren’t sufficiently challenged. Self-paced
materials give all children the opportunity to advance at their
own speed, and the teacher can be more aware of each student’s
mastery of the classroom material. (p. 327)

Heid (1997) defined computer technology as attending to students’ cognitive
realms as amplifiers and reorganizers. Many standard software applications have been
integrated into program structure as amplifiers; these amplifiers, such as MyMathLab,
complement traditional curriculum delivery methods by increasing the quantity and scope
of examples with which students come into contact. More recent and advanced programs
have been incorporated via the mathematics reform movement as reorganizers of
conventional instructional delivery; reorganizers, such as I CAN Learn® Math, have
changed the primary character and design of mathematics education by becoming the
absolute method of content delivery. By altering modes of delivery, adjustments must be
made to the definition of the traditional classroom instructor. Teachers will need a new
flexibility and depth of mathematical knowledge (Heid, 1997). They must become highly
flexible improvisers able to multi-task with several students on any topic as compared to
being the independent actor and sole authority in the traditional classroom setting
(Saloman, 1998).

Summary

The reform movement in mathematics education has progressively placed
emphasis on the need to modify the student learning continuum by increased use of
computer technology (Schofield, 1999). Education practitioners have witnessed a shift
from being content providers to being facilitators of student learning (Smith, Ferguson, &
Caris, 2003). Although mathematics success is contingent on many factors, students’
attitudes toward the topic and their belief in their abilities to complete relevant tasks are a major issue of concern for education practitioners. Stevens, Olivarez, Lan, and Tallent-Runnels (2004) express that students who enjoy mathematics work on mathematically-related tasks even when they are not required to do so. They are open to taking a greater number of mathematics courses and consider the pursuit of careers related to mathematics. Turner and Meyer (2004) believed that students who prefer challenge will persist longer, be more interested in the subject, and have higher achievement. The essential components of a mathematics course are defined by the outcomes that all students demonstrate (Ouellett, 2004). Student outcomes should include skills attainment, knowledge accumulation, and attitude adjustments, and they should be evaluated in a non-discriminatory manner. Ouellett further elaborates:

There are four key arenas: what you want students to know (core content, principles, concepts); what you want students to be able to do (academic skills); what you want students to value or appreciate (values or attitudes); and the level of proficiency you will expect students to demonstrate at the completion of this course. (pp. 138-139)

With the incorporation of technology-intensive instructional programs, educators must remain cognizant of the fact that implementation and administration will require more time in class and outside of class on behalf of all involved in the educational process (Heid, 1997). These innovations require additional planning time, and program completion will require increased engagement time. As time progresses, students may lose focus and motivation as the new curriculum routine becomes common.
Technologically rich mathematics classrooms run the risk of losing students’ interest in the subject due to the overwhelming nature of the technological tools at their disposal.
CHAPTER III
METHODOLOGY

The purpose of this study was to compare the attitudes of African American students' toward mathematics, comprehension, and course completion as impacted by two computer-assisted instructional formats and to explore whether attitude and computerized-instruction were predictors of comprehension. This chapter focused on the participants, methods of data collection, and research designs necessary for exploration of these relationships.

Participants

Participants were selected based on their enrollment in Basic Mathematics, Elementary Algebra, and Intermediate Algebra during the fall semester of 2006. Students pre-registered for their classes and had no prior knowledge of which level of computer-assisted instruction (CAI) they would experience. The courses were offered every semester at a prominent community college branch in the southern portion of the United States which serves a predominantly African American student population of varying age and socioeconomic status. The duration of the data collection entailed the fall semester of 2006. There were 26 sections of developmental mathematics courses available for enrollment, and institutional enrollment data displayed a total of 593 registered students. For the 233 students enrolled in Basic Mathematics, there were five sections with completely computerized instruction and four sections with supplemental computerized instruction. For the 206 students enrolled in Elementary Algebra, there were three sections with completely computerized instruction and seven sections with supplemental computerized instruction. For the 154 students enrolled in Intermediate Algebra, there
were two sections with completely computerized instruction and five sections with supplemental computerized instruction.

Variables

There were several factors supported by the research literature as determinants of attitudes toward mathematics. These variables included self-confidence in one’s personal ability to work mathematics problems; value placed on mathematics in career and personal pursuits; enjoyment of engaging in mathematics pursuits; and motivation to pursue mathematics-related problems. The correlation of these four factors was purported by education psychologists as formative elements of mathematics attitudes and was examined in this study. Due to the concentrated computer usage in both groups of learners, a derivative computer confidence variable was included.

Student comprehension was determined by the end-of-semester examination grade. The examination encompassed objectives which were pre-selected by district curriculum specialists for topic coverage throughout the duration of the semester. All students were required to take the exam in order to qualify for a final grade. The exam grade was the sole measure of students’ comprehension for purposes of this research, and comparison was made relative to the level of computerized instruction. Receipt of the final grade was the completion indicator for this study. Successful completion grades were “A,” “B,” and “C.” The grade that indicated non-completion was “F – failure, did not meet requirements for passing, or stopped attending.”

Computerized instructional formats consisted of two forms. The first and most basic form of computer-assisted instruction was rendered via tutorial and homework software from the MyMathLab courseware produced by Pearson Prentice Hall.
Publications as a supplement to their Elementary Algebra and Intermediate Algebra courses. The tutorial component for the Basic Mathematics course was entitled Interact Math and was also courseware created by Pearson Prentice Hall Publications. The second, more comprehensive form of computer-assisted instruction was rendered via I CAN Learn® Mathematics Education Systems from JRL Enterprises.

Supporting variables were age, gender, socioeconomic status, computer confidence and choice of major. Effects on completion were examined relative to these variables. The study explored variables relative to African Americans and their mathematics pursuits, thus, outcomes by other races will be disregarded.

Data Collection

Permission was requested and received from the community college administration to pursue the study. The ATMI (Tapia, 1996), an affective attitude survey (reliability measures ranging from 0.88 to 0.95), was disseminated during the latter portion of the semester to all Basic Mathematics, Elementary Algebra, and Intermediate Algebra students still enrolled in their respective courses. The survey was used as the sole attitude assessment instrument, and factors influencing students’ attitudes toward mathematics were addressed. Comprehension was measured by final examination scores which were submitted by instructors after the last class meeting. Completion was measured by final grade calculations which were also submitted by the instructors.

Permission to proceed with this study was contingent on the premise that all students and personal information were to remain anonymous. All documents and survey instruments relating to this study were destroyed subsequent to data analysis procedures. Identification codes were used only for purposes of matching data with the respective
participant. Findings of the study were shared with the selected institution of higher learning for further perusal and assistance in policy decisions related to the topic.

The survey instrument for the assessment of computer confidence was adapted from the Computer Attitude Questionnaire (CAQ) created by practitioners from the Texas Center for Educational Technology (Knezek & Christensen, 1995). Part I of the original instrument was a measure of computer importance, computer enjoyment, and computer anxiety with factor analyses of item scores yielding reliability measures ranging from 0.82 to 0.84 for the three constructs. The researcher deduced that student perspectives from previous computerized instructional experiences were relevant for this exploration.

Methods of Analyses

The survey data were analyzed using techniques of simple linear regression and analyses of variance. The hypotheses in the study were tested at an alpha (α) level of 0.05. Excel and SPSS version 13.0 for Windows were used for all data entry and data analyses.
CHAPTER IV

RESULTS

The purpose of this research was to study the effects of two levels of computer-assisted instruction on students' attitudes toward mathematics, comprehension, and completion rates and to investigate whether attitudes and comprehension can predict completion. The analyses of the data will be addressed in this chapter. Four hypotheses were tested, and the relative statistical findings follow each. Data are discussed using descriptive statistics including means, standard deviations, frequencies, and percentages. Inferential statistical analyses were performed according to the methods described in chapter 3.

Presentation of Descriptive Data

Participants were retained if they completed the survey instrument, took a final examination at the end of the semester, and received a final grade for the course. These parameters inevitably eliminated many students from participation in the study. Many of the students withdrew from the course or stop attending the course before taking the final exam and receiving a final grade, and many of the students were absent during the administration of the survey or refused to participate in the survey. Original enrollment observations indicated that there were 593 students enrolled in developmental mathematics courses at the institution. There were 233 students enrolled in Basic Mathematics, and these students demonstrated an overall pass rate of 32% (75 of the 233 students received grades of “A”, “B”, or “C”). Of the remaining students in Basic Mathematics, 24% received grades of “F”, 42% withdrew before semester’s end, and 2% received grades of Incomplete. For Elementary Algebra, there were 206 students enrolled
in the course. These students demonstrated an overall pass rate of 29% (60 of the 206 students received grades of “A”, “B”, or “C”). Of the remaining students in Elementary Algebra, 18% received grades of “F” and 53% withdrew from the course. For Intermediate Algebra, there were 154 students enrolled in the course. These students demonstrated an overall pass rate of 40% (61 students received grades of “A”, “B”, or “C”). Of the remaining students in Intermediate Algebra, 19% received grades of “F”, 40% withdrew from the course, and 1% received grades of Incomplete.

Of this population, there were 101 African American students who completed this study. There were 8 students of other ethnicity who were not included in the data analyses due to the scope of the research questions. Seventy participants met the requirements and completed the study from the traditional (TRAD) mathematics courses with supplemental computer instruction. Thirty-one participants met the requirements and completed the study from the mathematics courses with solely computerized instruction (ICL).

Attitudes toward mathematics and computers were measured using a 60-item Likert-scale instrument. The instrument included ten demographic questions to assist the researcher with identifying participant gender, ethnicity, age range, socioeconomic status, classification, previous exposure to computerized instruction, computer ownership, computer skill level, prior enrollment in the course, and choice of major. These data are summarized in Table 1.

The instrument was administered to all students enrolled in Basic Mathematics, Elementary Algebra, and Intermediate Algebra during the first week of December 2006,
Table 1

Demographic Information of Participants (n = 101 unless indicated by *)

<table>
<thead>
<tr>
<th></th>
<th>Lecture Format</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ICL</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>8</td>
</tr>
<tr>
<td>Female</td>
<td>23</td>
</tr>
<tr>
<td><strong>Race</strong></td>
<td></td>
</tr>
<tr>
<td>Black</td>
<td>31</td>
</tr>
<tr>
<td><strong>Age Range</strong></td>
<td></td>
</tr>
<tr>
<td>18-20</td>
<td>7</td>
</tr>
<tr>
<td>21-23</td>
<td>4</td>
</tr>
<tr>
<td>24-26</td>
<td>0</td>
</tr>
<tr>
<td>27-29</td>
<td>3</td>
</tr>
<tr>
<td>30 or older</td>
<td>17</td>
</tr>
<tr>
<td><strong>Annual Income</strong></td>
<td></td>
</tr>
<tr>
<td>$0-$9999</td>
<td>15</td>
</tr>
<tr>
<td>$10000-$14999</td>
<td>9</td>
</tr>
<tr>
<td>$15000-$19999</td>
<td>1</td>
</tr>
<tr>
<td>$20000-$24999</td>
<td>1</td>
</tr>
<tr>
<td>$25000 or more</td>
<td>5</td>
</tr>
<tr>
<td><strong>Classification</strong></td>
<td></td>
</tr>
<tr>
<td>1st Year</td>
<td>25</td>
</tr>
<tr>
<td>2nd Year</td>
<td>4</td>
</tr>
<tr>
<td>Transfer</td>
<td>2</td>
</tr>
<tr>
<td><strong>Prior Course with</strong></td>
<td></td>
</tr>
<tr>
<td>Computer Instruction*</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>14</td>
</tr>
<tr>
<td>No</td>
<td>17</td>
</tr>
<tr>
<td><strong>Own a Computer</strong></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>20</td>
</tr>
<tr>
<td>No</td>
<td>10</td>
</tr>
<tr>
<td><strong>General Computer Skills</strong></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>0</td>
</tr>
<tr>
<td>Low</td>
<td>8</td>
</tr>
<tr>
<td>Average</td>
<td>13</td>
</tr>
<tr>
<td>High</td>
<td>9</td>
</tr>
<tr>
<td>Pro</td>
<td>1</td>
</tr>
<tr>
<td><strong>Taken Course Before</strong></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>5</td>
</tr>
<tr>
<td>No</td>
<td>26</td>
</tr>
<tr>
<td><strong>Choice of Major</strong></td>
<td></td>
</tr>
<tr>
<td>Business</td>
<td>11</td>
</tr>
<tr>
<td>Education</td>
<td>5</td>
</tr>
<tr>
<td>General Studies</td>
<td>1</td>
</tr>
<tr>
<td>Health/Nursing</td>
<td>10</td>
</tr>
<tr>
<td>Technology</td>
<td>0</td>
</tr>
</tbody>
</table>

* Some student(s) did not record a response for this item.
and instructions for completion of the survey were given at that time. The instrument was constructed using a Likert-scale response coding with the following array of options: 1 – strongly disagree; 2 – disagree; 3 – neutral; 4 – agree; and 5 – strongly agree. There was no make-up session for administering the survey to students who were not in attendance; therefore, many students were disqualified from the study due to their failure to comply with this portion of the study. Part I of the instrument, questions 1-40, pertained solely to students’ perceptions of self-confidence in mathematics (overall mean = 3.42 and SD = 0.93), value of mathematics (overall mean = 3.89 and SD = 0.68), enjoyment of mathematics (overall mean = 3.43 and SD = 0.80), and motivation to pursue mathematical endeavors (overall mean = 3.14 and SD 1.06). Table 2, 3, 4, and 5, respectively, contain the means and standard deviations for instrument items factor analyzed to establish the self-confidence, value, enjoyment, and motivation aspects of the mathematics attitude variable. Instrument items in the tables are ordered correspondingly. Several items were reverse coded and are indicated in the resultant tables.

Due to the research focus pertaining to level of computer use, a variable allowing for computer attitudes was incorporated in order to address students’ attitudes toward computers in conjunction with the exploration of mathematics attitudes. Part II of the instrument, questions 41-60, assessed students’ perceptions of the importance of computers in education (overall mean = 3.70 and SD 0.63), enjoyment of computer use (overall mean = 3.66 and SD = 0.51), and anxiety of computer interaction (overall mean = 3.48 and SD = 0.42). The twenty items were separated into the three factors and averaged together to create the variable for computer attitude (overall mean = 3.62 and SD = 0.44). Table 6 contains the means and standard deviations for computer importance,
### Table 2

**Descriptives for Instrument Items: Self-Confidence**

<table>
<thead>
<tr>
<th>Lecture Format</th>
<th>ICL</th>
<th>TRAD</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>9 Mathematics is one of my most dreaded subjects. (reversed)</td>
<td>31</td>
<td>2.68</td>
<td>1.51</td>
</tr>
<tr>
<td>10 My mind goes blank and I am unable to think clearly when working with mathematics. (reversed)</td>
<td>31</td>
<td>3.71</td>
<td>1.10</td>
</tr>
<tr>
<td>11 Studying mathematics makes me feel nervous. (reversed)</td>
<td>31</td>
<td>3.45</td>
<td>1.26</td>
</tr>
<tr>
<td>12 Mathematics makes me feel uncomfortable. (reversed)</td>
<td>31</td>
<td>3.48</td>
<td>1.26</td>
</tr>
<tr>
<td>13 I am always under a terrible strain in a math class. (reversed)</td>
<td>31</td>
<td>3.42</td>
<td>1.12</td>
</tr>
<tr>
<td>14 When I hear the word mathematics, I have a feeling of dislike. (reversed)</td>
<td>31</td>
<td>3.81</td>
<td>1.22</td>
</tr>
<tr>
<td>15 It makes me nervous to even think about having to do a mathematics problem. (reversed)</td>
<td>31</td>
<td>3.77</td>
<td>1.12</td>
</tr>
<tr>
<td>16 Mathematics does not scare me at all.</td>
<td>31</td>
<td>3.13</td>
<td>1.43</td>
</tr>
<tr>
<td>17 I have a lot of self-confidence when it comes to mathematics.</td>
<td>31</td>
<td>3.26</td>
<td>1.32</td>
</tr>
<tr>
<td>18 I am able to solve mathematics problems without too much difficulty.</td>
<td>31</td>
<td>3.06</td>
<td>1.12</td>
</tr>
<tr>
<td>19 I expect to do fairly well in any math class I take.</td>
<td>31</td>
<td>3.65</td>
<td>1.02</td>
</tr>
<tr>
<td>20 I am always confused in my mathematics class. (reversed)</td>
<td>31</td>
<td>3.77</td>
<td>0.96</td>
</tr>
<tr>
<td>21 I feel a sense of insecurity when attempting mathematics. (reversed)</td>
<td>31</td>
<td>3.65</td>
<td>0.99</td>
</tr>
<tr>
<td>22 I learn mathematics easily.</td>
<td>30</td>
<td>3.50</td>
<td>1.17</td>
</tr>
<tr>
<td>23 I am confident that I could learn advanced mathematics.</td>
<td>31</td>
<td>3.65</td>
<td>0.99</td>
</tr>
</tbody>
</table>

*Scale: 1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree*
Table 3

**Descriptives for Instrument Items: Value**

<table>
<thead>
<tr>
<th>Item Description</th>
<th>N</th>
<th>ICL Mean</th>
<th>SD</th>
<th>TRAD Mean</th>
<th>SD</th>
<th>Overall Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Mathematics is a very worthwhile and necessary subject.</td>
<td>31</td>
<td>4.48</td>
<td>0.57</td>
<td>70 4.11</td>
<td>0.99</td>
<td>101 4.23</td>
<td>0.89</td>
</tr>
<tr>
<td>2 I want to develop my mathematical skills.</td>
<td>31</td>
<td>4.39</td>
<td>0.50</td>
<td>70 4.27</td>
<td>0.93</td>
<td>101 4.31</td>
<td>0.82</td>
</tr>
<tr>
<td>4 Mathematics helps develop the mind and teaches a person to think.</td>
<td>31</td>
<td>4.42</td>
<td>0.85</td>
<td>61 4.26</td>
<td>0.85</td>
<td>92 4.32</td>
<td>0.85</td>
</tr>
<tr>
<td>5 Mathematics is important in everyday life.</td>
<td>28</td>
<td>4.25</td>
<td>0.93</td>
<td>60 4.22</td>
<td>0.90</td>
<td>88 4.23</td>
<td>0.91</td>
</tr>
<tr>
<td>6 Mathematics is one of the most important subjects for people to study.</td>
<td>31</td>
<td>3.97</td>
<td>0.75</td>
<td>69 3.97</td>
<td>0.99</td>
<td>100 3.97</td>
<td>0.92</td>
</tr>
<tr>
<td>7 College level math courses would be very helpful no matter what I decide to study.</td>
<td>31</td>
<td>3.68</td>
<td>1.05</td>
<td>70 3.64</td>
<td>1.19</td>
<td>101 3.65</td>
<td>1.14</td>
</tr>
<tr>
<td>8 I can think of many ways that I use math outside of school.</td>
<td>31</td>
<td>3.97</td>
<td>0.80</td>
<td>68 3.85</td>
<td>0.95</td>
<td>99 3.89</td>
<td>0.90</td>
</tr>
<tr>
<td>37 I am comfortable expressing my own ideas on how to look for solutions to a difficult problem in math.</td>
<td>31</td>
<td>3.13</td>
<td>0.89</td>
<td>70 3.29</td>
<td>1.16</td>
<td>101 3.24</td>
<td>1.08</td>
</tr>
<tr>
<td>38 I am comfortable answering questions in math class.</td>
<td>31</td>
<td>3.35</td>
<td>0.99</td>
<td>70 3.40</td>
<td>1.11</td>
<td>101 3.39</td>
<td>1.07</td>
</tr>
<tr>
<td>39 A strong math background could help me in my professional life.</td>
<td>31</td>
<td>4.13</td>
<td>0.92</td>
<td>70 3.77</td>
<td>1.08</td>
<td>101 3.88</td>
<td>1.04</td>
</tr>
</tbody>
</table>

*Scale: 1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree*
Table 4

*Descriptives for Instrument Items: Enjoyment*

<table>
<thead>
<tr>
<th>Item</th>
<th>Lecture Format</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ICL</td>
<td>TRAD</td>
</tr>
<tr>
<td>3 I get a great deal of satisfaction out of solving a mathematics problem.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>31</td>
<td>4.00</td>
</tr>
<tr>
<td>25 Mathematics is dull and boring. (reversed)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>31</td>
<td>4.06</td>
</tr>
<tr>
<td>26 I like to solve new problems in mathematics.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>31</td>
<td>3.65</td>
</tr>
<tr>
<td>27 I would prefer to do an assignment in math than to write an essay.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>31</td>
<td>3.03</td>
</tr>
<tr>
<td>28 I would like to avoid using mathematics in college. (reversed)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>31</td>
<td>3.58</td>
</tr>
<tr>
<td>30 I am happier in a math class than in any other class.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>31</td>
<td>3.03</td>
</tr>
<tr>
<td>31 Mathematics is a very interesting subject.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>31</td>
<td>3.87</td>
</tr>
<tr>
<td>32 I am willing to take more than the required amount of mathematics.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>31</td>
<td>2.94</td>
</tr>
<tr>
<td>36 I believe studying math helps me with problem solving in other areas.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>31</td>
<td>3.52</td>
</tr>
<tr>
<td>40 I believe I am good at solving math problems.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>31</td>
<td>3.39</td>
</tr>
</tbody>
</table>

*Scale: 1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree*
Table 5

**Descriptives for Instrument Items: Motivation**

<table>
<thead>
<tr>
<th>Item Description</th>
<th>ICL N</th>
<th>Mean</th>
<th>SD</th>
<th>TRAD N</th>
<th>Mean</th>
<th>SD</th>
<th>Overall N</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>I have usually enjoyed studying mathematics in school.</td>
<td>31</td>
<td>3.52</td>
<td>1.29</td>
<td>70</td>
<td>3.13</td>
<td>1.27</td>
<td>101</td>
<td>3.25</td>
<td>1.28</td>
</tr>
<tr>
<td>I really like mathematics.</td>
<td>31</td>
<td>3.29</td>
<td>1.44</td>
<td>70</td>
<td>3.23</td>
<td>1.27</td>
<td>101</td>
<td>3.25</td>
<td>1.32</td>
</tr>
<tr>
<td>I plan to take as much mathematics as I can during my education.</td>
<td>31</td>
<td>2.97</td>
<td>1.17</td>
<td>70</td>
<td>2.61</td>
<td>1.29</td>
<td>101</td>
<td>2.72</td>
<td>1.26</td>
</tr>
<tr>
<td>The challenge of math appeals to me.</td>
<td>31</td>
<td>3.26</td>
<td>1.24</td>
<td>70</td>
<td>3.16</td>
<td>1.24</td>
<td>101</td>
<td>3.19</td>
<td>1.23</td>
</tr>
<tr>
<td>I think studying advanced mathematics is useful.</td>
<td>31</td>
<td>3.29</td>
<td>1.22</td>
<td>69</td>
<td>3.17</td>
<td>1.25</td>
<td>100</td>
<td>3.21</td>
<td>1.23</td>
</tr>
</tbody>
</table>

Scale: 1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree

Table 6

**Descriptives for Computer Attitude**

<table>
<thead>
<tr>
<th>Attitude Type</th>
<th>ICL N</th>
<th>Mean</th>
<th>SD</th>
<th>TRAD N</th>
<th>Mean</th>
<th>SD</th>
<th>Overall N</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Importance (Items 43,46,47,48,49,50,51)</td>
<td>31</td>
<td>3.74</td>
<td>0.53</td>
<td>70</td>
<td>3.69</td>
<td>0.68</td>
<td>101</td>
<td>3.70</td>
<td>0.63</td>
</tr>
<tr>
<td>Computer Enjoyment (Items 41,42,44,45,49,52,53,55,58)</td>
<td>31</td>
<td>3.58</td>
<td>0.47</td>
<td>70</td>
<td>3.70</td>
<td>0.53</td>
<td>101</td>
<td>3.66</td>
<td>0.51</td>
</tr>
<tr>
<td>Computer Anxiety (52,53,54,55,56,57,58,59)</td>
<td>31</td>
<td>3.49</td>
<td>0.38</td>
<td>70</td>
<td>3.47</td>
<td>0.44</td>
<td>101</td>
<td>3.48</td>
<td>0.42</td>
</tr>
<tr>
<td>Computer Attitude</td>
<td>31</td>
<td>3.60</td>
<td>0.36</td>
<td>70</td>
<td>3.62</td>
<td>0.47</td>
<td>101</td>
<td>3.62</td>
<td>0.44</td>
</tr>
</tbody>
</table>

Scale: 1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree
computer enjoyment, and computer anxiety as relates to students’ attitudes toward computer use in educational pursuits and for the variable computer attitude.

The measurement of students’ attitudes toward mathematics was computed as the sum of students’ averages for the self-confidence, value, enjoyment, motivation, and computer attitude variables. The mathematics attitude variable was expressed on a scale of 1 to 25. A minimum score of 1 was indicative of low mathematics attitude, and a maximum score of 25 was indicative of high mathematics attitude. Table 7 is a compilation of these data. Students’ mathematics attitude scores and their respective computerized instructional programs are represented in Figure 1.

Successful completion of Basic Mathematics, Elementary Algebra, and Intermediate Algebra was contingent upon qualifying for and participating in the final examination process instituted by the community college district. Each course had a coordinated written comprehensive examination which was proctored by individual instructors during the final class meeting. Qualification to take the final examination was assessed according to homework average, unit examination average or scores, and record of attendance. This virtually guaranteed students’ successful completion of the course. Regardless of computerized instructional format, all students who qualified participated in the written comprehensive examination compiled by the district curriculum committee. The measure of comprehension for this study was the final examination score as reported by the instructor of record. The overall final examination score mean for all participants in the study was 81.65 (SD = 9.93, n = 101). Students enrolled in the ICL courses demonstrated a mean of 84.94 (SD = 8.44, n = 31). Students enrolled in the TRAD courses demonstrated a mean of 80.25 (SD = 10.23, n = 70).
Table 7

*Mathematics Attitude Construct*

<table>
<thead>
<tr>
<th>Construct</th>
<th>N</th>
<th>Mean</th>
<th>Std Dev</th>
<th>Max</th>
<th>Mean</th>
<th>Std Dev</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-confidence</td>
<td>31</td>
<td>3.47</td>
<td>0.88</td>
<td>70</td>
<td>3.38</td>
<td>0.96</td>
<td>101</td>
</tr>
<tr>
<td>Value</td>
<td>31</td>
<td>3.98</td>
<td>0.55</td>
<td>67</td>
<td>3.88</td>
<td>0.74</td>
<td>98</td>
</tr>
<tr>
<td>Enjoyment</td>
<td>31</td>
<td>3.51</td>
<td>0.81</td>
<td>69</td>
<td>3.39</td>
<td>0.81</td>
<td>100</td>
</tr>
<tr>
<td>Motivation</td>
<td>31</td>
<td>3.26</td>
<td>1.14</td>
<td>70</td>
<td>3.07</td>
<td>1.05</td>
<td>101</td>
</tr>
<tr>
<td>Computer Attitude</td>
<td>31</td>
<td>3.60</td>
<td>0.36</td>
<td>70</td>
<td>3.62</td>
<td>0.47</td>
<td>101</td>
</tr>
<tr>
<td>Mathematics Attitude*</td>
<td>31</td>
<td>17.82</td>
<td>3.01</td>
<td>70</td>
<td>17.12</td>
<td>3.42</td>
<td>101</td>
</tr>
</tbody>
</table>

Scale: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree

*Summation of Previous Categories

Figure 1

*Mathematics Attitude Scores*
The measure for successful course completion utilized for this study was the final letter grade assigned by the instructor of record. District policy mandates that a student must score at least C or higher on the comprehensive final examination for the course to qualify to receive a final grade. The fulfillment of this requisite was intended to detect and decrease the number of students who successfully completed the day-to-day assignments for the course but did not retain the materials for transference on the next level of mathematics study. Final grades were tabulated as a compilation of homework grades, quiz grades, unit examination grades, and the final examination grade. The completion rate for the ICL participants was 97%; and the completion rate for the TRAD participants was 93%. Figure 2 is the combined grade distribution for participants in this study from Basic Mathematics, Elementary Algebra, and Intermediate Algebra according to their respective computer-assisted instructional program.

Figure 2

*Final Grade Distribution*
Testing of Hypotheses

Three analyses of variance (ANOVAs) were used to test hypotheses 1-3. The hypotheses were:

$H_1$: There is a significant difference between attitudes toward mathematics of African American students enrolled in developmental mathematics courses with supplemental computer-assisted instruction as compared to students enrolled in developmental mathematics courses where computer-assisted instruction is the main instructional delivery system.

$H_2$: There is a significant difference between the levels of comprehension of African American students enrolled in developmental mathematics courses with supplemental computer-assisted instruction as compared to students enrolled in developmental mathematics courses where computer-assisted instruction is the main instructional delivery system.

$H_3$: There is a significant difference between persistence to course completion of African American students enrolled in developmental mathematics courses with supplemental computer-assisted instruction as compared to students enrolled in developmental mathematics courses where computer-assisted instruction is the main instructional delivery system.

The results of the ANOVAs for hypotheses 1-3 are presented in Table 8. The data show no statistical significance between attitude levels for the two groups of participants using level of computerized instruction as the independent variable and mathematics attitude.
Table 8

ANOVA for Mathematics Attitude, Comprehension, and Course Completion

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>Sum of Squares</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics Attitude</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between Groups</td>
<td>10.42</td>
<td>1</td>
<td>10.42</td>
<td>0.96</td>
<td>0.33</td>
</tr>
<tr>
<td>Within Groups</td>
<td>1077.87</td>
<td>99</td>
<td>10.89</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1088.28</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Comprehension</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between Groups</td>
<td>460.75</td>
<td>1</td>
<td>460.75</td>
<td>4.75*</td>
<td>0.03</td>
</tr>
<tr>
<td>Within Groups</td>
<td>9608.08</td>
<td>99</td>
<td>97.05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>10068.93</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course Completion</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between Groups</td>
<td>0.01</td>
<td>1</td>
<td>0.01</td>
<td>0.01</td>
<td>0.91</td>
</tr>
<tr>
<td>Within Groups</td>
<td>60.35</td>
<td>99</td>
<td>0.61</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>60.36</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p < 0.05  
** p < 0.01

as the dependent variable. The data show a statistically significant difference between comprehension for the two groups of participants, $F(1, 99) = 4.75$, $p < 0.05$, using level of computerized instruction as the independent variable and comprehension as the dependent variable. The data show no statistical significance for completion rates for the two groups of participants using level of computerized instruction as the independent variable and course completion as the dependent variable.

Hypothesis 4 was analyzed using simple linear regression. The hypothesis was:

$H_4$: Attitudes toward mathematics and computer-assisted instruction can significantly predict comprehension.

Evaluations of linearity, normality, homoscedasticity, and multicollinearity showed that the assumptions were met within acceptable limits. Regression results
showed that the linear combination of attitude toward mathematics and level of
computer-assisted instruction in the overall model significantly predict comprehension, $F$
$\left(2, 98\right) = 7.58, p < 0.01, R^2_{adj} = 0.12$. The linear combination of predictors accounts for
12% of the variance in comprehension. Table 9 presents a summary of the regression
coefficients. Based on the Standardized Coefficients, the strongest predictor was
mathematics attitude. Attitude had a positive impact on comprehension, and traditional
instruction had a negative impact on comprehension. Of the predictors, mathematics
attitude was significant in the linear model, however, there was no significance in
mathematics attitude as relates to the computerized instructional formats. The correlation
coefficient between the linear combination in the overall model and comprehension was
0.37.

Table 9

Summary of Simultaneous Linear Regression Analysis for Variables Predicting
Comprehension ($n = 101$)

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE B</th>
<th>$\beta$</th>
<th>$t$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Constant)</td>
<td>68.47</td>
<td>5.39</td>
<td>12.70</td>
<td>0.000</td>
<td></td>
</tr>
<tr>
<td>Math Attitude</td>
<td>0.91</td>
<td>0.29</td>
<td>0.30</td>
<td>3.16</td>
<td>0.002</td>
</tr>
<tr>
<td>Traditional Instruction</td>
<td>-4.00</td>
<td>2.05</td>
<td>-0.19</td>
<td>-1.96</td>
<td>0.053</td>
</tr>
</tbody>
</table>

Summary

The comprehension statistics indicated that the mean for the ICL students (84.94)
was significantly higher than the mean for the TRAD students (80.25). The regression
analysis indicated that the linear combination of predictors was a significant predictor of
comprehension.
CHAPTER V
SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Subjects

The subjects for this study were African American students enrolled in Basic Mathematics, Elementary Algebra, and Intermediate Algebra from a community college in the southern region of the United States. The population consisted of ten classes where students received instruction entirely via the computerized instructional program (ICL) and sixteen classes where students received traditional instruction with a computerized tutorial and homework supplement (TRAD). Students who completed the attitude survey, received a grade on the final examination for the course, and received a final letter grade for the course were retained for purposes of this study. The sample consisted of 101 mathematics students. There were 31 from the ICL group and 70 from the TRAD group to participate in the study.

Procedures

Data collection for this study entailed three different procedures. The attitude analyses were accomplished through the administration of a 60-item Likert-scale instrument. Part I of the instrument addressed the four variables which were analyzed as representative of mathematics attitude. The means and standard deviations for students' self-confidence, value, enjoyment, and motivation were averaged according to the level of computerized instruction and reported in chapter 4. This portion of the instrument was adapted from the Attitude Toward Mathematics Inventory by Martha Tapia (see Appendix B). Part II of the instrument addressed the computer attitude variable which compared students' perceptions of computer importance, enjoyment, and anxiety. This
portion of the instrument was adapted from the Computer Attitude Questionnaire created by practitioners from the Texas Center for Educational Technology. Part III of the instrument included demographic questions to equip the researcher with pertinent information to assist in identifying certain aspects of the population.

The analysis of comprehension was an overall assessment of students’ knowledge via the final examination administered for the courses. All students with qualifying homework, unit examination averages or scores, and attendance data were allowed to take the common examination.

The analysis of course completion was the assignment of the final grade as issued by the instructors of record for the courses. Course implementation and grading were standardized to ensure students’ receipt of the highest quality of excellence in instruction. Final grades were reported as “A,” “B,” “C,” and “F.”

Results

The study tested four hypotheses. Two of the hypotheses were accepted. A summary of these hypotheses follows:

H₁: There is a significant relationship between attitudes toward mathematics of African American students enrolled in developmental mathematics courses with supplemental computer-assisted instruction as compared to students enrolled in developmental mathematics courses where computer-assisted instruction is the main instructional delivery system \((F(1, 99) = 0.96, p = .33)\). Hypothesis 1 was not supported.

H₂: There is a significant relationship between the levels of comprehension of African American students enrolled in developmental mathematics courses with supplemental computer-assisted instruction as compared to students enrolled in developmental
mathematics courses where computer-assisted instruction is the main instructional
delivery system ($F(1, 99) = 4.75, p < .05$). Hypothesis 2 was supported. The
comprehension mean for students enrolled in the ICL courses ($n = 31$, mean = 84.65, SD
= 8.63) was significantly higher than the comprehension mean for students enrolled in the
TRAD courses ($n = 70$, mean = 80.01, SD = 10.34).

H$_3$: There is a significant relationship between persistence to course completion of
African American students enrolled in developmental mathematics courses with
supplemental computer-assisted instruction as compared to students enrolled in
developmental mathematics courses where computer-assisted instruction is the main
instructional delivery system ($F(1, 99) = 0.01, p = .91$). Hypothesis 3 was not supported.

H$_4$: There is a significant relationship between attitudes toward mathematics and
computer-assisted instruction as predictors of comprehension of African American
students in developmental mathematics courses ($F(2, 98) = 7.58, p < .01$). The linear
combination of predictors consisting of attitude toward mathematics and traditional
instruction significantly predicts comprehension. Hypothesis 4 was supported.

Summary of Major Findings

As a result of this research study, two of the hypotheses were supported and two
of the hypotheses were not supported. The following is a summary of these major
findings.

- A significant difference was found between comprehension scores for participants
  in the ICL and TRAD groups. The ICL group scored significantly higher than the
  TRAD group.
There was no significant difference between attitudes toward mathematics for the participants in the ICL and TRAD groups. There was no significant difference between course completion for participants in the ICL and TRAD groups.

A significant difference was found between mathematics attitude and traditional instruction as predictors of comprehension.

Discussion

This study incorporated two levels of computer-assisted instruction into a community college developmental mathematics program to observe differences between students' attitudes toward mathematics, comprehension, and completion rates and to determine whether attitude toward mathematics and type of computer-assisted instruction could significantly predict comprehension. The traditional lecture format was augmented with a supplemental, computerized tutorial program which offered a moderate level of intervention. Computer interaction focused primarily on repetition of problem solving. The service offered interactive tutorials, hints and suggestions to solve problems, video lectures, and animated examples of problem solving. Student use of these enhancements was optional, and they were permitted to explore the concepts presented by the instructor in class and work problems independently via the computer software. Mastery levels were set at 80% for each computerized assignment which forced students to complete the assignments in the sequence designated by the district curriculum coordinators. Deadlines were flexible, and instructors allowed students to continue submitting and resubmitting late assignments in efforts to improve grades and promote retention. Students were able to navigate through the objectives, stay on pace with the instructor, and finish computerized assignments on their own time.
The computerized instructional format was a self-paced, digital environment which offered an extreme level of intervention. Each lesson followed a specific delivery format: 1) pre-test – students must take the pre-test for each lesson and may test out of the lesson with 100% mastery; 2) lesson presentation – students were forced to watch a series of video lectures and slides which discussed the topic, provided examples, and offered guided problem solving; 3) tutor – students were given 3 problems to assess strengths and weaknesses on the subject matter; 4) independent practice – students were assigned between 5 and 20 problems to complete independently and were asked to record the answers in the database; 5) quiz – students were given a quiz to test for mastery of the objective. Students were given the course objective listing during the opening class period; the listing was compiled from the company database and was standardized to follow the sequence designated by the district curriculum coordinators. Mastery levels were set at 80%, and students were forced to remain on difficult lessons for extended periods of time until that mastery level was achieved. The instructors for these courses served as facilitators and motivators, and students were solely responsible for managing their time and completion of the lessons and unit exams before the culmination of the semester.

The measurement of mathematics attitude was a combination of self-confidence, value, enjoyment, and motivation (Tapia, 1996). According to Hidi and Harackiewicz (2000), interest in a particular subject is directly related to increased knowledge, value, and positive feelings for that subject. Interest is acquired over time and is facilitated by environmental stimuli. The participants in this study were exposed to two types of
computerized instruction with the anticipation that interest in mathematics would be
generated and would subsequently impact completion rates.

Self-confidence interpretations for the two groups of participants in the study
were remarkably similar. Differences between participants' responses to items on the
survey instrument were miniscule and allowed the researcher to conclude that although
the ICL group had the higher self-confidence responses, confidence levels were
comparable with reference to individual mathematics performance. Students' expressions
of dread, nervousness, discomfort, insecurity, and fear balanced evenly with expressions
that they would do fairly well in any mathematics course and that they learn mathematics
easily.

Participants' responses to instrument items relating to value were also similar.
The researcher observed high emphasis on all participants' perceptions of mathematics as
a worthwhile and necessary subject that helps to develop the mind and teaches a person
to think. Participants from both groups expressed high agreement that the study of
mathematics is one of the most important subjects for people to study and that a strong
mathematics background could help in academic and career pursuits. The similarity in
expression allowed the researcher to conclude that participants from both groups truly
desire to develop problem solving mathematics skills.

Participants from both groups expressed several perspectives as relating to the
enjoyment of mathematics pursuits. Participants agreed that mathematics problem solving
produced great satisfaction. However, the researcher observed that participants
considered the study of mathematics dull and boring and that most were not receptive to
the idea of enrolling in mathematics courses beyond what was required.
Observations of motivation revealed that participants did not view the challenge of mathematics as appealing. Low responses were observed on item responses related to participants' plans to take as much mathematics as possible throughout their matriculation and the utility of studying advanced level mathematics. The researcher concluded that although problem solving was of interest to participants, the study of advanced mathematics was not a direct concern.

Due to the nature of the study, computerized intervention was incorporated into the attitude variable in order to take into account participants' perspectives of their respective instructional method. Participants' attitudes toward computer importance, enjoyment, and anxiety were addressed and averaged to construct an overall computer attitude component of mathematics attitude (Knezek & Christensen, 1995). Participants expressed agreement on the importance of computers in educational and career pursuits. The researcher observed similarly high responses on participants' expressions of the impact that knowledge of computer use would have on the ability to obtain employment and experience new opportunities. Participants were in agreement that computer technology could be difficult to use and did not feel more could be learned via computers than textbooks. The researcher concluded from participants' responses that they were comfortable with exposure to computers, and computer attitudes would not negatively impact mathematics pursuits.

The measure of mathematics attitude among African American students as compared via two levels of computerized instruction revealed similar expressions of self-confidence, value, enjoyment, motivation, and computer attitude. Participants' mathematics attitude scores indicated reasonably high attitudes toward the study of
mathematics contrary to Rech (1994). The within group perspective of the study allowed
the researcher to deduce that the level of computerized instructional involvement does not
impact the African American student’s mind-set with regard to studies of mathematics.

The measure of comprehension among the African American students in this
study established that participants’ scores on the final examination were comparable at
the end of the semester. The analysis of the data indicated that there was a statistically
significant difference in comprehension when comparing the two levels of computerized
instruction. The mean score for the ICL participants on the final examination was higher
than the mean score for their TRAD counterparts.

The participants enrolled in the ICL classes witnessed a slightly higher
completion rate than students in the TRAD classes, but no statistical significance was
found relative to the difference in course completion. This led the researcher to conclude
that both forms of computerized instruction were functional intervention methods for the
developmental mathematics program. All of the participants in this study were African
American and expressed agreeable attitudes toward the use of computerized instruction.

The high percentages of C letter grades from participants in both computer
programs led the researcher to deduce that difficulty may have been encountered in
achieving the mastery levels designated for the respective programs. Several factors may
have contributed to these complexities. According to Li (2005), instructor adaptation and
pedagogical application are significant factors in determining student success in
implementation of computer applications in mathematics. Training sessions were hosted
by the software companies for all institutional personnel involved in implementation of
the computerized applications (I CAN Learn ® Education Systems, 2006; MyMathLab,
Follow-up sessions are scheduled for continuing instructor development and assessment of learning strategies within the new technological environments. Li (2005) contends that student development and success are directly related to instructor acceptance, application, and enthusiasm of technology incorporation.

Increased student computer use should augment students' independence and control as relates to preparation and application of material outside of class time (Forgasz, 2004). Participants for both programs consistently fell behind the scheduled paces assigned by instructors. Students were ostensibly unaware of the intensity of study necessary to complete the lessons outlined in their respective programs. Lou (2004) maintains that computer-assisted instructional applications cater to individual learner differences and maximize the instructional continuum by allowing students to work at his/her own pace. As computerized instruction becomes the norm, students will have to become more responsible for their own learning. Wighting (2006) concurred that technology integration should reveal a greater sense of student engagement in their mathematics studies and that increased student independence will result in increased student accountability.

According to Forgasz (2004), open and increased access to computer resources has been the technological focus of educational institutions throughout recent years. Software companies are promoting their products by installing entire labs, complete with hard drives, monitors, furniture, printers, and networks, in efforts to increase availability to underserved populations (I CAN Learn® Education Systems, 2006). Students participating in completely computerized instructional programs, however, only have access to courseware during lab hours and are not allowed the flexibility of completing...
computer work after hours. Students participating in traditional lecture classes have access to their computerized tutorial programs any time they are able to access a computer with the proper internet capabilities (MyMathLab, 2006). Limited computer availability and time constraints may have actively contributed to students’ inability to maintain the pacing established by the instructors of the two cohorts.

Recommendations for Future Research

The levels of computer-assisted instruction addressed in this study have been deemed effective mechanisms for promoting African American students’ success in developmental mathematics courses. The data for this study was collected over one semester or instructional period. Further research should be conducted in order to assess subsequent mathematics pursuits by the participants in the study and to provide follow-up data on all participants’ persistence in subsequent courses and determine the long-term effects of program implementation.

Student withdrawal rates were unusually high for the semester in which the two forms of computer-assisted instruction were initiated which, also, was the semester in which data was collected for this study. Of the 593 total students enrolled in developmental mathematics courses, 45% withdrew before the end of the semester, representative of past withdrawal rates in the fall semester. Additional research should be conducted to assess whether these students were more inclined to withdraw because of the newly integrated technology interaction or due to the complexity of mathematical pursuits.

Observations of students in this study were conducted subsequent to exposure to the two levels of computerized instruction. Student perspectives on computer use in
mathematics pursuits had been influenced and decided by the dates of instrument administration. Further research should be conducted to pre-assess student attitudes toward the variables in the study and to follow-up with post-assessments of students’ interactions, success, and attitudes.

Student access to mathematics resources may have presented obstacles to student completion. Supplementary research may reveal that time constraints and accessibility will increase student success, and exploration should be conducted in order to assess the significance.

Instructor status was not a variable considered in this study, however, adjunct or full-time instructor status may directly impact the student learning continuum and influence student attitudes toward the course. Further research should be conducted to explore correlation between student success and instructor status.
HUMAN SUBJECTS PROTECTION REVIEW COMMITTEE
NOTICE OF COMMITTEE ACTION

The project has been reviewed by The University of Southern Mississippi Human Subjects Protection Review Committee in accordance with Federal Drug Administration regulations (21 CFR 211.111), Department of Health and Human Services (45 CFR Part 46), and university guidelines to ensure adherence to the following criteria:

- The risks to subjects are minimized.
- The risks to subjects are reasonable in relation to the anticipated benefits.
- The selection of subjects is equitable.
- Informed consent is adequate and appropriately documented.
- Where appropriate, the research plan makes adequate provisions for monitoring the data collected to ensure the safety of the subjects.
- Where appropriate, there are adequate provisions to protect the privacy of subjects and to maintain the confidentiality of all data.
- Appropriate additional safeguards have been included to protect vulnerable subjects.
- Any unanticipated, serious, or continuing problems encountered regarding risks to subjects must be reported immediately, but not later than 10 days following the event. This should be reported to the IRB Office via the “Adverse Effect Report Form”.
- If approved, the maximum period of approval is limited to twelve months.

Projects that exceed this period must submit an application for renewal or continuation.

PROTOCOL NUMBER: 26112802
PROJECT TITLE: The Relationship Between Attitude, Comprehension, and Course Completion in Two Computer-Assisted Instructional Formats
PROPOSED PROJECT DATES: 06/20/06 to 01/31/07
PROJECT TYPE: Dissertation or Thesis
PRINCIPAL INVESTIGATORS: Marquise L. Loving
COLLEGE/DIVISION: College of Education & Psychology
DEPARTMENT: Educational Leadership & Research
FUNDING AGENCY: N/A
HSPRC COMMITTEE ACTION: Expedited Review Approval
PERIOD OF APPROVAL: 11/28/06 to 11/27/07

Lawrence A. Hosman, Ph.D.
HSPRC Chair

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.
APPENDIX B

STUDENT ID# _____ _____ _____

COURSE (Circle One) BASIC ELEMENTARY INTERMEDIATE
MATH ALGEBRA ALGEBRA
1103 1203 1233

This survey is to be used as part of a research project and institutional evaluation of instructional programs. Your responses will be held in the strictest confidence, and all evaluations will be discarded upon completion of the program evaluation. Your careful attention and accuracy are important to us. If anything is published as a result of this research, no one reading these publications will ever be able to tell that you participated in this survey.

Part I. Attitude Toward Mathematics

DIRECTIONS: This inventory consists of statements about your attitude toward mathematics. There are no correct or incorrect responses. Read each item carefully. Please think about how you feel about each item. Circle the response that most closely corresponds to how the statements best describe your feelings. Use the following response scale to respond to each item.

PLEASE USE THESE RESPONSE CODES:
1 – Strongly Disagree
2 – Disagree
3 – Neutral
4 – Agree
5 – Strongly Agree

<table>
<thead>
<tr>
<th>Item</th>
<th>Statement</th>
<th>Response Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mathematics is a very worthwhile and necessary subject.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>2</td>
<td>I want to develop my mathematical skills.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>3</td>
<td>I get a great deal of satisfaction out of solving a mathematics problem.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>4</td>
<td>Mathematics helps develop the mind and teaches a person to think.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>5</td>
<td>Mathematics is important in everyday life.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>6</td>
<td>Mathematics is one of the most important subjects for people to study.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>7</td>
<td>College level math courses would be very helpful no matter what I decide to study.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>8</td>
<td>I can think of many ways that I use math outside of school.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>9</td>
<td>Mathematics is one of my most dreaded subjects.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>10</td>
<td>My mind goes blank and I am unable to think clearly when working with mathematics.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>11</td>
<td>Studying mathematics makes me feel nervous.</td>
<td>1</td>
</tr>
<tr>
<td>12</td>
<td>Mathematics makes me feel uncomfortable.</td>
<td>1</td>
</tr>
<tr>
<td>13</td>
<td>I am always under a terrible strain in a math class.</td>
<td>1</td>
</tr>
<tr>
<td>14</td>
<td>When I hear the word mathematics, I have a feeling of dislike.</td>
<td>1</td>
</tr>
<tr>
<td>15</td>
<td>It makes me nervous to even think about having to do a mathematics problem.</td>
<td>1</td>
</tr>
<tr>
<td>16</td>
<td>Mathematics does not scare me at all.</td>
<td>1</td>
</tr>
<tr>
<td>17</td>
<td>I have a lot of self-confidence when it comes to mathematics.</td>
<td>1</td>
</tr>
<tr>
<td>18</td>
<td>I am able to solve mathematics problems without too much difficulty.</td>
<td>1</td>
</tr>
<tr>
<td>19</td>
<td>I expect to do fairly well in any math class I take.</td>
<td>1</td>
</tr>
<tr>
<td>20</td>
<td>I am always confused in my mathematics class.</td>
<td>1</td>
</tr>
<tr>
<td>21</td>
<td>I feel a sense of insecurity when attempting mathematics.</td>
<td>1</td>
</tr>
<tr>
<td>22</td>
<td>I learn mathematics easily.</td>
<td>1</td>
</tr>
<tr>
<td>23</td>
<td>I am confident that I could learn advanced mathematics.</td>
<td>1</td>
</tr>
<tr>
<td>24</td>
<td>I have usually enjoyed studying mathematics in school.</td>
<td>1</td>
</tr>
<tr>
<td>25</td>
<td>Mathematics is dull and boring.</td>
<td>1</td>
</tr>
<tr>
<td>26</td>
<td>I like to solve new problems in mathematics.</td>
<td>1</td>
</tr>
<tr>
<td>27</td>
<td>I would prefer to do an assignment in math than to write an essay.</td>
<td>1</td>
</tr>
<tr>
<td>28</td>
<td>I would like to avoid using mathematics in college.</td>
<td>1</td>
</tr>
<tr>
<td>29</td>
<td>I really like mathematics.</td>
<td>1</td>
</tr>
<tr>
<td>30</td>
<td>I am happier in a math class than in any other class.</td>
<td>1</td>
</tr>
<tr>
<td>31</td>
<td>Mathematics is a very interesting subject.</td>
<td>1</td>
</tr>
<tr>
<td>32</td>
<td>I am willing to take more than the required amount of mathematics.</td>
<td>1</td>
</tr>
<tr>
<td>33</td>
<td>I plan to take as much mathematics as I can during my education.</td>
<td>1</td>
</tr>
<tr>
<td>34</td>
<td>The challenge of math appeals to me.</td>
<td>1</td>
</tr>
<tr>
<td>35</td>
<td>I think studying advanced mathematics is useful.</td>
<td>1</td>
</tr>
<tr>
<td>36</td>
<td>I believe studying math helps me with problem solving in other areas.</td>
<td>1</td>
</tr>
<tr>
<td>37</td>
<td>I am comfortable expressing my own ideas on how to look for solutions to a difficult problem in math.</td>
<td>1</td>
</tr>
<tr>
<td>38</td>
<td>I am comfortable answering questions in math class.</td>
<td>1</td>
</tr>
<tr>
<td>39</td>
<td>A strong math background could help me in my professional life.</td>
<td>1</td>
</tr>
<tr>
<td>40</td>
<td>I believe I am good at solving math problems.</td>
<td>1</td>
</tr>
</tbody>
</table>

*As adapted from the Attitude Toward Mathematics Inventory (ATMI) created by Tapia (1996).*

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.
**Part II. Attitude Toward Computers**

**DIRECTIONS:** This inventory consists of statements about your attitude toward computers. There are no correct or incorrect responses. Read each item carefully. Please think about how you feel about each item. Circle the response that most closely corresponds to how the statements best describe your feelings. Use the following response scale to respond to each item.

**PLEASE USE THESE RESPONSE CODES:**
1 – Strongly Disagree
2 – Disagree
3 – Neutral
4 – Agree
5 – Strongly Agree

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>41</td>
<td>I enjoy doing things on a computer.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>42</td>
<td>I am tired of using a computer.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>43</td>
<td>I will be able to get a good job if I learn how to use a computer.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>44</td>
<td>I concentrate on a computer when I use one.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45</td>
<td>I enjoy computer games very much.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>46</td>
<td>I would work harder if I could use computers more often.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>47</td>
<td>I know that computers give me opportunities to learn many new things.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>48</td>
<td>I can learn many things when I use a computer.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>49</td>
<td>I enjoy lessons on the computer.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>I believe that the more often teachers use computers, the more I will enjoy school.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>51</td>
<td>I believe that it is very important for me to learn how to use a computer.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>52</td>
<td>I feel comfortable working with a computer.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>53</td>
<td>I get a sinking feeling when I think of trying to use a computer.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>54</td>
<td>I think that it takes a long time to finish when I use a computer.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>55</td>
<td>Working with a computer makes me nervous.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>56</td>
<td>Using a computer is very frustrating.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>57</td>
<td>I will do as little work with computers as possible.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>58</td>
<td>Computers are difficult to use.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>59</td>
<td>Computers do not scare me at all.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>I can learn more from books than from a computer.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(^b\) As adapted from Part I of the Computer Attitude Questionnaire (CAQ) created by the Texas Center for Educational Technology (2005).
Part III. Student Information

DIRECTIONS: Circle the most accurate response.

<table>
<thead>
<tr>
<th>61 Gender</th>
<th>MALE</th>
<th>FEMALE</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>62 Race</th>
<th>Black</th>
<th>White</th>
<th>Hispanic</th>
<th>Asian</th>
<th>Other</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>63 Age Range</th>
<th>18-20</th>
<th>21-23</th>
<th>24-26</th>
<th>27-29</th>
<th>30 or older</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>64 Annual Income</th>
<th>$0-$9999</th>
<th>$10000-$14999</th>
<th>$15000-$19999</th>
<th>$20000-$24999</th>
<th>$25000 or more</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>65 Classification</th>
<th>1st year</th>
<th>2nd year</th>
<th>Transfer</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>66 Have previously taken classes using some form of computer instruction</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>67 Own a computer</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>68 General computer skills</th>
<th>None</th>
<th>Low</th>
<th>Average</th>
<th>High</th>
<th>Professional</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>69 Have taken this class before and had to drop or withdraw</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>70 Choice of Major</th>
</tr>
</thead>
</table>

Please return forms to:
Marquise L. Loving
4554 Will-O-Lake Drive
Jackson, Mississippi 39212

July 31, 2006

Dr. Clyde Muse, President
Hinds Community College
PMB 10458
Raymond, Mississippi

Dear Dr. Muse:

Please accept this letter as a request for permission to collect data on students enrolled in developmental mathematics during the fall 2006 semester at Hinds Community College - Jackson Campus ATC. I am currently enrolled at the University of Southern Mississippi majoring in Higher Education Administration with a minor in Research and an emphasis in Community College Administration. This requested data will be used for my dissertation research. I have enclosed for your review a copy of my problem statement. I would very much like the opportunity to visit with you or a representative of your staff to discuss this research request. I will follow-up with you on this request on Friday, August 4, 2006. Thank you very much for your consideration in this request.

Sincerely,

Marquise L. Loving

Enclosure (1)
REFERENCES


Teaching & Learning. 34th ASEE/IEEE Frontiers in Education Conference.


