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ABSTRACT

The purpose of this study was to examine whether computer-assisted instruction integrated with lecture/discussion would improve student performance in developmental English when compared to a traditional lecture/discussion instructional method. A total of 180 community college students were enrolled in one of six sections of developmental English. Two-full time instructors each conducted one traditional lecture/discussion and each facilitated one section of the computer-assisted program using the INVEST software and one section of the computer-assisted program using the PLATO software. The research questions addressed were: (1) Is there a difference in achievement among students who are taught developmental English using either software as compared to students who receive instruction through traditional methods? (2) Is there are difference in achievement among students in Associate of Arts or Associate of Science degree programs who are taught developmental English using either software as compare to students receive instruction through traditional methods? The Multiple Assessment Programs and Services (MAPS) language arts pretest and posttest scores were used to measure writing achievement for all groups. A one-way Analysis of Covariance was used to analyze the relative effectiveness of the different instructional methods and to determine if differences existed between writing scores of Associate of Arts degree-seeking students and Associate of Science degree-seeking students by the different instructional methods. The results of this study support the research on the effectiveness of the computer-assisted instructional method for developmental English students. Contains 48 references. (Author)

EFFECTS OF COMPUTER-ASSISTED INSTRUCTION ON DEVELOPMENTAL ENGLISH INSTRUCTION AT A COMMUNITY COLLEGE

By

CHERYL H. FANTE

A DISSERTATION PRESENTED TO THE GRADUATE SCHOOL
OF THE UNIVERSITY OF FLORIDA IN PARTIAL FULFILLMENT
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EFFECTS OF COMPUTER-ASSISTED INSTRUCTION ON DEVELOPMENTAL ENGLISH INSTRUCTION AT A COMMUNITY COLLEGE

By

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The purpose of this study was to examine whether computer-assisted instruction integrated with lecture/discussion would improve student performance in developmental English when compared to a traditional lecture/discussion instructional method.

A total of 180 community college students were enrolled in one of six sections of developmental English. Two full-time instructors each conducted one traditional lecture/discussion section and each facilitated one section of the computer-assisted program using the INVEST software and one section of the computer-assisted program using the PLATO software. The research questions addressed were as follows:

1. Is there a difference in achievement among students who are taught developmental English using either INVEST or PLATO software as compared to students who receive instruction through the traditional lecture/discussion method?

2. Is there a difference in achievement among students in Associate of Arts or Associate of Science degree programs who are taught developmental English using either INVEST or PLATO software as compared to students who receive instruction through the traditional lecture/discussion method?

The Multiple Assessment Programs and Services (MAPS) language arts pretest and posttest scores were used to measure writing achievement for all groups. A one-way Analysis of Covariance (ANCOVA) was used to analyze the relative effectiveness of the different instructional methods and to determine if differences existed between writing scores of Associate of Arts degree-seeking students and Associate of Science degree-seeking students by the different instructional methods.

Analysis of the data indicated that the computer-assisted groups, INVEST and PLATO, integrated with traditional lecture/discussion, were the most effective instructional method for teaching developmental English. When degree type (Associate of Arts or Associate of Science) was considered in conjunction with the instructional method,

no statistically significant difference was found. Improvement was evidenced in both groups. The results of this study support the research on the effectiveness of the computer-assisted instructional method for developmental English students.

CHAPTER 1
INTRODUCTION

The number of academically underprepared students who need remedial/developmental education in the nation's community colleges continues to grow (Tomlinson, 1989). After Congress passed the Higher Education Act of 1965, colleges admitted a significantly higher number of non-traditional students, many of whom needed remediation courses.

The number of nontraditional community college students continued to grow over the next 10 to 15 years. A simultaneous decline in SAT scores of high school graduates came during the same period. Between 1972 and 1979, the average verbal SAT scores of college freshmen declined 40 points (Trow, 1983). This downward trend in SAT scores became a growing challenge for educators who were being asked to prepare illiterate and underprepared students for the future. "In recent years, great concern has been directed toward the inability of many students, from elementary to college level, to express themselves adequately in writing" (Phelps-Gunn & Phelps-Teraski, 1982, p.1).

Concern over declining performance in writing skills led college officials to expand remedial offerings. In May

1991, the U. S. Department of Education reported that 91% of all public colleges offer at least one remedial course and that 30% of all incoming college freshmen enroll in at least one remedial/developmental course. This same study found that 77% of the students successfully completed remedial reading, 73% successfully completed remedial writing, and 67% successfully completed remedial mathematics.

In Florida approximately 50% of all currently incoming community college freshmen needed some type of remedial/developmental program. The Division of Community Colleges reported in 1991-92 that 59% successfully completed remedial mathematics, 77% successfully completed remedial reading, and 73% successfully completed remedial writing. In 1992-93, these numbers remained fairly constant with successful completion rates of 59% in mathematics, 75% in reading, and 73% in writing (Fleishman, 1994).

Students who are planning to seek an A.S. or A.A. degree, and who are determined by placement tests to have skill deficiencies in either English, mathematics, or reading, must satisfactorily complete any or all of the developmental courses prior to continuing coursework in their chosen program of study. Cross (1976) described these underprepared students as "new students"--students who would have never been allowed to attend college in earlier years because of low scores on traditional tests in academic aptitude.

Developmental/remedial education is designed to meet the needs of students who aspire to higher education but lack some of the basic skills needed for successful college or university study. The objective of a developmental or remedial program is to bring students to the point where they can effectively deal with college-level material.

Cross (1976) proposed a distinction between developmental and remedial programs. A remedial program would have the goal of overcoming academic deficiencies whereas a developmental program would have as its purpose the development of a student's diverse talents--academic or otherwise. In spite of that distinction, the terms "remedial" and "developmental" have melded over the years and are now often used interchangeably. The major issue is how best to serve the at-risk, underprepared student, not the title of the program (Roueche & Roueche, 1993).

The curricula for remedial or developmental programs consist of math, reading, and English/writing. Some institutions also include science courses and English as a Second Language course in their developmental studies program.

According to research findings, many studies have been completed in the areas of math and reading, but few studies have focused on the area of developmental English (Lowe & Bickel, 1993). Developmental English is the course designed

for students whose writing skills are insufficient for success in associate degree programs.

Concern for the improvement of writing has become a priority for postsecondary English educators. In community colleges, remedial English composition is the developmental writing course. Instructors are in search of instructional methods for teaching developmental English/writing courses to improve students' writing performance (Sedgwick, 1989).

Statement of the Problem

The instructional method used for teaching preparatory courses varies from instructor to instructor and from institution to institution. Although the faculty of developmental English courses agree that student success rates in remedial/developmental English need to improve, they disagree about the best method of instruction. The problem studied in this research was to determine which method of instruction used to teach developmental English to underprepared community college learners results in greater academic achievement. Are there differences in learning outcomes of groups of developmental English students who were taught using integrated computer-assisted instruction in Associate of Arts and Associate of Science degree programs when compared to learning outcomes of groups of developmental English students who were taught using the traditional lecture/discussion method?

Purpose and Research Questions

The purpose of this study was to examine whether computer-assisted instruction integrated with a lecture/discussion would improve student performance in developmental English when compared to a traditional lecture/discussion instructional method. Two types of computer software were compared to the traditional teaching methods used in a community college course in developmental English. The research questions addressed were as follows:

1. Is there a difference in achievement among students who are taught developmental English using either INVEST or PLATO software as compared to students who receive instruction through the traditional lecture/discussion method?

2. Is there a difference in achievement among students in Associate of Arts and Associate of Science degree programs who are taught developmental English using either INVEST or PLATO software as compared to students who receive instruction through the traditional lecture/discussion method?

Justification of the Study

As a consequence of the lack of recent research on the various methods of teaching developmental English, there is inconsistency and uncertainty on the part of faculty who teach developmental English courses as to the appropriate method for teaching underprepared students. By identifying

alternative instructional methods and analyzing data on those methods, the results of this study will assist college administrators and English faculty in determining the most appropriate instructional method to teach developmental English. Recommendations for future research can be reported and examined by analyzing data from other colleges that offer developmental English courses using a variety of instructional methods. Further research utilizing additional computer-assisted instructional software may also be useful in determining the most effective method for teaching other developmental courses.

A full description of INVEST and PLATO software can be found in Chapter 3, Methodology.

Limitations

The following limitations existed in this study:

1. Treatment conditions may have been affected by a variety of uncontrolled factors since the computer-assisted INVEST software was recently acquired. These factors include hardware malfunctions, implementation of the software, and lack of experience by the faculty in using the software.

2. The instructors involved in the proposed research were full-time, experienced faculty. Every attempt to replicate instructional methods was used; however, the use of two instructors may have confounded the treatment

regardless of the standardization and uniformity of instructional methods and content.

3. No attempt was made to monitor classroom approach or presentation by the instructor.

4. Instructor familiarity with PLATO may have biased results because it has been used in previous terms.

5. The research was limited to one community college and measured over a one-year period.

Assumptions

1. Evaluation instruments were assumed to produce reliable and valid scores based on prior use with students who were reasonably comparable to the students included in this study.

2. The demographics of the sample population were characteristic of any student population consisting of typical students at a medium-sized Florida community college. These students were similar to student populations at other community colleges.

Definition of Terms

The following terms will be used throughout this study:

Computer-Assisted Instruction is a technique for using a computer to make a tutorial presentation of previously prepared text, computer graphics, or video (O'Banion, 1994).

College Preparatory English (ENC0010) is the lower-division developmental English course offered at Florida community colleges and universities and is designed for

students whose English skills are insufficient for academic success in postsecondary institutions. For many students, College Prep English (ENC0010) is the foundation course leading to the basic college-level courses in English.

Developmental, Remedial, and College Prep are used interchangeably to refer to the upgrading of pre-college skills to the point where students can handle college-level work in mathematics, reading, and English (Fleishman, 1994).

Integrated instruction is a process that combines classroom instruction with computer-assisted instruction in the presentation of materials.

INVEST educational software was developed in 1990 by Jostens Learning Corporation to provide a variety of computer-assisted applications designed to improve literacy and basic skills in English, reading, and mathematics.

Multiple Assessment Programs and Services (MAPS) test (Educational Testing Services, 1984) is a standardized instrument designed to measure a student's readiness for entry into college mathematics, reading, or English courses.

PLATO is the commercially prepared, computer-assisted educational software designed to assist in the instructional process of skill development in language arts, reading, and mathematics.

Traditional lecture/discussion is an instructional method providing approximately 40 minutes of lecture and 10

minutes of classroom discussion in each class period, including workbook assignments.

Organization of the Dissertation

Chapter 2 contains a review of the literature pertinent to this subject. Chapter 3 contains a description of the methods of procedure for conducting this study as well as an analysis of the statistical treatment used for these data. Chapter 4 includes a detailed analysis of the data collected, and Chapter 5 consists of the summary, conclusions, and recommendations.

CHAPTER 2
REVIEW OF THE LITERATURE

Community colleges serve students with a wide range of diverse backgrounds and preparation for college. "The preparation/diversity issue is arguably the most important challenge community colleges confront" (Richardson & Elliott, 1994, p. 100). More adults are returning to college, more immigrants are requiring education, and the K-12 reform process is slow (McCabe, 1994). The number of underprepared students with special needs is projected to increase while business and industry demand increasingly higher skills for employees. Therefore, developmental/remedial courses must provide the best possible strategies for achieving the writing, reading, and math competencies necessary for student success in college and in future employment opportunities.

Underprepared Students Entering College

In response to the needs of the underprepared student, "college preparatory" programs were developed in the mid-1800s (Boylan, 1988). Those programs were much the same as programs today labeled "academic development," "remedial," or "developmental studies." The goal of developmental programs continues to be to bring students to a point where they can effectively deal with college-level materials.

Services provided to the underprepared students include courses in reading, writing, and mathematics, as well as study and test-taking strategies to assist students in becoming successful in the college curriculum.

The U. S. Department of Education (1991) reported that 91% of all public colleges offer at least one remedial course and that 30% of all college freshmen enroll in at least one remedial course. This same study found that 73% of all enrollees successfully complete remedial or developmental English/writing courses at a level that improves their potential for success in college-level courses.

In 1991 the National Center for Education Statistics published findings of a Fast Response Survey System done on developmental/remedial programs offered at 473 institutions during the fall of 1989. With regard to developmental writing/English courses, the results found that 65% offer a writing course and 30% of all college freshmen took at least one remedial course. Specifically, 31% enrolled in math, 16% enrolled in writing, and 13% enrolled in reading.

The state of Florida is committed to remediation programs, with community colleges carrying the largest responsibility for remedial/developmental programs (Fleishman, 1994). According to Florida law (F.S. 233.051), programs of remediation "shall provide students with enhancement or improvement of any basic skills in which the

students are deficient and shall assist students in moving from one grade level to another and assist students of the district who request remedial assistance, including those residents with high school diplomas."

The State of Florida Department of Education, Bureau of Research and Information Systems (1993) reports that in 1992-93, 101,884 students were enrolled in preparatory courses. Of that number, 40,484 were enrolled in writing (College Preparatory English)--an increase over the 1991-92 enrollment of 92,261, of which 39,111 were enrolled in writing (College Preparatory English).

According to "A Report on College Preparatory Instruction and the College Level Academic Skills Test Programs" (Postsecondary Education Committee of Florida, 1992-93), the average rate of enrollments for college preparatory programs has grown at an average rate of 9% each year over the 1986 to 1991 period. This same study found that 28% of the total number of first-time-in-college students, or 11,905 students, failed to make a passing score on the writing/English entry-level placement test(s). From the group who failed the writing/English entry placement test(s), 9,512 enrolled in a college preparatory course. Of those who enrolled, 6,167, or 69%, successfully completed a course by obtaining a passing or satisfactory grade (Postsecondary, 1993, p. 27).

Nature of Underprepared Students

Understanding the special characteristics, needs, and interests of underprepared (developmental) students is a necessary component of a successful remedial program (Kulik & Kulik, 1991). Developmental education is designed to meet the needs of students who aspire to higher education but who appear to lack some basic skills and information needed for successful postsecondary study. The sole purpose of developmental education is to help underprepared students make the transition from high school to college.

There is a major difference between the traditional college freshmen and the non-traditional students that broader, open-door admissions policies at community colleges have included. Students in the traditional college populations have always assumed, along with family and peers, that they would eventually go to college somewhere (Trillin, 1980).

In contrast, many of the non-traditional students never thought of college as a possibility. Varying in age from their mid-20s to mid-60s and beyond, these non-traditional students may be returning to the classroom after many years in the workforce or as housewives preparing to enter the workforce for the first time. "Then there are increasing numbers of academically disadvantaged students--those who are learning and/or emotionally disabled, those whose backgrounds haven't provided a respect for learning and what

it can mean in one's life" (Fleishman, 1994, p. 15). All of these groups require assistance in bringing academic skills to the level required for success in college-level courses.

Faculty committed to teaching underprepared students often have to adopt new modes of communicating with their classes. These students are often intimidated by their professors and fear criticism for their lack of knowledge of the English language or feel the cultural aspect that their writing and speech expresses.

Theoretical Framework

Colleges nationwide are currently struggling to improve the performance of underprepared students. As Boylan (1983, p. 1) stated, "Theories of learning are a basic part of the knowledge base which informs the practice of developmental education."

Cognitive theorists, such as Piaget and Bruner, and developmental theorists, such as Kohlberg and Perry, have provided a foundation for the design of developmental programs (Roueche and Roueche, 1993). Since these theories are the predominant models and are the foundations used to describe developmental education, the cognitive and developmental theories will be the basis of this study.

Cognitive Theory

Cognitive science is a relatively new discipline that supports the concept of student-centered learning--the teacher sees himself or herself as a manager of learning and

shares accountability for learning with students (Roueche and Mink, 1980). The application and evaluation of the results of the applications are just beginning (Kulik & Kulik, 1991).

Cognitive scientists, such as Piaget and Bruner, use the term "learning strategies" to describe mental activities that students use to influence affective and cognitive processing (Weinstein & Mayer, 1986). Scientists believe these learning strategies--rehearsal, elaboration, organization, and monitoring comprehension--can be taught and should be emphasized more in education. "Teaching students to use better learning strategies should therefore make them better learners generally" (Kulik & Kulik, 1991, p. 38).

Language was seen as a major component in Piaget's work with cognitive development. Factors of maturation, direct experiences with the physical environment, social transmission, and equilibration all influence intellectual development (Piaget, 1964). Haller, Child, and Wallberg (1988) analyzed findings from 20 studies of students who received training in learning strategies and cited an average increase in reading comprehension scores of 0.6 and 0.7 standard deviations. "Theory-based learning strategies make a difference in (developmental) student performance" (Kulik & Kulik, 1991, p. 35).

Developmental Theory

All developmental theories are based on the philosophy that learning is a process in which students are stimulated to move from one level to the next in a sequence (Cross, 1976; Boylan, 1983). Students are challenged to progress with new skills based on the level of skill they possess. Progress occurs as the students work on a structured series of tasks. Boylan (1983) listed the major characteristics in most developmental theories as follows:

1. Growth and learning take place in stages;

2. Each stage of development is an integrated whole;

3. As individuals pass from one level of development to another, all previous stages are integrated in to the next; and

4. Each individual develops in a direction and at a rate that is unique.

One of the premises of developmental theory is that individuals differ in their levels of development. The teacher/facilitator must accept a student's current level of development and work from there. Developmentalists believe the learning environment should be supportive and encouraging with a variety of resources for growth. Developmentalists also believe that teachers must take an active role in providing challenges necessary to stimulate growth. At each stage of the process of learning, students

are expected to integrate prior knowledge and development into the next stage (Boylan, 1983).

The field of developmental education incorporates instructional models from various traditional education theories that contribute to the common goal of giving underprepared students a better chance of college success (Kulik & Kulik, 1991).

Developmental Programs for Underprepared Students

Kulik and Kulik define developmental instruction at institutions of higher education as "instruction that is adjusted in content, style or pace to meet the educational needs of high-risk students" (1991, p. 1). Cross (1976) also described these underprepared, high-risk students as "new students"--students who would have never been allowed to attend college in earlier years because of low scores on traditional tests of academic aptitude.

Developmental/college preparatory programs are designed to provide competency-based instruction for the development of college-entry competencies in reading, writing, mathematical reasoning, and logical thinking (Postsecondary, 1990, p. 26). Various colleges have experimented with instructional approaches, and the methodology that appears to be most effective is one-on-one instruction (O'Banion, 1994). "Individualized instruction has been the goal of all good teaching for decades, but the fact is that traditional

classroom-based methods of delivering instruction make true individualization virtually impossible" (O'Banion, 1994, p. 223).

Methods of Teaching Developmental English

Effecting significant changes in a developmental student's language skills depends on a great deal more than a dedicated and optimistic teacher. Effective teaching involves not only what goes on in the classroom but also involves integrated steps that lead to a particular learning experience and eventually takes the student beyond that experience (Trillin, 1980).

Kroll (1994) surveyed faculty teaching developmental writing courses and reported that teaching writing as a process appeared to be the dominant pedagogical method used in remedial writing courses, with the emphasis on teaching a combination of essays, paragraphs, and correct usage and mechanics. To assist underprepared students, instructors need to have access to a variety of teaching strategies by which students can become active learners and demonstrate their writing ability. In language skills courses, no limits are set as to what a student needs to learn. The different skill levels of entering students and how these skill levels are determined involves defining specific levels of skills (competencies) needed in writing and then devising methods of determining the level at which to place each student. A diagnostic test, or locator test, is given

to each student to determine any individual remediation needs prior to enrolling in classes and to permit instructors to tailor instruction to meet those needs.

A developmental course can provide underprepared students with the basic language skills necessary for success in college and beyond. A carefully designed program is required, one "nourished and sustained by a belief in the students' ability to learn and a willingness to pursue increasingly effective ways to teach them" (Trillin, p. 15). The teaching approaches used in developmental programs usually give students more structure, feedback, and support than they would have in a conventional college course (Kulik & Kulik, 1991).

The combination of individualized instructional methods and mastery learning methods has value in language arts learning. Even though it may appear easy to administer and evaluate individualized programs, individualized programs actually require more observation and adaptation to track student progress than does traditional instruction (Roueche and Roueche, 1993). English teachers need to ask themselves exactly what it is that their students are mastering. They must be certain that the information being mastered will help students achieve the course objectives.

An issue that makes remediation of written language difficult is the extremely broad range of students' needs, ages, and abilities (Phelps-Gunn & Phelps-Teraski, 1982).

For this reason, "faculty should make greater use of active modes of teaching and require that students take greater responsibility for their learning" (National Institute of Education, 1984, p. 127).

Crawford (1993) conducted a study on the effects of whole language instruction on community college students, comparing posttest results of college-prep students who received traditional, isolated skills instruction with students who received instruction using a whole language approach. The whole language approach is defined as "an instructional method that supports teaching reading, writing, speaking, and listening skills in a natural, holistic manner instead of in a fractionalized manner" (Crawford, 1993, p. 8). No significant effect was found for gender and ethnicity; however, a significant effect was found for the method of instruction. Students taught by the whole language approach increased in reading language skills more than those taught with a traditional approach. Among the recommendations Crawford listed for additional research was the need to analyze method of instruction as a critical factor in helping college students improve their language skills.

The growing number of academically underprepared students has brought a substantial challenge to both the teaching method and the content of traditional freshman English courses. To meet the needs of students unprepared

to write at the level required for college work, a "basic writing" or developmental course has been tailor-written to bring underprepared students up to the level of skill required for competent college work. "As a corollary to the need for an effective instructional theory, more effective teaching methods must be developed" (Stevenson, 1970, p. 114).

Traditional Approach

"The finest teachers, the greatest resources of the academic community, should be involved in the teaching of skills" (Trillin, 1980, p. 8). The traditional classroom is one in which the teacher is in control and has responsibility for the learning process; the environment is teacher-directed (Mandinach & Cline, 1994).

In developmental English courses, students receive instruction in vocabulary and reading comprehension and in grammar and basic writing skills. Greenwood (1984) analyzed the achievement of students in community college developmental writing courses. In a comparison between students who received instruction in a traditional classroom and students who received instruction through individualized-approach instruction, the individualized students achieved a higher mean grade. However, more classroom students finished the course than did the individualized students. Brown (1984) conducted a study between 1977 and 1980 on developmental English courses. He

found that students in teacher-paced classrooms for the developmental English course seemed to earn higher grades than those students in individualized lab classes.

In studying the permanent effect of the traditional methodology, Sedgwick (1989) reported that after numerous years of research, "the study of formal grammar taught by traditional methods has very little or no effect on students' use of language" (p. 8).

In Florida, the most popular method of developmental English instruction is to require students to attend semester-length courses supplemented by lab activities. Students enrolled in college preparatory classes in 23 of the 28 community colleges are required to use a lab for assistance, usually one to two hours per week. Peer tutors and/or qualified instructors give students one-on-one assistance in the labs (Fleishman, 1994).

As is true for most underprepared learners, the typical developmental English student lacks self-confidence and may be easily intimidated (Roueche & Roueche, 1993). Teachers must find ways to restructure classroom procedures to encourage student success and to add new instructional methods to existing ones in order to engage students in active teaching and learning.

Computer-Assisted Approach

One of the instructional methods widely used to teach developmental writing is computer-assisted instruction. The

term "computer-assisted instruction" (CAI) refers to the instructional method in which students of all performance levels use the computer as an instructional tool that provides individualized tutorial assistance. According to Lepper (1985), computer-assisted instruction uses the computer as an instructional tool to improve the effectiveness and efficacy of instruction while enhancing motivation. "It (the computer) asks students prepared questions and selects subsequent information based on student responses" (O'Banion, 1994, p. 207).

As cited in Teaching and Learning with Computers (Heermann, 1988, p. 112), Fisher conducted a 20-year research project and concluded that "mixing computer and noncomputer materials also provides variety in instructional approaches, which increases the chance of reaching students with a variety of learning styles and background." Whenever possible, integration of classroom assignments and computer-assisted instruction should occur so that they support and enhance each other.

Technological developments have caused the methods and media of communication and education to dramatically change during the past decade in developmental writing classes (Lowe & Bickel, 1993). "Teaching preparatory (developmental) students is becoming almost synonymous with using computers both in the classroom and in the labs" (Fleishman, 1994, p. 56). According to Brothen (1992),

"Computers can help developmental students in an important way. Developmental students often need more individual attention than traditional methods deliver; the right computer software in the right environment can provide this" (p. 32). Kulik and Kulik (1991) add, "The revolution brought on by computer technology may be especially important for developmental educators" (p. 33).

A well-designed computer-assisted program allows learners to repeat instruction they may have missed or misunderstood, provides for expanded practice opportunities, and often contains a self-test so learners can determine if they are achieving what is intended. Repetitive drill is more likely to occur because a well-designed computer program has more assignment choices available than does an instructor in a traditional classroom. The computer does not take over the job of the instructor; it only changes the emphasis on what a teacher does personally for students.

When computers are used in instruction, the instructor assumes different duties than when teaching is instructor-centered. The instructor often acts as both an instructor and a facilitator. These techniques are combined so that the learner or instructor has a menu of procedures from which to choose in achieving the stated objectives. "Faculty who work with preparatory students tend to prefer a highly structured approach where students spend considerable time on task and have ample opportunity for reinforcement

through lab work and tutoring" (Fleishman, 1994, p. 51). Technological advances change the processes and dynamics of the classroom and activities for both students and teachers. A different set of behaviors, skills, and abilities is required from teachers (Mandinach & Cline, 1994).

In a study conducted at Medgar Evers College of the City University of New York (Barrozo, Richards, & Olsen, 1978), some students who placed low on placement tests in reading, writing, or mathematics were assigned to a laboratory for computer-assisted instruction. Other students who also placed low on placement tests were assigned to laboratories staffed with tutors. A significantly greater gain was found for the computer-assisted instruction group on standardized tests in reading and writing and a small, nonsignificant superiority for the computer-assisted instruction group in mathematics. "On the average, scores for the CAI group were 0.2 standard deviations higher than the scores of the group that received tutoring from professional and student tutors" (Kulik & Kulik, 1991, p. 31).

Kulik, Kulik, and Cohen (1979) conducted a review of 54 studies of computer-based instruction that considered the effects of computer-based instruction on student achievement. They found a slight but significantly higher difference in examination scores of those enrolled in

computer-based courses over those enrolled in conventional courses.

In the 1970s and early 1980s, developmental educators suggested that "computer-based instruction should be at least as effective as conventional instruction and, in some cases, may be related to a slight improvement of student academic performance" (Boylan, 1983, p. 6).

A study comparing computer-assisted instruction with non-computer-assisted instruction was conducted at Brevard Community College, Florida (Flom & Walker, 1994). The results of that study showed a statistically significant increase in the mean grade for all college prep classes except college preparatory reading. In the developmental/college prep writing classes, the mean grade for the CAI group was 3.36 compared to a mean grade of 1.92 for the non-CAI group.

In a Report from the House Postsecondary Education Planning Committee (1990), Santa Fe Community College (SFCC) required students to attend a large lecture session twice a week. The lecture was conducted three times a week by master teachers and then followed by smaller classroom sessions conducted by adjunct instructors. Additional reinforcement activities were conducted through computer lab assignments. According to the report, SFCC documented that more than 80% of college preparatory students who took the first college-level course in English passed. Additionally,

the report noted that more than 30% of SFCC's developmental students graduated with an associate's degree.

Not all studies show that computer-assisted instruction improves student performance. In 1991, Miami-Dade Community College conducted a computer efficacy study of Computer Systems Research and similar computer-assisted instructional programs. Unfavorable reviews were given to the effects of computer-assisted instruction, especially with underprepared students. "Developmental writing (English) students who followed a prescribed series of modules did less well than other developmental students who received teacher-delivered instruction in grammar and mechanics and who used the computer program (CSR) on a needs-only basis" (Project Synergy, 1991, p. 13). A 1993 study by Downs and Linnehan found the opposite to be true: Computer-assisted students perform better, on average, than students who receive only teacher-delivered instruction. In the two studies cited, integrated instruction was reported to be more effective than individualized computer-based instruction.

In 1992 Miami-Dade Community College participated in a longitudinal study of college preparatory instruction. The response to the question "What percentage of A.A. and A.S. degree recipients over the last three years began college academically underprepared?" found that about 40% of the combined group of A.A. and A.S. graduates needed college preparatory work. In addition, A.S. graduates were more

likely than A.A. graduates to enter with low basic skills scores--61% vs. 36% for the most recent year (Belcher, 1992).

Schramm and Rich (1993) found that CAI had a positive effect on achievement in English and journalism classrooms and also increased satisfaction with the quality of the software used. They also reported that researchers who found lower achievement with CAI, compared to other instructional methods, "found faults in the software used" (Schramm & Rich, p. 48).

Lowe and Bickel (1993) studied student achievement in a developmental writing course for those students who had received instruction using the computer-assisted method as compared to the conventional classroom method. Though the observation set was small, the results showed that students receiving computer-assisted instruction scored an average of 5.4 points higher on the posttest than students in the traditional class.

A comprehensive analysis of 254 comparative studies (Kulik & Kulik, in press) reported that computer-based instruction has positive effects on students. Kulik and Kulik concluded that "computer-based instruction has raised student achievement in numerous settings. Its effectiveness has been demonstrated with a variety of research designs" (1991, p. 32).

Stevenson (1970) reported that early remedial English programs used a combination of methods: group instruction, individualized instruction, and laboratory instruction. Individualized instruction and lab instruction methods seemed to allow each student the opportunity for personal attention that was found to be a critical factor in teaching remedial students.

One of the most important aspects of using computers in literacy (and developmental) programs is the sense of empowerment they provide (Turner, 1988). The computer can provide a more enjoyable environment for some students. Adults control their learning by accepting the responsibility for educating themselves and controlling the pace of program accomplishment. Their success becomes more meaningful (Finnegan & Sinatra, 1991).

Since the 1980s, "the focus on learning included many of the insights derived from cognitive psychology and proposed 'to use technology for individualizing the learning environment'" (Anadam in Roueche and Roueche, 1993, p. 178). Microcomputers provide several advantages for teachers, including independent work for students, infinite patience, immediate feedback to the students, and the capability of storing test results. Student motivation, enthusiasm, cooperation, independence, and opportunities for low-ability students to master basic math and language arts skills were

benefits of computer-assisted instruction listed by teachers in Becker's study (1986).

Various researchers state that there is evidence that suggests that providing computerized writing instruction to basic writers can improve student writing (Kurth and Stromberg, 1984; Rosenbaum, 1984). According to VanProoyen and Clouse (1994), the main problems encountered in computer-assisted instruction are machine reliability, stimulus deprivation, equipment costs, difficulty in communicating audio messages to students, and the temptation to settle for less than the best curriculum because of programming problems.

No one has suggested that computers can replace teachers. Computers are recognized as a pedagogical tool that can enhance sound, well-planned developmental writing instruction. "Computerized writing programs which require students to interact and which allow students to explore and experiment have a place in basic writing courses and developmental writing labs" (Broderick & Caverly, 1987, p. 2).

Gleason (1981) summarized the effects of computer-assisted instruction as follows:

1. Computer-assisted instruction can be used successfully to assist learners in attaining specified instructional objectives;

2. There is substantial savings in time required for learning over traditional instruction;
3. Retention is at least as good as, if not superior to, retention following conventional instruction; and
4. Students react positively to good CAI programs, and they reject poor ones.

"Sophisticated and independent learners might not need computer help, but for underprepared students and weaker learners, computers might make a real difference" (Kulik & Kulik, 1991, p. 33). With awareness of the need for students to interact with computers in the future, teachers will need to make informed choices concerning technology and how it can be applied to language arts instruction (Downs & Linnehan, 1993). Rodgers (1990) added, "(Computers) will have a growing impact on language teaching in higher education and in industrial and domestic settings" (p. 14).

Summary of Chapter 2

The literature review revealed a limited amount of research on the effectiveness of various instructional methods for developmental English courses. In some studies, the findings appeared to support the belief that computer-assisted instructional methods are effective for teaching underprepared, developmental students. A learning environment which incorporates computer software programs

for writing appears to improve learning and academic achievement (Kulik & Kulik, 1991).

This literature review appears to support the idea that computer-assisted methods of instruction can be adapted to respond to the needs of developmental English students. From the literature, the conclusion can be reached that there may be no one best way to teach English to the exclusion of all others. A combination of classroom content instruction with computer-assisted instruction may provide the best of both methods (Longman, 1992).

CHAPTER 3
METHODOLOGY

Introduction

The purpose of this study was to examine whether computer-assisted instruction integrated with a lecture/discussion improved student performance in developmental English when compared to a traditional lecture/discussion instructional method. Two types of computer software were compared to the traditional teaching methods used in a community college course in developmental English. The research questions addressed were as follows:

1. Is there a difference in achievement among students who are taught developmental English using either INVEST or PLATO software as compared to students who receive instruction through the traditional lecture/discussion method?

2. Is there a difference in achievement among students in Associate of Arts or Associate of Science degree programs who are taught developmental English using either INVEST or PLATO software as compared to students who receive instruction through the traditional lecture/discussion method?

Developmental (college preparatory) English is the course designed for students whose English skills are

insufficient for success in college-level programs. Placement in preparatory courses results from the diagnosis of students' individual remediation needs as determined by the College Placement Test (CPT) entry-level placement test and the Multiple Assessment Programs and Services Test (MAPS) locator test, the statewide standardized pretest and posttest of achievement level. Students' scores in language arts from the MAPS was used as a pretest and posttest to measure the achievement level of students in developmental/college prep English.

To determine if there was any difference in student performance when computer-assisted instruction methods were used to supplement the traditional lecture/discussion methods, achievement levels of groups of students taught only in the traditional lecture/discussion groups were compared to groups of students taught by the integrated lecture/discussion approach supported by a computer-assisted instruction.

Students self-selected one of six available classroom sections of developmental English based on a number of circumstances, such as time offered, day of the week, etc. The six sections, or groups, were then randomly assigned to one of three instructional methods. The research design provided for special attention to the relative differences in performance when two different computer-assisted software programs were used.

Description of the Institution

The study subjects were students enrolled in one of six randomly selected sections of developmental English at a medium-sized southern community college. The institution had an enrollment of 5,972 students, with the student population composed of approximately 86% Anglo-Saxon, 10% African-American, 3% Hispanic, 0.3% Native American, and 1% Other. Females represented 60% of the student population, and males represented 40% of the population. Enrollment figures in College Prep English (ENC0010) for the term showed that there were approximately 180 students in six sections of the course.

In 1992-93, 1,741 students were enrolled in developmental courses. Of those who enrolled in College Prep English (ENC0010), 533 (91%) enrolled successfully completed the course and 53 (9%) did not complete the course. In these courses, the student population was broken down to approximately 64% Anglo-Saxon, 23% African-American, 9% Hispanic, 1% Native American, and 2% Other. Females represented 57% of the student population, and males represented 43% of the student population.

Minimum scores are established by Rule 6A-10.0315, Florida Administrative Code (FAC), which requires that students who score below the recommended minimums on any of eight currently approved tests "shall enroll in college preparatory communication and computation instruction. . ."

In a 1994 survey, Fleishman reported that 15 of the 28 community colleges in Florida require higher scores than the minimum state requirement in order to increase the chances that students will succeed when they enter college-level courses. The college reported in this study is one of those that requires a higher cut-off score.

Research Design

Degree-seeking students who do not satisfy the minimum requirement score of 31 in the English section of the MAPS state placement test must enroll in developmental/College-Prep English (ENC0010). Six sections of this course were taught by two full-time instructors. All classes taught by adjuncts were excluded from this study.

Two sections were randomly designed as traditional sections and were taught in a traditional lecture/discussion method. Four other sections were randomly designed as experimental sections and were taught using two computer-assisted instructional methods integrated with the traditional lecture/discussion method. The experimental sections included two-thirds of the instructional time in lecture/discussion and one-third of the instructional time using a computer-assisted instructional method.

The length of instruction per term was approximately 45 hours. Students enrolled in the computer-assisted sections received 30 hours of traditional lecture/discussion and 15 hours of computer-assisted instruction. Students enrolled

in the stand-alone lecture/discussion sections received approximately 45 hours of classroom instruction.

The analysis of covariance was used to test means of pre- and posttest MAPS scores, controlling for the pretest score (see Table 1). A confidence level of .05 was selected as a rejection criterion of the null hypothesis for each hypothesis. The Statistical Analysis System (SAS) was used to analyze the data.

Table 1

Descriptive Statistics

Method	Pretest		Posttest	
	Mean	N	Mean	N
CAI INVEST	22.458	43	26.686	43
CAI PLATO	20.884	44	26.418	44
Traditional	21.202	36	23.551	36

Two full-time instructors each conducted one traditional lecture/discussion section and each facilitated one section of the computer-assisted program using the INVEST software and one section of the computer-assisted program using the PLATO software. Each instructor was experienced in teaching developmental English education and

experienced with self-paced computer-assisted instruction. Course content (ENC0010) was based on the content in a traditional text, and the same text was used with all groups. Instructional material included basic grammar and paragraph writing.

The first two class meetings of the computer-assisted groups (approximately 50 minutes each) were used to orient students to use of the computer-assisted lab and the appropriate software. Students in computer-assisted groups used specific assigned tutorials for supplemental exercises and assignments. Students in the traditional lecture/discussion groups used text-accompanied workbooks for supplemental exercises and assignments.

During the 15-week instruction period, students in the computer-assisted group were given assignments using the computer-assisted tutorials. Group one received instruction using the INVEST computer-assisted instructional program, and Group two received instruction using PLATO as the computer-assisted instructional program. Both computer-assisted groups were expected to spend a minimum of one hour per week in the lab in addition to classroom time.

The traditional class was taught for 15 weeks using the lecture/discussion method of instruction. Text-based workbooks and handouts were used to supplement the text. In-class exercises and writing assignments for the traditional lecture/discussion group were designed to

present lessons leading to meet the same competencies as those competencies prescribed for the computer-assisted groups.

This research study was designed to determine whether differences exist in achievement levels of developmental English students enrolled in one of two different instructional methods: computer-assisted instruction using one of two different software packages (INVEST or PLATO), or traditional lecture/discussion method. The research design was a pretest-posttest control group design. Students self-selected classroom sections, and the sections were then assigned randomly to one of four computer-assisted groups and two of the traditional groups. The groups were composed of approximately 30 students each. The randomization of student selection of groups through course registration was assumed to increase the chances that the groups were equivalent.

All groups met for 15 weeks and received competency-based instruction from one of two full-time, trained English teachers. Though this study did not control for differences in the teaching styles of the instructors, each instructor had taught developmental courses for several years. The teachers selected for inclusion in this study worked together in developing the curriculum. The curriculum for developmental (college prep) English was competency based and designed to provide a comprehensive system of quality

instruction. Each instructor taught one computer-assisted (INVEST) group, one computer-assisted (PLATO) group, and one traditional lecture-discussion group for a total of six groups.

Faculty were trained in using both computer-assisted programs prior to teaching. The computer-assisted PLATO software has been used with developmental students for several years. The computer-assisted INVEST software was obtained in 1994, and faculty training was conducted prior to the beginning of the 1994-95 school year.

Research Questions and Hypotheses

In order to determine whether one method of instruction was more effective than others, the following research questions were proposed:

1. Is there a difference in achievement among students who are taught developmental English using either INVEST or PLATO software as compared to students who receive instruction through the traditional lecture/discussion method?

2. Is there a difference in achievement among students in Associate of Arts or Associate of Science degree programs who are taught developmental English using either INVEST or Plato software as compared to students who receive instruction through the traditional lecture/discussion method?

Based on the research questions, three null hypotheses were developed:

1. There is no significant difference ($p \leq .05$) in writing scores as measured by the Multiple Assessment Programs and Services Test (MAPS) language arts posttest between community college students receiving computer-assisted instruction using INVEST software and traditional classroom lecture/discussion instruction, when controlling for pretest scores.

2. There is no significant difference ($p \leq .05$) in writing scores as measured by the Multiple Assessment Programs and Services Test (MAPS) language arts posttest between community college students receiving computer-assisted instruction using PLATO software and traditional classroom lecture/discussion instruction, when controlling for pretest scores.

3. There is no significant difference ($p \leq .05$) in writing scores as measured by the Multiple Assessment Programs and Services Test (MAPS) language arts posttest between community college students in Associate of Arts or Associate of Science degree programs receiving computer-assisted instruction using either PLATO or INVEST software as compared to students receiving traditional classroom lecture/discussion instruction, when controlling for pretest scores.

Analysis of Data

A one-way analysis of covariance (ANCOVA) was conducted to analyze the relative effectiveness of the different instructional methods. The alpha level used to test the null hypotheses was set at .05. The scores from the pretests formed the covariate, with the scores from the posttests as the dependent variables and the instructional method as the independent variable. Following the preliminary analysis when significant differences were found, pairwise comparisons were made to look for actual differences among the groups.

Instrumentation

All groups completed a statewide, standardized pretest and posttest of achievement level in English--the Multiple Assessment Programs and Services test (MAPS) (Educational Testing Services, 1984). MAPS was designed by the College Board and includes the Reading Comprehension test from the Descriptive Tests of Language Skills (DTLS), the Test of Standard Written English (TSWE), and the Arithmetic Skills test and the Elementary Algebra Skills test from the Descriptive Tests of Mathematics Skills (DTMS). The tests are each designed to provide information concerning a student's readiness for entry into college courses. The reliability coefficients reported for the MAPS were alpha reliabilities, "computed by a formula that uses agreement between questions on one form to estimate the correlation

between that form and another form of the test" (Education Testing Service, 1984, p. 28). The reliability coefficient reported for the TSWE was .89. Evidence of validity was reported.

The MAPS Test of Standard Written English (TSWE) was used as an indicator of achievement level in English. The TSWE is a 30-minute test containing 50 five-choice questions to measure student achievement in college-level English. The TSWE has been administered since 1974 as part of the SAT. A single score from 0 to 60 is reported on the TSWE (Educational Testing Service, 1984).

Pretests and posttests for all groups were given by a single trained test administrator to all groups to ensure uniformity of testing procedures. The researcher used the students' pretest MAPS scores as a covariate in the analysis. The covariate was used to reduce the amount of unexplained variation in posttest scores, thereby increasing the statistical power of the analysis.

The developmental English faculty have integrated the content of the traditional lecture/discussion curriculum into the materials contained in the INVEST and PLATO computer learning systems. Two-thirds of the instructional time was spent in lecture/discussion, and one-third of the instructional time was spent in computer-assisted instruction. A percentage of the students' grades included

completion of the assigned work using the computer-assisted labs.

INVEST

INVEST is a comprehensive computer-assisted software program designed to enhance the delivery of instruction for academically underprepared students by integrating relevant, adult content in the areas of English, reading, and math. INVEST was developed by Josten's Learning Corporation and released in 1990. The integrated lessons include thinking skills and workplace and functional text applications.

The management system allows teachers to modify and re-order the hierarchy of competencies. INVEST focuses student's time on relevant concept mastery and skill development in an individualized manner. Because it is a new software product, no previously established data on INVEST exists. One of the goals of this study will be to provide information which will add to the validation of the writing portion of the software program.

Developmental English faculty have integrated the existing curriculum at the subject college into the INVEST computer-assisted system. All classes involved used the program for learning activities supplementing the classroom portions of the course. After placement was determined, assignments were made, scored, monitored, and adjusted automatically. The program assesses the students' various degrees of weaknesses and can provide individualized

prescriptions to accommodate student needs. The language skills component includes grammar, mechanics, punctuation, and parts of speech. The writing components include sentence elements, process writing steps, paragraph writing, and correspondence.

PLATO

Programmed Logic for Automated Teaching Operations (PLATO) courseware is a computer-assisted software program designed to assist learners in developing basic skills in reading, mathematics, and language arts. PLATO, considered the "granddaddy" in the field, was developed in the 1970s and undergoes continuous upgrading and improvements (Turner, 1988).

PLATO provides competency-based instruction and sequential skill development in a comprehensive system. Instructors are able to individualize instruction to meet student needs and the objectives of the course. This software targets specific competencies and skill levels, with each module broken into a series of lessons providing flexible learning plans for individual students. The instructional strategies include individualized test/tutorial/drill and practice/application/test throughout the curricula.

PLATO correlates with many national and standardized tests such as the General Educational Development Exam (GED), Test of Adult Basic Education (TABE), and Scholastic

Aptitude Test (SAT). The software has been integrated into the existing curriculum.

CHAPTER 4
RESULTS

The purpose of this study was to determine whether computer-assisted instruction integrated with lecture/discussion would improve student performance in developmental English when compared to a traditional lecture/discussion method. Two types of computer software were compared to the traditional teaching methods used in a community college course in developmental English. The research questions addressed were as follows:

1. Is there a difference in achievement among students who are taught developmental English using either INVEST or PLATO software as compared to students who receive instruction through the traditional lecture/discussion method?

2. Is there a difference in achievement among students in Associate of Arts or Associate of Science degree programs who are taught developmental English using either INVEST or PLATO software as compared to students who receive instruction through the traditional lecture/discussion method?

A total of 180 students participated in the study. The students were from a medium-sized Florida community college and were randomly assigned to one of six groups consisting of 30 students each. One hundred fourteen or 63% were

Anglo-Saxon, 48 or 27% were African-American, 10 or 6% were Hispanic, and 8 or 4% were Other. Females represented 42% and males represented 58% of the students enrolled in developmental English. Attrition and non-reported posttest scores reduced the sample to 123 students.

The research design was a pretest-posttest control group design. A one-way analysis of covariance (ANCOVA) was used to analyze the relative effectiveness of the different instructional methods. Basic skill levels in English were measured by the standardized test, Multiple Assessment Programs and Services (MAPS) Test of Standard Written English. Scores from the pretests formed the covariate, with scores from the posttests as the dependent variables and the instructional method as the independent variable. The .05 level of significance was selected as the level for rejection of the null hypotheses. The analysis of covariance procedures for all three hypotheses were executed with the SAS computer program.

Analysis of Hypotheses 1 and 2

HO1: There is no significant difference ($p \leq .05$) in writing scores as measured by the Multiple Assessment Programs and Services Test (MAPS) language arts posttest between community college students receiving computer-assisted instruction using INVEST software and traditional classroom lecture/discussion instruction, when controlling for pretest scores.

HO2: There is no significant difference ($p \leq .05$) in writing scores as measured by the MAPS language arts posttest between community college students receiving computer-assisted instruction using PLATO software and traditional classroom lecture/discussion instruction, when controlling for pretest scores.

Writing scores on the MAPS posttest were used to analyze first two statistical hypotheses. The means and standard error of estimates are listed in Table 2.

Table 2

Descriptive Statistics for the Two ANCOVAs Addressing HO1 and HO2

Group	N	Mean	Std. Error
CAI - PLATO	43	26.418	1.008
CAI - INVEST	44	26.686	.999
Traditional	36	23.551	1.100

A one-way analysis of covariance (ANCOVA) was used to test both hypotheses to determine the main effect of the instructional methods treatment on the MAPS language arts scores. If the probability factor was less than the level of significance, then it was significant and the null hypotheses would be rejected. The F value calculated was 84.4 and the probably factor was .0001, which exceeds the .05 level of significance. Thus, significant differences

were found between the groups using pretest scores as a covariate. Results of the ANCOVA for the first two hypotheses are reported in Table 3.

Table 3

Summary of Analysis of Covariance for MAPS Language Arts Scores and Interaction Effect with Instructional Method

Source	DF	Sum of Squares	Mean Square	F Value	Pr>F
Model	5	4220.38431	844.07686	20.05	0.0001
Error	117	4924.60756	42.09066		
Total	122	9144.99187			

Source	DF	Type III SS	Mean Square	F Value	Pr>F
Entry	1	3552.40486	3552.40486	84.40	0.0001
Method	2	381.21430	190.60715	4.53	0.0128
Entry*Meth	2	253.18379	126.59189	3.01	0.0532

The one-way ANCOVA for the first two hypotheses operated under the assumption of homogeneous slopes. Therefore, an ANCOVA was run to control for pretest scores. As shown in Table 3, there was no significant interaction between pretest (entry) and the method of instruction. To determine if there was a difference in methods of instruction, further analyses were run on the general linear model. These results are shown in Table 4.

The posttest scores for methods were significantly different from one another. The posttest scores for methods of the computer-assisted groups, PLATO and INVEST, were significantly higher than the posttest scores of the traditional lecture-discussion group. The F-ratio for the computer-assisted groups (INVEST and PLATO) supported the rejection of the null hypotheses at the .05 significance level. Pairwise comparisons were made to look for actual differences among the groups and are presented in Table 4.

As illustrated in Table 4, the mean for the computer-assisted INVEST group was 3.1 which is higher than the traditional lecture/discussion group. The mean for the computer-assisted PLATO group was 2.9, also higher than the traditional lecture/discussion group.

Table 4

Estimates for Differences in the Means for MAPS Language Arts Posttest Scores

Parameter		Estimate	T for HO: Parameter=0	PR > T	Std Error of Est.
Intercept		4.401	1.88	0.0628	2.34324368
Entry		0.889	9.10	0.0001	0.09776396
PLATO	1	2.867	1.92	0.0568	1.49039599
INVEST	2	3.135	2.11	0.0372	1.48792979
TRAD.	3	0.000			

The adjusted mean posttest score for students in group one, PLATO, was 26.418. The adjusted mean posttest score for students in group two, INVEST, was 26.686. The adjusted mean posttest score for group three, traditional lecture/discussion, was 23.551. In this analysis, the null hypotheses 1 and 2 were rejected. There were significantly higher posttest writing scores ($p \leq .05$) of students in computer-assisted instructional groups using INVEST and PLATO, when compared to students in the traditional lecture-discussion group. These results are listed in Table 5.

Table 5

Adjusted Means and Standard Error by Instructional Method

Method	Posttest	
	Adjusted Mean	Standard Error
PLATO	26.418	1.008
INVEST	26.686	.999
Traditional	23.551	1.100

Analysis of Hypothesis 3

There is no significant difference ($p < .05$) in writing scores as measured by the Multiple Assessment Programs and Services Test (MAPS) language arts posttest between community college students in Associate of Arts or Associate

of Science degree programs receiving computer-assisted instruction using either PLATO or INVEST software as compared to students receiving traditional classroom lecture/discussion instruction, when controlling for pretest scores.

In the analysis of data, 76 students stated that their declared degree was an Associate of Arts and 42 listed their declared degree was an Associate of Science. Five students stated that their declared degree was a one-year certificate and were therefore eliminated from this analysis. Table 6 illustrates the means and standard deviations of the computer-assisted group and traditional lecture/discussion group by degree type.

Table 6

Computer-Assisted Instructional (CAI) Methods and Traditional Lecture/Discussion Method by Degree Type

Associate of Arts

Source	N	Mean	Std. Dev.	Std. Error
CAI	56	25.857	7.735	1.034
Trad.	20	25.250	11.276	2.521

Associate of Science

Source	N	Mean	Std. Dev.	Std. Error
CAI	27	28.741	7.906	1.522
Trad.	15	21.267	7.968	2.057

The two-way ANCOVA for the third hypothesis was run to determine if a significant interaction by type of degree existed. The data analyzed revealed no statistically significant interaction between the type of degree (Associate of Arts or Associate of Science). Therefore, the null hypothesis failed to be rejected. There was no significant difference found in posttest writing scores of students when compared by degree type, Associate of Arts or Associate of Science. These findings are reported in Table 7.

Table 7

Summary of Analysis of Covariance for MAPS Language Arts Scores and Interaction Effect with Method for HO3

Source	DF	Type III SS	F Value	Pr>F
Degree	1	2.2832	0.05	0.8190
Method	1	271.7479	6.27	0.0137
Degree*Meth	1	115.7371	2.67	0.1052
Error	113	4901.4381		

Summary of Chapter 4

The hypotheses were formed to test the method of instruction to groups of developmental English students who would achieve greater academic achievement. Analysis of covariance was used to test the hypotheses. In summary, all

groups increased in posttest scores over the pretest scores.

Hypothesis 1 compared the difference in MAPS posttest language arts scores between students receiving computer-assisted instruction (INVEST) and traditional lecture-discussion instruction. Hypothesis 2 compared the difference in MAPS posttest language arts scores between students receiving computer-assisted instruction (PLATO) and traditional classroom lecture/discussion instruction.

There was a significant difference between the INVEST group and the traditional lecture/discussion group, and between the PLATO group and the traditional lecture/discussion group. Therefore, the null hypotheses were rejected. This finding suggests that the computer-assisted groups, INVEST and PLATO, integrated with traditional lecture-discussion, were the most effective instructional methods for teaching developmental English.

Hypothesis 3 dealt with the MAPS posttest scores for students receiving integrated computer-assisted instruction (PLATO and INVEST) or students receiving traditional classroom lecture/discussion instruction, compared by degree type (Associate of Arts or Associate of Science), when controlling for pretest scores. When degree type was considered in conjunction with the instructional method, no significant difference was found when using either the computer-assisted instructional method or the traditional lecture-discussion method. However, a significant

difference (p = .05) was found between the computer-assisted instructional method (PLATO or INVEST) and the traditional lecture-discussion method. Therefore, the null hypothesis was accepted.

CHAPTER 5
SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The problem studied in this research was to determine which method of instruction used to teach developmental English to underprepared community college learners resulted in greater academic achievement. Learning outcomes of groups of developmental English students who were taught using integrated computer-assisted instruction in Associate of Arts and Associate of Science degree programs were compared to learning outcomes of groups of developmental English students who were taught using the traditional lecture/discussion method.

The purpose of this study was to examine whether computer-assisted instruction integrated with a lecture/discussion improved student performance in developmental English when compared to a traditional lecture/discussion instructional method. Two types of computer software were compared to the traditional teaching methods used in a community college course in developmental English. The research questions addressed were as follows:

1. Is there a difference in achievement among students who are taught developmental English using either INVEST or PLATO software as compared to students who receive

instruction through the traditional lecture/discussion method?

2. Is there a difference in achievement among students in Associate of Arts or Associate of Science degree programs who are taught developmental English using either INVEST or PLATO software as compared to students who receive instruction through the traditional lecture/discussion method?

The research study began with a concern for the most effective instructional method to use when teaching underprepared college students in a developmental English course. Another issue for concern was the achievement of developmental English students seeking an Associate of Arts degree as compared to the achievement of developmental English students seeking an Associate of Science degree by instructional method.

In order to determine the most effective instructional method, pretest and posttest scores from the Multiple Assessment Programs and Services (MAPS) Test of Standard Written English were compared by method and by declared degree. Study participants were students at a medium-sized Florida community college who were enrolled in one of six sections of developmental English (ENC0010). The six sections, or groups, were then randomly assigned to one of three instructional methods being tested:

1. Computer-assisted instruction method using INVEST software integrated with traditional lecture/discussion instruction,

2. Computer-assisted instruction method using PLATO software integrated with traditional lecture/discussion instruction, and

3. Stand-alone traditional lecture/discussion method.

All students spent the Fall 1994 semester covering the same competencies. Students enrolled in the traditional lecture/discussion group spent 45 hours in the classroom, whereas those in the computer-assisted groups spent 30 hours in the classroom and 15 hours in the lab. Two full-time, experienced instructors participated in this research study. The MAPS Test of Standard Written English was used as an indicator of achievement in college-level English. All students took the MAPS pretest in August 1994 and the MAPS posttest in December 1994.

Three hypotheses were formed to test which method of instruction used to teach developmental English students would result in greater academic achievement. Analysis of covariance was used to test the hypotheses. All groups experienced increases in posttest scores; however, the computer-assisted groups had the higher MAPS language arts posttest scores. The results indicated that the computer-assisted groups, PLATO and INVEST, were approximately equal.

The traditional lecture/discussion group had the lowest MAPS language arts posttest scores.

Several limiting factors and assumptions affected the study: (1) computer malfunctions, implementation of the software, and lack of experience by the faculty using the software; (2) use of two instructors in an attempt to replicate instructional methods and content; (3) lack of control over instructional approach or presentation; and (4) possible instructor bias in the computer-assisted instructional software.

Conclusions

Comparisons of learning outcomes were made between groups of developmental English students who were taught using computer-assisted instruction integrated with lecture/discussion and students who were taught using traditional classroom lecture/discussion method. The results indicated that computer-assisted instruction integrated with lecture/discussion was an effective instructional method to improve student performance in developmental English.

Based on the findings in this study, computer-assisted instruction was found to be an effective way to instruct underprepared students in developmental English. Analysis of the data using Analysis of Covariance found the following results:

1. A significant difference was found in writing scores between community college students receiving computer-assisted instruction using INVEST software integrated with traditional classroom lecture/discussion instruction, when controlling for pretest scores.

2. A significant difference was found in writing scores between community college students receiving computer-assisted instruction using PLATO software integrated with traditional classroom lecture/discussion instruction, when controlling for pretest scores.

3. No significant difference was found in writing scores for community college students receiving computer-assisted instruction (PLATO or INVEST) or students receiving traditional classroom lecture/discussion instruction, compared by degree type (Associate of Arts or Associate of Science), when controlling for pretest scores.

These results were consistent with the research of the literature on the instructional methods for teaching developmental English students. The open-door policies of community colleges have provided new opportunities for students with diverse backgrounds, many of whom are academically unprepared for college (Roueche and Roueche, 1993; Richardson & Elliott, 1994). To assist the needs of the underprepared student, "college preparatory" or "developmental" programs were developed. Teaching methods in these programs usually give students more structure, more

feedback, and more support than they would have in a conventional course (Kulik & Kulik, 1991). Two methods of instruction were analyzed in this study: traditional classroom lecture/discussion and computer-assisted instruction integrated with lecture/discussion. Early studies found that the traditional classroom approach was successful; however, technological developments during the past decade have caused the instructional methods to dramatically change (Lowe & Bickel, 1993).

The number of underprepared college students is expected to grow. At the same time, business and industry are demanding increasingly higher skills for employees. For those students who anticipate entering the workforce upon graduation, an Associate of Science degree will be their declared degree. With this in mind, the researcher attempted to review the research available comparing developmental English students by declared degree, Associate of Science or Associate of Arts. The search was limited. However, the literature did appear to support evidence for teaching developmental English students by the computer-assisted instructional method (Kulik & Kulik, 1991; Boylan, 1983).

It appears that, whenever possible, computer-assisted instruction integrated with classroom instruction should occur so that both methods support and enhance one another. Developmental English students apparently benefit from the

computer-assisted instructional method and appear to be more successful in learning when this method is integrated with the traditional classroom lecture/discussion method. It does not appear that there is any difference in the method used when comparing students whose declared degree is an Associate of Arts to students whose declared degree is an Associate of Science.

Recommendations

The findings of this study indicated that computer-assisted instruction is an effective method of teaching developmental English. The results may assist developmental English faculty and administrators in determining the most appropriate method for teaching underprepared English students.

Computer-assisted instruction can provide developmental English faculty with an effective alternative to the traditional lecture/discussion method and assist instructors in developing integrated teaching methods that improve student performance. To effectively implement the instructional techniques, regular faculty development workshops should be conducted to familiarize new faculty with the software and to discuss instructor concerns about student performance.

The difference between the two types of software programs was not statistically significant. The results did agree with other research studies, however, that computer-

assisted instruction is an effective means for teaching developmental courses. The recommendations include using either PLATO or INVEST computer-assisted instructional software integrated with traditional classroom lecture/discussion. It is not recommended that either the traditional lecture/discussion or computer-assisted instructional software be used as a stand-alone method of teaching developmental English.

This study has implications for further research utilizing additional computer-assisted instructional software, especially as new software is introduced. Analysis of underprepared learners by gender, age, and even learning styles would provide additional data for understanding the way individuals interact in an educational environment that includes computer-assisted instruction.

Further research is needed to investigate the lack of a significant relationship between language arts posttest scores of students enrolled in Associate of Arts degree programs and scores of students enrolled in Associate of Science degree programs.

A replication of this study might also include data from other colleges that offer developmental English courses using a variety of educational methods. Additionally, other content areas such as developmental math and developmental reading programs may benefit from this type of study.

The use of computer-assisted instruction has been shown in this study to be an effective delivery method for teaching writing skills and is another example of the impact of computers and technology on the educational environment. The demand by business and industry for better trained and more skilled employees, coupled with the trend toward home and business use of computers, is a trend that also supports use of computers in instruction and skill development.

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BIOGRAPHICAL SKETCH

Cheryl H. Fante was born in Tampa, Florida, on May 8, 1950. She attended local schools, including the University of South Florida where she received a Bachelor of Arts degree in business education in 1977 and a Master of Arts degree in business and vocational education in 1981.

Since that time, she has taught business subjects for three years at Robinson High School in Tampa and as an adjunct instructor for Hillsborough Community College. In 1983, Cheryl and her family moved to Ocala, Florida, where she began a career at Central Florida Community College. She started as an adjunct instructor and continuing education coordinator, then advanced to Dean of Continuing Education, and currently is Dean of the Business Division.

Mrs. Fante has been married to Norbert J. (Joe) Fante, Jr. since 1976. They have two children, Laura C. Fante, 14, and Joseph Q. Fante, 11. She is active in many civic and community organizations.

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