

THE USE OF TECHNOLOGY IN DEVELOPMENTAL EDUCATION

by

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A DISSERTATION

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ABSTRACT

While the topic of who is responsible for addressing the issue of developmental education is being discussed at the national level, it is also presently being discussed in the Alabama postsecondary arena, where committees and symposiums are forming to discuss this topic. While nothing has yet been resolved, it still bears some study since developmental education is an important function for most community colleges.

This study adds to the current data of the success of students who take developmental courses. Most of the studies done on the topic of developmental education focus on the comparison between students who had remediation with those who did not. There is not much data that compares the type of instruction given in remedial courses and how the different types of instruction affect student learning outcomes. This study compared two different methods of instructional delivery in a developmental English classroom, straight lecture based classrooms and classes where some type of technology was used to deliver course material, and evaluated the learning outcomes for each class.

DEDICATION

I dedicate this to my husband, Rick, who has been supportive and encouraged me through this process, and my children, Alyson and Erik, who were understanding when Mom had to miss a band concert or show choir competition because I had to do school work, and to my parents, Jerald and Lois Berg, who instilled in me my love and passion for education and learning.

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CHAPTER 1

INTRODUCTION

The use of technology in developmental education and whether it is effective in student learning outcomes is an issue on community college campuses today. With community colleges being responsible for teaching remediation courses in higher education today, the validity of different methods of teaching students must be evaluated. The issue of who is responsible for teaching developmental education has been ongoing in higher education over the years, so “it is not surprising that remediation remains an important issue for colleges and universities” (Caboni & Adisu, 2004, para. 1). Kozeracki (2002) points out that high schools are failing to provide the level of education students need in order to succeed in college courses and goes on to state that 4-year institutions across the nation are considering implementing policies where students who need remedial courses will attend community colleges to get their remediation before transferring to 4-year institutions. The rationale he provides is that community colleges are better equipped to provide these courses for students. Since community colleges are the primary institutions that provide remediation for students, it is imperative that community colleges evaluate their current methods of course material delivery to see which method is best meeting and serving the needs of these students.

A study conducted by the Southern Regional Education board found that “over 90% of the public colleges and universities surveyed had remedial/developmental programs” (Abraham, 1991, para. 1). Researchers have analyzed the types of students who are enrolling in developmental education courses and why these students need remediation. Perin (2002) stated

that high schools are not adequately preparing students for college courses and more students from diverse ethnic and educational backgrounds want a college degree, so developmental education is essential to students who want a college education. Along with students from different backgrounds, community colleges are admitting a substantial number of students who are over the age of 25. These students are classified as non-traditional.

The age of developmental education students is an important variable to analyze if institutions are going to provide the most effective tools to teach these students. A 1992 study conducted by the National Center for Education Statistics showed that “45% of all undergraduate and graduate students were over the age of 25” and that the higher education arena was not meeting the needs of these students (Miglietti & Strange, 1998, para. 1). The study also showed that older students, or nontraditional students, bring many different ideas into the classroom, such as goals, learning styles, and instructional needs (Miglietti & Strange, 1998). As college enrollments see an increase in students over the age of 25 and students from diverse backgrounds, meeting the specific needs of this changed student demographic is paramount.

Miglietti and Strange (2002, para. 2) stated, “Serving students well should include examining students’ preferences for different learning styles as well as their expectations of the classroom environment.” Levin and Calcagno (2008) stated that community college students who are identified and are taking developmental coursework come from very different backgrounds. Some of the traditional students may not have done well in high school; some of the nontraditional students may have done well in high school but it has been a while since they have been in a classroom. As a result they need a refresher on some basic skills. There are also students who may have the skills but English is not their primary language; therefore, they struggle with basic concepts. Researchers go on to state, “This tremendous variety of student

types suggests long-term solutions must be diverse (Levin & Calcagno, 2008, para. 1). Migletti and Strange (1998) found that the educational needs of many of these nontraditional students have not been met by many institutions of higher education. They add, “Adult learners bring to the classroom unique learning interests, educational goals, and instructional needs. Are educators responding appropriately?” (Migletti & Strange, 1998, para. 1).

With diverse student populations--including increasingly broad inclusion of ethnic backgrounds and age--entering higher education and being placed into developmental education courses, institutions, especially community colleges, need to reevaluate the methods of teaching developmental courses and assess whether or not these methods are effective in meeting the needs of developmental students. Since there is not much data currently available that focuses on the effectiveness of other types of course methods of delivery, many instructors are sticking with methods with which they are familiar and that they know will work. One method is the skill-and-drill method--lecturing on a skill and then giving tests to see if students have grasped the skill. This skill-and-drill method is one teaching method that students were exposed to in high school that may have contributed to their difficulties in the first place (Levin & Calcagno, 2008).

Levin and Calcagno (2008) found that developmental education instructors do not favor the so called “drill-and-skill” approaches to learning. These authors go on to state that these skill-and-drill concepts may prevent students from “seeing the usefulness of what is being taught in real-world situations and from applying the skills that are learned later to academic and vocational coursework” (Levine & Calcagno, 2008, para. 1). As college enrollment grows more diverse, meeting the instructional needs of an ever-“changing student population is paramount” (Migletti & Strange, 1998, para. 1). Community colleges must examine how they are teaching

developmental courses and reevaluate the methods they are using to make sure the methods they are using are the most effective methods for students in these classes.

Modifying the methods of course material delivery in the classroom and assessing the effectiveness are two areas of developmental education that need to be addressed. Levin and Calcagno (2008) state, “Adopting alternative instructional strategies and technologies is another approach to remediation” (para. 1). They go on to state that the techniques that can be used are technology and computer driven programs and skills. Some institutions have begun using even more integrated computer components that require students to work at their own pace and on skills that are specific weak areas that have been specifically identified for each student. These self-directed programs give useful feedback to these underprepared students that will provide helpful information and guide them, through positive feedback, on how they can correct and improve in these areas (Levin & Calcagno, 2008). With community colleges looking for different methods of teaching developmental courses and the effectiveness of these strategies, the make-up of the students in the classroom also needs to be considered. Factors that institutions need to look at when evaluating the effectiveness of developmental education curriculum are traditional versus nontraditional, age and gender of the student, and what methods of course material delivery are the most effective for successful student-learning outcomes.

While these factors will provide valuable data for institutions to use to modify and improve their developmental education programs, “the majority of community colleges do not know how effective their remediation is because they do not assess their effectiveness very well, do not know how to assess it, or do not want to” (Kozeracki, 2002, para 1). Many institutions evaluate the success of developmental students by their successful completion, a passing grade, in the developmental course or by their success in college-level courses (Kozeracki, 2002). Most

studies have analyzed this type of data to measure effectiveness, but “most recent studies have focused on the program components and have found some commonly cited elements that are associated with students’ success in developmental programs” (Kozeracki, 2008, para. 3). A few elements that are noteworthy are the assessment and placement of new students into developmental courses, more focus on the design and delivery of these courses, and more attention to the “social and emotional development of students” (Kozeracki, 2008, para. 4).

Background

An issue surrounding developmental education is whether developmental education belongs in higher education at all, and, if so, whether it should only be taught at the community college (Kozeracki, 2002)? Community colleges and 4-year institutions are trying to figure out where developmental classes need to be taught. The open admission policies that began in the 1960s meant that students who were not adequately prepared for college were not denied access to college (Kozeracki, 2002). Many 4-year institutions were pressured by their governing bodies to discontinue their offerings of remedial education, and the burden of educating these students was then placed on the community colleges by their governing bodies to offer remediation and to prepare students for college-level courses (Brothen & Wambach, 2004). The National Center for Education Statistics in 1996 reported, “99% of public community colleges offered remedial courses in at least one subject” (Boylan & Saxon, 1999, para. 1). If community colleges are offering remedial courses, then community colleges need to focus on how to best instruct these students so that they stay in college and are successful in college-level courses.

While the burden of remediation falls on the community colleges, what led to this increase in the need for remediation? Cohen and Brawer (2003) outlined that the increase in

remediation was no surprise based on the scores made on nationally assessed tests that are given to students before entering college. Between 1900 and the 1950s, the academic achievement of students entering college showed gradual improvement. There was an accelerated improvement between the mid-1950s and the mid-1960s and a widespread decline between the mid-1960s and the late 1970s before leveling off in the early 1980s (Cohen & Brawer, 2003, p. 255). An explanation of this decline can be based on the coming of age of the first generation that was reared on television and an attitude that the written word is not as important as it once was before the invention of television. Cohen and Brawer (2003, pp. 256-258) also looked at the increasing number of students whose primary language is not English and the decline in academic requirements at all levels of school and noted that the decline in academic requirements was an issue that could be changed. In the 1960s and 1970s, schools in the United States put less emphasis on writing and grammar and focused more on “creative expression” in writing. With this shift in academic requirements turning out students who are not prepared for college, the focus on developmental education in community colleges needed to reevaluate on how best to meet the needs of these students who require developmental courses.

A goal of community colleges is to help the underprepared student. There is a consensus among most community colleges that “serving the underprepared students is an important part of the community college mission” (Oudenhoven, 2002, para. 6). If community colleges want to succeed at meeting this goal, they must look at their current developmental education curriculum to see if the needs of these students are being met (Cohen & Brawer, 2003, p. 263). The integration of students from diverse backgrounds and educational needs into the higher education arena, especially at the community college level, indicates a need for more diverse approaches to teaching and learning at the 2-year college level. In order for community colleges to affect

changes in their curriculum, they must first identify and understand the types of students they serve. Three classifications of students that community colleges must deal with are age, ethnicity, and gender.

When looking at the age of students in community colleges, there are two distinct categories: traditional and nontraditional. The traditional students are those who have just completed high school and are between the ages of 18 and 24. The other classification of student is the nontraditional or “adult learner,” who is 25 years or older and who has worked or raised a family before enrolling in college. Jenkins (2005) in *The Chronicle of Higher Education* reports, “Two-year college students are such a marvelously diverse group, they can hardly be called a group at all” and continued that “demographers may tell us that the typical community college student is a 27-year-old woman with 2.5 kids, but beyond that rather meaningless statistical analysis, there really is no ‘typical’ community college student” (para. 6). One study noted, “Adult learners bring to the classroom unique learning interests, education goals, and instructional needs. Are educators responding appropriately” (Migliette & Strange, 1998, para. 2)?

A nationwide campus survey conducted in 1990 found “6 million students over the age of 25 are studying for college credit each year” and that “two-year colleges have been more successful than four-year institutions in attracting non-traditional learners” (Miglietti & Strange, 1998, para. 1). According to Cohen and Brawer (2003), when the competitiveness between universities and community colleges began in the 1970s, “the proportion of academically well-prepared students going to community colleges shrank” (p. 260). The well-prepared students were choosing universities over community colleges, which left more underprepared students attending community colleges. This created the dilemma at most community colleges on how to

teach these underprepared students. One study outlined that “over 40% of first-year students at public two-year colleges take remedial courses” (Bettinger & Long, 2005, para 1). Another study found that “42 percent of community college students are now under the age of 22--an increase of 10 percentage points in the last decade” (Jenkins, 2005, para. 20).

Along with differences between the ages of community college students, community colleges are also seeing an increase in the number of immigrants and students from different ethnic backgrounds seeking degrees. A recent “Current Population Survey” found that in March 2000, “28.4 million foreign-born persons resided in the United States, comprising over 10% of the country’s population” (Szelenyi & Chang, 2002, para 1). The highly diverse population coming through the doors of community colleges today is substantially different than from years ago. These immigrants bring different needs and education aspirations as well as achievements and qualifications to higher education (Szelenyi & Chang, 2002). The challenge is for institutions of higher education to meet the needs and expectations of these students (Szelenyi & Chang, 2002). One issue that community colleges need to address concerning immigrant students is what the community colleges must do to ensure that immigrant students are able to achieve college degrees (Szelenyi & Change, 2002).

Gender is a variable that should be considered when looking at the type of students who take developmental courses. Boylan (1987, para. 5) concluded, “The percentage of White males attending colleges and universities will stabilize” and continued by stating that enrollment of non-White males and, White and non-White females will increase. According to a study conducted by Abrahams (1991), concerning gender in developmental math courses, “gender differences are small.” Abrahams (1991) also found that public two-year colleges had a difference of 32% male verses 37% female of full-time freshmen in developmental programs.

The study concluded, “The higher remedial rates for females rather than males lead to a question of whether this reflects the typical performance pattern of females on most math skills tests” (Abrahams, 1991, p. 8).

Community colleges that focus on meeting the needs of diverse students in developmental education need to take into account different ways of teaching all students. According to Oudenhoven (2002, para. 1), “there is no one-size-fits-all solution.” In many community classrooms, the skill-and-drill method is being changed to incorporate different types of technology. Emerging technology in the classroom is being stressed much more in today’s educational environment. The technology being used in the classroom involves anything from individualized computer-generated programs with online components to in-class classroom performance systems. Means (2001) stated that “schools that incorporate the technology of the future can offer the best combination of traditional face-to-face instruction--role modeling, socialization, and morale building--along with projected benefits of learning with new technologies” (p. 61). Educators are adapting their classrooms and their teaching styles to keep up with this trend towards the use of technology (Grasha & Yangarber-Hicks, 2000). Lecture-based classes are now being changed to facilitate the technology added into the classrooms. Because of constant changes in teaching methods, “the traditional methods of teaching, individual classrooms as a standard curriculum for all students are fading (“Designs,” 1998, para. 28).

Because students are being exposed to technology in every aspect of their college life, from checking e-mail to distance education, what impact is the use of personalized instruction and classroom performance system technology in the developmental classes having on student learning outcomes? The developmental classes tend to have students who need one-on-one,

hands-on teaching to learn and retain the material needed to progress to the next class.

Technology is new, and “the likely uses of technology in the classroom have possibilities for application that benefit students with intellectual strengths as well as those with a variety of learning styles” (“Creating Learning Centered Classrooms...”, 1998, Technology, Learning Styles, and Multiple Intelligences). One researcher stated, “Technology can become the pencil of tomorrow. With the most appropriate tools of today, students will be better prepared for the world of tomorrow” (Meltzer, 1996, para. 5).

Problem Statement

With shifts in education becoming more technology-based, should the effectiveness of technology used in developmental education be assessed? Ehrman (1999) emphasized the value of technology by stating that “technology (in the broadest sense of that term) is providing a foundation for the reorganization of higher learning.” One article noted, “There is little doubt that technology has the potential to enhance teaching and learning, but there is a lack of agreement on how it should be used for improving academic productivity and enhancing higher learning” (Ma, 2004, para. 2).

As the trend seems to be technology use in higher education classrooms, institutions need to evaluate and assess whether the technology being integrated into the classroom is truly beneficial to students’ learning outcome for that course, especially the developmental classroom. Studies that have also evaluated the “outcomes of developmental education seem to indicate that remediation is, in fact, quite effective in improving the chances of collegiate success for under-prepared students” (Kozeracki, 2002, para. 1). Kozeracki goes on to state, “Success for developmental students is often defined as the completion of the developmental course” (para.

2). The completion of a course is an effective measurement of a students' success in a course, but what also needs to be evaluated in this final grade is what methods were used in the classroom throughout the course to help the student achieve this final grade. By using the successful completion of a course and the method of course material delivery, colleges can get an accurate assessment on what works in the classroom. The effectiveness of course material delivery, which includes technology, must be assessed. There needs to be more research on how technology, specifically personalized instruction, and classroom performance systems, in a developmental classroom affect students' learning outcomes in the course.

Purpose of the Study

The purpose of this study is to assess the effectiveness of personalized instruction and classroom performance system technology use in developmental English courses on student learning outcomes. This study will not look at distance education as a method of delivery but will look at courses where individualized computerized material, as well as in-class classroom performance systems, were the primary method of delivery and will analyze the effectiveness of this method of delivery. Most distance education courses do not have face-to-face interaction between students and instructors, and there may be lag time between when a student asks a question and the instructor's response. There is little opportunity for individualized and immediate feedback between student and instructor. Many institutions also purchase license agreements for software and programs and some have restrictions on how many students have access to the software. This is a problem for distance education students.

The students will be given direction for what needs to be done to complete the course successfully. The students in these classes will use interactive methods, such as a response

system, and computer-generated exercises and tests to assess their understanding of the material. These classes will receive some material verbally from the instructor, but most of the work will be individualized with computerized material. Research shows that because technology is becoming more streamlined and integrated into education today, instruction will begin to move away from the traditional lecture-based approach and incorporate different technology to enhance the learning experience (“Designs,” 1998).

Before technology was an integral part of higher education, students were given homework assignments in the form of handouts from a textbook or other resource that were completed outside of class and turned in to the instructor at the next class meeting. The instructor then collected the completed assignments and graded them. For the classes where instructor-prepared assignments were given and turned in, students were usually given some type of feedback from the instructor, whether a letter grade or written comments, but many times it was not immediate. Students had to wait until the instructor graded the assignment and gave it back, which could be days later. The instructor may have already moved on to another concept before handing back the assignment or test and would have lost the opportunity for review. Even if the instructor did review the test or assignment, students may not have been as attentive to the instruction because they had already moved on to something else. Also, if the course were a building block where one concept was a step to the next level and so on, if the students did not understand the concept and failed the test/assignment, they may have then struggled with the next level and may have possibly gotten behind in the course. Another option may be that the instructor just hands back the assignment or test and does not provide a review; the students only receive their grade without any explanation or opportunity for explanation or questions.

In the lecture-based classrooms, after an instructor has explained material, the teacher may ask if students have any questions. This is how the instructor makes sure students understand the material for a test. When an instructor reviews for an exam and asks if anyone has any questions, most students are reluctant to raise their hands for fear of feeling foolish or asking a “dumb” question. Instructors assume, then, that everyone in the class understands the covered material. There are now computer software programs that eliminate the reluctance of students to ask questions because the responses to questions are anonymous.

Today there are interactive methods and individualized computer programs that students in developmental courses are using to enhance their understanding of the material. Remote systems are just one example of an interactive method. Students are given a remote control to answer questions that are projected on a screen. Once students answer the questions, they are given immediate feedback on assignments. Not only do they get immediate feedback, the results of the questions are anonymous, so students in the class do not know who answered the question correctly and who missed the question. Based on the number of students who answered the question correctly or incorrectly, the instructor can provide an immediate review of the material before going on to another concept or idea. If there is a pattern of missed questions by a majority of students, an instructor can then reemphasize the concept by providing more material for students to complete and study so that they will eventually grasp the concept and be able to move on to the next concept.

This individualized instruction may work well for some students who are self-motivated and can do the work with little guidance, but what about those underprepared, older students who struggle with using computers and other technology devices? Are the technology-enhanced classrooms helping or hindering students? There has been little research that focuses on the

learning outcomes of developmental education students who were in classes where individualized computerized material and classroom performance technology was used as the primary method of teaching.

Significance

While the topic of the effectiveness of using some computer-generated and classroom performance technology as a method of course material delivery in developmental education is an issue that is beginning to become a national forum, it is presently being discussed in the Alabama postsecondary arena. Committees and symposiums are currently forming that are researching different types of technology and how they can be used in the developmental classroom. In October of 2010, Dr. Jill Biden, wife of Vice President Joe Biden, hosted the first White House Summit on Community Colleges. The purpose of this summit was to engage talk in the important role that community colleges play in preparing students for the work force. The summit will provide, “educators, administrators, students and other stakeholders to participate in the discussion about improving community colleges for the future.” (Community College Summit, 2010). While nothing has yet been resolved, it still bears some study since developmental education is an important function for most community colleges.

This study will add to the current data that addresses the success of students who take developmental courses. As Bettinger and Long (2005, para. 2) point out, “Despite the growing numbers of underprepared students who enroll in remedial courses at community colleges each year, little is known about the causal effects of remediation on student outcomes. Most of the studies on the topic are descriptive and provide only simple comparisons between remediated and non-remediated students.” There is significant data that compares the success of students

who took remediation with those students who did not. McMillan (1997) points out, “Most studies compare the performance of students who completed recommended remedial/developmental coursework to that of students who did not require developmental coursework” (p. 26). But there is not much data that looks at how technology use in remedial courses affects student learning outcomes. Seybert (2002, para. 2) states, “Relatively little assessment work is evident and much remains to be accomplished in assessment of remedial and developmental programs.” One study concluded that more research is certainly needed on the issues of technology as colleges continue to expand the use of technology both inside and outside higher education (Grasha & Yangarger-Hicks, 2000).

This study will look at two types of technology--personalized computer-based instruction and in-class remote classroom performance systems--used in developmental English classrooms and how this technology affects student-learning outcomes. As Banta (2004) concludes, “Assessment experts recognize that if assessment is to improve learning, then processes and practices as well as outcomes must be assessed” (p. 6). Banta (2007) goes on to state that she is an “advocate of appropriate (i.e., valid and reliable) assessment that can improve student learning” (p. 1).

While this study would add to the ongoing research of developmental education, it will also provide valuable information for community college administrators who prepare annual budgets and request funding. This information will help administrators budget for the best materials that will benefit students. The amount of money that is currently being used for developmental courses in the United States is “only 1% of the U.S. higher education budget” (Brothen & Wambach, 2004, para 2). Astin (1998) concluded that “the education of the remedial student is the most important educational problem in America today” and that providing

effective remedial education would help to alleviate some of the most serious economic and social problems today (para. 4 and 5).

Changes in developmental education might lead to greater success and provide a new future for developmental education (Brothen & Wambach, 2004). If community colleges continue to improve developmental education programs, colleges can continue to meet the needs of their students. One study found that “over 1.2 million students participate annually in community college remedial courses and 99% of the nation’s public 2-year institutions offer remedial courses” (Boylan & Saxon, 1998, para. 1). As Brothen and Wambach (2004) stated, developmental courses are a difficult challenge for those who teach these courses and that developmental education needs to be taken more seriously and given the appropriate level of focus and stature. Traditional methods of teaching are giving way to new and innovative methods. One study outlined “the increasing emphasis on lifelong learning is having a tremendous impact” on how institutions in higher education structure courses (“Designs,” 1998, para. 30).

Levine (2004), based on the findings in his study, argues that in the next 5 years, the nation’s 2-year colleges will face a substantial increase in enrollment during a time of economic cutbacks and reduced resources. This clash of supply and demand will raise the question in higher education about the mission of the community college (Levine, 2004). Community colleges will face an onslaught of students who want access to college. This is due to the coming of age of baby boomers, immigration, job competition, and the need for retraining due to company downsizing. Another problem created with this increase is too few faculty members to teach and limited space. Community colleges are going to have to choose what their focus should be. Community colleges will have to re-evaluate their priorities based on the community they are

in and the climate of the citizens. Since World War II, community colleges have been able to provide an education to anyone who wanted one. Kozeracki (2002, para. 1) commented that the amended open admission policies that began in the 1960s meant “inadequate academic preparation was no longer a barrier to college access.” Since their inception, community colleges have always allowed open access to all. If that access is denied or if the community colleges are forced to offer a limited number of courses or, for that matter, if they are limited to teaching only developmental courses, then students will be denied access to higher learning (Cohen & Brawer, 2003). Also, without significant additional funding, community colleges may have to begin turning away students or at least reevaluating their mission. Because developmental education is part of the community college, research needs to continue so that there is proof of the validity and necessity of developmental education and its need in the community college.

Chapter 1 outlined the statement of the problem, purpose, and significance of the study. This chapter also gave an overview of the methodology. Chapter 2 will provide a review of literature that outlines the role of developmental education in the community college, types of technology being used in the classroom, and how the use of technology in developmental education affects student-learning outcomes. Chapter 3 will explain the methodology used for the study as well as research instrument and data collection procedures.

CHAPTER 2

REVIEW OF LITERATURE

This chapter will begin with a review of the literature that addresses the role of developmental education in the community college and how specific types of technology used as a method of course delivery is affecting student learning outcomes, particularly in developmental English classrooms. This chapter will also examine literature that discusses the types of technology that are available and are being used in classrooms today and will conclude with how competency-based learning models can be used to evaluate how the use of technology is affecting student learning outcomes in the developmental classroom. The purpose of this review is to provide an understanding of the role of developmental education in the community college and how some types of technology as a method of course material delivery is affecting student learning outcomes in the classroom.

History of the Community College and Developmental Education

Cohen and Brawer (2003), in their book *The American College*, outline the inception of the community college that can be traced back to the early part of the 20th century. Publicly supported universities that had been formed because of the Morrill Acts of 1862 and 1890 primarily provided agricultural training and also provided teacher training. These were the main goals of these institutions. But with an increased strain being put on these public institutions by people who wanted more diverse programs and goals beyond agricultural and teaching, there was a need for another type of institution. Community colleges were then formed to deal with the

increasing demands put on all levels of education. With the boom in industry and the need for highly skilled workers, community colleges grew (Cohen & Brawer, 2003).

From the beginning, there were two distinct names given to community colleges: junior colleges and community colleges. Up until the 1940s these institutions of higher learning were known as junior colleges. These junior colleges were either branches of a larger, state-funded institution that was controlled by state boards or district junior colleges that were run by the local school board. In 1922, a junior college was defined “as an institution offering two years of instruction of strictly collegiate grade” (Cohen & Brawer, 2003, p. 3). Students who attended a junior college received their lower-level courses. Many junior colleges provided a different curriculum based on the needs of the students who attended, but the quality of instruction was on a college level.

The American College traced the history of the community college. The authors found that during the 1950s and 1960s, the junior college was redefined and often referred to as lower divisions of private universities or 2-year colleges that were supported by a church. The term “community college” was used for the publicly supported, “collegiate grade” institutions. By the 1970s, community college was applied to both types. Today the community college is defined as “any institution regionally accredited to award the associate in arts or the associate in science as its highest degree” (Cohen & Brawer, 2003, p. 5).

According to Cohen and Brawer (2003, p. 11), there are many reasons for the growth of community colleges early on. One argument is that with the increase of high school students wanting additional schooling, there was a need for additional institutions. Another argument is the increase in technology-gearred industries that required skilled workers. Still another argument for the increase in community colleges is that local governments saw these institutions in their

community as prestigious. Owen and Demb (2004) stated that community colleges were considered successful if they geared their curriculum to meet “the educational needs of their communities” (p. 637). They went on to say that the community colleges that changed “to include a major focus on perpetual learning for adults, workplace learning and occupational preparation” were the ones that lasted (p. 637).

While the number of community colleges being built has stabilized over the years, the number of students attending has increased. Kozeracki (2002) outlined that with the open admissions policies that began in the 1960s, more students who were not academically prepared for the 4-year colleges were flocking to the community colleges. With the increase in the number of underprepared students entering college, the community colleges had to refocus and provide a college education for all students, even those who were not financially able to afford or were not ready academically to attend a 4-year institution. The community colleges were affected more with the changes in the college population than the 4-year institutions. In the 1920s, there was not as much of a difference in numbers of students attending community colleges as those who were going straight to 4-year institutions as there was in the 1980s (Kozeracki, 2002). Since more students were attending a community college before going to a 4-year institution, the mission of the community college had to change. These community colleges now had not only to provide a quality education, but they also had to adapt and meet the challenges of the community (Cohen & Brawer, 2003). The mission and goals of the community college had to change.

Many students were attending community colleges before going to a 4-year college, so community colleges had to begin offering academic transfer courses. According to *The American Community College*, many community colleges began offering vocational and technical training for those who did not want to go to a 4-year institution but wanted to learn a skill to get a job.

Community colleges also had to begin addressing the needs of the underprepared students. The change in emphasis of community colleges brought about new obstacles (Cohen & Brawer, 2003). Owen and Demb (2004) noted, “Successful community colleges responded to the educational needs of their communities” (p. 637). The educational needs of these communities changed as the jobs became more technical and required skilled workers. Perin (2002) noted community colleges were important to communities and to higher education. Because of the changes in the climate of the community, community colleges had to adjust their focus and mission and offer courses that would benefit the jobs in the community. Since many of the students entering community colleges had come from manual labor and agricultural jobs or had been out of school for a while, many needed basic instruction in math, English, and reading. It became the role of the community colleges to offer these courses so that students could then advance to college-level courses (Perin, 2002). Perin went on to state that along with changes in communities, “ineffective high school education and increasing ethnic and linguistic diversity are combining to make developmental education critically important for individuals who wish to participate in postsecondary education” (para. 1).

The need for developmental education at community colleges also grew as the percentage of poorly prepared students in secondary schools flocked to the community colleges (Cohen & Brawer, 2003). Attewell, Lavin, Domina, and Levey (2006) stated that “remedial courses have been a regular part of the Ivey League universities and other colleges from the Colonial period to the present” (p. 888). The number of colleges that were offering developmental classes and the number of students who needed to take these courses remained stable. With the stabilization, many of the 4-year institutions stopped providing developmental courses as part of their curriculum (Attewell et al., 2006).

In *The American College*, remedial work has been a part of the curriculum at most junior colleges since 1920, but the number of students needing remediation increased greatly in the years since. The most notable disparity in developmental education took place in the 1960s when the basic academic education in secondary education began to break down. Along with the decline in basic skills in high school, there was also a larger percentage of students entering college (Cohen & Brawer, 2003).

Cohen and Brawer (2003) pointed out that until about 1940, the term used for the classes for the underprepared students was remedial. But since the 1990s there has been much debate as to how to define these courses. Many people who teach these classes have moved away from the term remedial and have been using the term developmental. As one author put it, the term remedial has a “curative connotation of a medical model that posits the courses as remedy that will fix the student or some weakness exhibited by the student” (Kozeracki, 2002, para. 2). Kozeracki (2002) further argues that the remedial approach focuses on one area of weakness a student may have and assumes that by fixing that one area, a student will have learned what was needed and be ready to move on. With the remedial approach, it is assumed that a student has failed to grasp one specific skill, while with the developmental approach, the underprepared student was “not one who failed, but one who could succeed” (Kozeracki, 2002, para. 5). According to Kozeracki (2002), in 1984 the term “remedial” was removed from the *Journal of Developmental and Remedial Education* and is now titled the *Journal of Developmental Education* to reflect the change from a specific skill deficiency approach to more of a refresher approach.

Since the “purpose of remedial education is to provide underprepared students with the skills necessary to succeed in college and gain employment in the labor market” (Bettinger,

2005, para. 1), it is then the responsibility of community colleges to serve students by “examining students’ preferences as well as their expectations of the classroom environment” (Miglietti & Strange, 1998, para. 2). Businesses are struggling with an under-skilled workforce. Companies are looking to community colleges to provide better-prepared workers, and one way to do this is to offer developmental courses (Kozeracki, 2002). By producing workers who are better prepared for the workforce, community colleges are able to provide job placement as one way to assess the effectiveness of their developmental programs.

History of Alabama Community Colleges

In an article written by Katsinas (1994), former Alabama Governor George Wallace formulated that the best bargain for education in Alabama was the community junior colleges and technical institutions. Katsinas (1994) emphasized that these institutions were located all across the state and made available a postsecondary education for anyone who wanted an education. Katsinas (1994) went on to state there were no barriers for admission, the cost of tuition and fees was low, and the funding for these institutions was provided by the state. There was no drain on the local communities. The community college system in Alabama has changed over the years, but it is still the best value today to get a college education for anyone who wants one. Alabama, along with other states, is trying to keep the dream of an education alive for all people. Katsinas (1994) stated the idea of prestige for the community was evident with the creation of the Alabama community college system. Between 1965 and 1975, there was a dramatic increase in the number of community college campuses in the state. It was postulated that almost “one new community college opened each week” (Katsinas, 1994, p. 447). Any community in the state of Alabama that wanted a community college got one.

Because remedial education has been shifted to community colleges all across the country, Alabama is addressing the issue of developmental education by offering opportunities for educators, administrators, and legislators to discuss this issue in the 2-year college system. While the discussions are ongoing in the Alabama postsecondary system, administrators and faculty at the community colleges do recognize the need for providing developmental education and are continually trying to find the best methods for providing this information. The mission statement of the Alabama College system is to provide “accessible, quality educational opportunities, promote economic growth and enhance the quality of life for the people of Alabama” (ACCS website). Cohen and Brower (2003) stated that community colleges will continue to be involved in educating those students who are underprepared no matter what.

Community College Students

The societal trends of today are going to increase the number of students who will be entering college, especially community college. One study noted that “64% of 2-year college students are enrolled part time, 60% work more than 20 hours per week, 34% spend 11 or more hours per week caring for dependents, and 20% spend 6 to 20 hours per week commuting to and from class” (Evelyn, 2004, para. 5). Of these students enrolled in two-year colleges, more than 1 million will enroll in developmental courses (Evelyn, 2004).

The traditional students are categorized as students who are 24-years-old or younger (Miglietti & Strange, 1998). In the state of California, “37% of the freshman class at California State needed remedial math, and 45% needed remedial English” (Schemo, 2006, p. 1). As these students applied to college and found they needed some type of remedial course, many were shocked and angry because they had been A/B students in high school. These students thought

that because they had done so well in high school and had graduated, they were ready for college (Schemo, 2006). Sixty percent of the developmental education population consists of these traditional age students who are still not prepared (Oudenhoven, 2002). With a higher percentage of students needing remedial English than math, English should be the focus of more research and trying to find the best ways to decrease the number of students who need developmental courses.

The older students, or non-traditional students, are 25 or older. Kim (2002) stated that when research refers to nontraditional students, it is referring to students who are 25 years of age or older. Hoyt (1999) found that “more older working adults attend college than ever before” (p. 55). He goes on to say these students are going back to college because they need or want to change careers or they need to update their job skills due to technological or other changes in the work environment (Hoyt, 1999). Kim (2002) stated that “typically these students must balance school with employment, family, and financial responsibilities, making successful completion of their education objectives more difficult” (p. 76). Kim (2002) goes on to state that due to family- and job-related obligations, the nontraditional students are not becoming involved in campus activities; they are just going to their classes and then leaving.

These older students may have forgotten material they learned in high school years ago or may not have learned the concepts early on and need developmental courses (Oudenhoven, 2002). Kim (2002) adds that these non-traditional students have been out of school for many years and are pursuing a college education because they either lost their jobs or need to improve their skills. They are not going to school because they want to; they are going to school because they have to (Kim, 2002).

Non-traditional students may also face challenges such as family obligations and work commitments while going back to school. Caboni and Adisu (2004) point out that many of these students are either working adults or immigrants. According to Kim (2002), “approximately one half of all African-American, Native-American, and Hispanic college students are enrolled at a community college” (p. 76).

Another reason there is an increase in non-traditional students in college is because, as Byrd (2005) stated, many older students were not ready for college after graduating from high school and that is why they waited to start school. Low income and other disadvantages are also impacting school performance of these non-traditional students. Enrollment in more than one remedial course tends to be higher among this older group. These underprepared students are “bipolar” in terms of age as well as the length of time that they have been away from education (Oudenhoven, 2002).

College classrooms, specifically the developmental education classrooms, are made up of students of different ages, genders, and cultures (Sianjina, 2000). These developmental education students, as a whole, constitute a diverse population. The differences in ages can be valuable in the classroom. Merullo (2004) commented that he had students who were in their teens and some who were in their 70s. This is true in most community college classrooms, and this mix can make teaching a challenge. The older students can bring a different perspective and pleasure in learning and a wealth of life experiences that act as a basis for classroom discussions (Merullo, 2004). Byrd (2005) also recognized that the older students had stronger self-concept, self-advocacy, goal focus, and time management skills. With the student population at community colleges becoming more diverse, community colleges must change their missions, goals, and

policies to recognize and understand the unique challenges students face today and be able to meet the needs of these students (Kim, 2002).

In order to understand the unique challenges in the community college classroom, especially the developmental education classroom, colleges must first understand the characteristics of the underprepared students such as gender, age, race, and educational background. The National Center for Developmental Education conducted a study that analyzed the characteristics of community college remedial students. For example, when looking at age and gender, “females accounted for about 53% to 57% of the total students needing remediation” (Saxon & Boylan, n. d., para. 6). Nearly one in four remedial students is married, and the average age of community college remedial students is 23 (Saxon & Boylan, n. d., para. 7). Also, according to a U.S. Department of Education study, 17% of males and 9% of females use computers at home. In high school, girls spend 5.7 hours per week on their home computers while boys spend 7.7 hours per week. Girls use computers primarily for word processing and skill building, while boys use them mostly for games (Dorman, 1998).

The National Center for Developmental Education study also looked at the race of the developmental students. The study revealed that, “while 67% of the student population who were enrolled in at least one developmental course at a community college were White, 23% were African American students and 6% were Hispanic students. There were other groups that made up 1-3% of the population as well” (Saxon & Boylan, n.d., para. 3). Santos (2004) stated that “minority students now account for almost 23% of postsecondary education students” (para. 3). Santos (2004) also indicated that the college-attending Hispanic population is predominantly female. Szelenya and Chang (2002) found “this highly diverse population arrives from a wide variety of educational traditions that may be substantially different from the ones they encounter

in the United States” (para. 4). Immigrant students bring many different educational needs as well as goals and qualifications to their pursuits of higher education in America (Szelenya & Chang, 2002). The challenge then for education institutions, including community colleges, “lies in finding appropriate ways of responding to the diversity of backgrounds and needs these students represent” (Szelenya & Chang, 2002, para. 4). Community colleges “play an important role in providing opportunities for immigrants to participate in the American educational system” (Szelenya & Chang, 2002, para. 11).

Educational background and behavior were two other characteristics that were looked at in The National Center for Developmental Education study. In the study, there was evidence that remedial students had low self-esteem and that their ability to work at their own pace on their own time was lacking. It was also noted in the study that a vast majority of the remedial students in community colleges were the first in their family ever to attend college (Saxon & Boylan, n.d.). Santos (2004, para. 6) stated, “As the United States increasingly becomes an information society, opportunities for well-paying manual labor jobs have been decreasing as well as low-level entrepreneurial opportunities” (p. 19-20). Because of the decrease in availability of certain manual labor jobs, there is increased pressure on all students, no matter what their socioeconomic background, to further their education beyond high school.

The characteristics of the developmental education student can be summarized as slightly more females than males and about 23 years of age. According to Saxon and Boylan (n.d.), “These students are typically White, single, provide for themselves financially and live and educate themselves on less than \$20,000 a year. They commute, attend college full-time, are motivated for college work, but have low self-esteem” (Saxon & Boylan, n.d., para. 3).

Based on The National Center for Developmental Education study, there is no typical remedial student. Students who must take remedial courses are not any different than any of the other students who are attending community college. There are no significant differences in demographics, economic status, or personal characteristics between remedial and non-remedial students. As this study concluded, “The only factor that appears to separate the remedial students from non-remedial students is that they have lower scores on institutional assessment tests” (Saxon & Boylan, n.d., para. 5). Kim (2002) stated that “community colleges provide access to higher education to a broader range of students than would be found at most four-year institutions.”

Community Colleges and Developmental Education

The National Center for Education Statistics (NCES) defines remedial/developmental education as “courses in reading, writing, or mathematics for college students lacking those skills necessary to perform college-level work at the level required by the institution” (McMillan, 1997, p. 21). The role of the community college has gone through many changes over the years. Bragg (2001) commented, “As time passed and as enrollment grew, community colleges became increasingly diverse in the students they serve and in their purpose for being” (p. 93). Bragg (2001) continued by stating, “Enrollment has risen in developmental education ever since the 1960s and 1970s, reaching as high as 80% of new college entrants in some community colleges today” (p. 100). Bragg (2001) stated that community colleges are becoming important components in higher education.

According to Milliron (2004), “Developmental/remedial education exemplifies the social role of community colleges” (p. 55). McMillan (1997) says,

The scope of remedial/developmental education has grown to the extent that it is likened to ‘the education world’s equivalent of the elephant-in-the-living-room syndrome: An enormous problem staring you in the face that everyone can see but no one wants to talk about. (p. 22)

One of the roles of the community college is “to serve students from a wider range of socioeconomic backgrounds, ages, levels of academic preparation, educational aspirations, work and family responsibilities, and levels of English fluency than do four-year institutions” (Schuetz, 2002, para 3). Jenkins (2005) emphasized this point by noting the differences in community college students such as age, race, gender, and political affiliation. Jenkins (2005) further noted that there is also a trend of more high school graduates attending a community college before going to a four-year institution because they are not prepared for college. Jenkins (2005) reported, “At a typical two-year college, 30-40 percent of first-year students enroll in pre-collegiate courses (also known as ‘remedial’ or ‘developmental’ courses), based on standardized placement test scores” (para. 10). Schuetz (2002) also found, “Almost half of all students entering community colleges enroll in at least one remedial course” (para. 4).

Schuetz (2002) discovered that the argument then continues concerning who is responsible for providing these underprepared students. Some taxpayers and school boards of education are arguing that by offering remediation at the community college level, taxpayers are paying twice, once in the public school system and once at the community college, for skills that should have been taught and learned in high school. Schuetz (2002) continues that opponents further argue that by having to teach remediation in college, many institutions are “dumbing down” the college curriculum. Then there are those who argue that as long as colleges are admitting those students who are underprepared, it is then their responsibility to help prepare these students to succeed in college (Schuetz, 2002). McMillan (1997) found that “questions about why additional tax dollars should be spent teaching students skills that they are expected to

acquire in high school are being asked with a greater sense of urgency” (p. 21). It is evident that developmental education is an important component to higher education.

Trends show that many institutions of higher education are shifting the burden of developmental education to the community colleges. The California State University System proposed that by the year 2007, 90% of its remedial education would be taught at the local community colleges (Yamasaki, 1998). While the issue of developmental education may be an issue in higher education that should not have to be addressed, it is not surprising that the debate about developmental education has intensified among educators and legislators (McMillan, 1997). McMillan (1997) said that some states have or are considering policies or laws addressing developmental education and include such policies as concentrating remediation in community colleges. While it seems the role of providing developmental education is being handed over to community colleges, there needs to be more research done on the effectiveness of developmental education programs.

Yamasaki (1998) concluded that more research needs to be conducted on developmental education, especially through the evaluation of currently successful programs that can also be used to facilitate the development of successful policies in the future. Chung (2005) said,

The field of developmental education currently faces an identity crisis. For the most part, developmental education has little knowledge of its roots or a widely understood and articulated philosophy, a body of common knowledge, or a commonly accepted set of theoretical assumptions congruent with that philosophy. (p. 2)

McMillan (1997) agreed and stated, “The debate regarding the problem of under-prepared students and the need for remedial/developmental education in the nation’s colleges and universities will undoubtedly continue” (p. 22). The current challenge for the nation’s community colleges is to encourage colleges and universities not only to provide developmental

education but to provide it using the best available research and practice (Boylan & Bonham, 2007).

Technology and Students

Because the student population in developmental courses is becoming more diverse, the question then becomes, “What methods of course material delivery are the most effective in teaching these students in developmental classes?” There are two types of students in community colleges: the non-traditional, older students and the younger, right-out-of-high-school students. Carlson (2005) defined the younger students, those under 25 years of age, as “the Net Generation” and stated that classroom instructors who are teaching these students need to alter their teaching styles by using “Blogs, iPods and video games” as part of their course material delivery. Instructors must also learn to accept divided attention spans. The younger generation of student that has arrived will most likely tune out an instructor who attempts to lecture for an hour. O’Banion (1997) found that “teachers in the typical classroom spent about 80% of their time lecturing to students who were attentive to what was being said about 50% of the time (p. 15). Younger students are coming to college with different expectations. They do not want to sit idly and listen to a lecture; they want the opportunity “to make choices, and to customize the things they choose (Carlson, 2005, p. A36). Brown (2006) became aware that while many instructors “were skilled at lecturing 800 people, new teaching practices were required for this new kind of learning environment” (para. 7). O’Banion (1997) stated that lecturing has its value and its place in teaching but not as the primary mode of teaching.

These “Net Generation” students are the students who are coming right out of high school. Schuetz (2002) pointed out,

Sixty percent of the remedial population are traditional-age students enrolling in college immediately after high school graduation. The other 40% are adult learners who may be pursuing personal interests, preparing for transfer, upgrading job skills, or preparing to change careers. (para. 4)

One college faculty member from the New Jersey Institute of Technology added that the system that is currently in place in the higher education system was “built for the baby boomers and previous generations under an industrial-age model” and this current system is not effective for the student who is graduating from high school and going to college (Carlson, 2005, p. A34). There seems, then, to be a debate on how to approach teaching. If classroom instruction is technology-based and geared towards the younger “Net Generation,” how is that affecting the non-traditional older student? One researcher noted that, “the issue of integrating technology with instruction is the single most important issue facing higher education,” (Fahmy, 2004, p. 55).

Because the students in college classrooms are diverse and teaching these students is becoming more of a challenge, institutions need to “react to customers’ needs rather than setting the educational agenda as they traditionally have done” (Fahmy, 2004, p. 56). Bragg (2001) commented that as the community colleges have matured, their learners have become more diverse and are much more diverse than the students of most 4-year colleges. If the goal of the community college is to meet the needs of the students, then educators need to determine how best to meet these needs by continually evaluating and restructuring curriculums to address the diverse needs of the students. Grasha and Yangerber-Hicks (2002) note, “That an evaluation of technology should include obtaining a baseline of student learning in a course before technology was introduced, as well as afterward” (p. 2). Technology is just one tool that can be used and fostered by students in the classroom to promote student learning and success. Brown (2000, para. 4) noted that “technology is supposed to improve our lives.” Community college faculty

need to use “other technologies to accommodate diverse learners” (Akryod, Jaeger, Jackowski, & Jones, 2004, para. 14).

Types of Technology

Technology can be defined in terms of types of technology. Carlson (2005) stated “Millenials consume and learn from a wide variety of media, often simultaneously” (p. 36). Technology goes beyond just showing videos and PowerPoint presentations. In fact, one professor stated for one of her classes, “I am not sure that students like PowerPoint” (Carlson, 2005, p. A36). Technology goes beyond just using slides and visuals in the classroom. It is referring to many new and current mediums such as iPods, blogs, CD-ROM’s, and interactive means of sharing information. Carlson (2005) explained, “Almost everyone today, it seems, is some kind of information broadcaster, a blogger or someone who maintains a Website or puts out a podcast. Fewer and fewer people know how to sit and listen” (p. A36). One researcher described the traditional lecture classroom as “a learning technology that’s simply out of date” (Brothen, 1998, para. 8). If students want more interaction in the classroom, teachers need to shift their teaching to meet the needs of the students and incorporate more technology in their delivery of classroom material. The questions that need to be asked are, “How do they learn? How do they like to learn?” (Brown, 2006, para. 7).

There are many different types of technology used in classrooms today. Carlson (2005) outlined the types of technology that traditional students want to see used in the classroom. Traditional students want to see classrooms that are more hands on and visual; they want classrooms where they can use handheld devices such as video games or interactive videos or

classes that are flexible by providing opportunities to complete assignments through learning management systems and the Internet.

While some traditional students are bored with PowerPoint, it is a popular tool among instructors (Carlson, 2005). But as Naomi Baron, a linguistics professor at American University, stated she is not sure students like or are getting anything from her PowerPoint presentations (Carlson, 2005). Traditional students are more advanced in how they receive and send information. Instructors who are still using lectures as their primary mode of delivery are being described as “sooo boring” (Carlson, 2005, p. A36).

Some instructors are beginning to restructure their class time to incorporate more discussion and one-on-one time. One instructor commented that he even began to hate lecturing because he knew students were not listening and paying attention, so he began using more interactive activities in the classroom (O’Donough & O’Steen, 2007). But as one instructor observed, that is not even enough (Carlson, 2005, p. A36).

Carlson (2005) pointed out that because traditional students watch more TV and participate in more interactive games these days, they now have shorter attention spans, especially in the classroom. Yet in the classroom, whether high school or college, they are asked to sit quietly and pay attention for long periods of time. Regardless of how traditional college students became whizzes with communication devices, if educators are going to reach them, they must adapt their teaching to the best ways students learn and that may be through technology.

Ehrmann (1995) found that advocates for technology in education “want to improve current teaching, but too often they fail to ask whether those ‘traditional methods’ are being used to teach the right content” (p. 22). Others argue that the type of technology used in the classroom is important as well as how it is used and in what setting it is used in the classroom to emphasize

a particular teaching-learning method. Still others are concerned with how these new teaching methods are affecting student learning outcomes in the non-traditional students (Ehrmann, 1995). An important question must then be addressed and answered, “Does the form of technology use affect its relationship with the measured outcome?” (Levin, Hansen, 2008, para. 2).

Teaching with Technology

According to Huitt (1999), society is encountering elements of the environment that are beyond our control, but in order to be successful in today’s world, we must make substantial changes. Even though these changes are changing the definition of success in our society, our schools are not making “corresponding modifications.” Huitt (1999) went on to state that some of the changes that have occurred in society over the last 200 years are shifts from an agricultural age to an industrial age to our current information age. He continued that throughout these changes over the last 200 years, technology has been an important element in all of these shifts, but the changes in technology have been happening at such a rapid pace instructors are constantly having to catch up and stay ahead of these changes. Educators need to restructure their thinking and views of technology in terms of how they will use it to best meet the needs of their students. Gorder (2008) stated, “Teachers need to know how and why to use technology in meaningful ways in the learning process for technology integration to work” (p. 64). Langhorst (1997) stated, “Community college leaders must chart a new course using technology to navigate through the shoals of access, accountability, diversity, and quality” (para. 1).

Instructors need to “pay attention to their own methods of asking questions, questioning answers, and questioning questions” (Hirose, 1992, para 3). That means instructors need to be creative and look for different ways of teaching material. One way educators are being

innovative in classroom instruction is the concept of active learning. Active learning is a “pedagogical principle practiced in the classroom” (Gorder, 2008, p. 64). It is a practice “where the learner is not overtly dependent on a teacher” and the student uses the teacher “as a resource and partner in the learning process” (Petress, 2008, p. 566). Active learning is a concept that uses peer learning where students discuss what they know with others in the class to “validate” what they have learned. Jaffe (1997) stated, “Active learning using technology involves student interaction with the content” (p. 271). Active learning without technology involves student interaction with other students and involves the instructor as needed. Jaffee (1997) found that when technology was integrated into an active learning environment, students became more focused on the task and were able to apply the skills learned. Active learning is then a method of course delivery as is the lecture-based classroom, but when technology is integrated into both types of classrooms, it can affect learning outcomes in both environments.

Being innovative in teaching methods is especially significant with developmental education. Developmental courses are usually taken the first semester of a student’s college experience. The developmental classroom has students from many diverse and socioeconomic backgrounds (Bragg, 2001). Any given class may have students who are coming straight out of high school, while the other half of the class may be non-traditional students. It is particularly important for the instructors in developmental courses to be most creative because they are working with students who are extremely savvy with technology and with those that may not even know how to turn on a computer. Koehler (1998) stated, “The human capacity for spontaneous creativity is the ultimate advantage of the human teacher; the advances of technology are now making spontaneity and new directions more immediately possible” (para. 7). Brothen (1998) pointed out instructors should review their methods of teaching to try to meet

the needs of the growing number of developmental students. Students who are in developmental courses typically are not students who can work on their own and think for themselves; they are in constant need of self-assurance and guidance. Developmental education students also “require feedback on their learning progress; positive feedback results in an increased sense of their ability to master learning tasks” (Brothen, 1998, para 14).

Brothen (1998) stated, “To be effective in helping developmental students become more independent, self-regulating, self confident learners, technology should function at the level of the student. That is, it should stimulate behavior change and help students and instructors monitor that change” (para. 15). Brothen (1998) went on to say that technology should not only be used as a tool that is interesting and entertaining to students, but technology must also advance the learning objectives of the class and help students see the educational value of what they are doing. The type of technology being addressed goes beyond technology that makes for a better lecture such as PowerPoint and slides; the technology encourages change in students. As Brothen (1998) noted, “The best way for technology to have a transformational role in developmental education is for it to be effective in transforming students” (para. 15). Akroyd, Jeager, Jackowski and Jones (2004) stated “Non-traditional course-delivery methods are increasing at all institutions and a greater percentage of community college faculty members are involved in nontraditional courses than faculty at other types of institutions” (para. 15). They continued by stressing that the new approaches to course material delivery are now becoming the tradition. The days of using overhead projectors and slide show presentations to present material in class are being replaced with computer-created PowerPoint presentations, and the handing out of material in class is being phased out by posting notes and handouts on the Internet or on instructor-created Web pages. Even the face-to-face meeting in a classroom 2 days a week is

becoming less of a factor in keeping students from going to college because of the use of Webcams and video-taped lectures being downloaded into Web pages and learning management systems for students to access 24 hours a day, 7 days a week (Akroyd et al., 2004).

There are a number of different types of technology being marketed and used in classrooms today. For example, one item is the Clicker, or the classroom response system. Bruff (2007) commented “clickers are instructional technologies that can be used to promote active participation, engagement, and discussion among students and can be used to assess student learning in real-time, during class” (p. 5). Clickers can be used for a variety of classroom activities. They can be used as a review before a test, as an in-class quiz, or as a way to engage discussion among students. Because clickers can be used to assess what students are understanding in the classroom, instructors can then use the results obtained from the clicker exercises to change their teaching strategies and lessons as needed to make sure all students are getting the material before moving on to another lesson (Bruff, 2007). Bruff (2007) explained that clickers promote active discussion among all students, even those who might not participate in typical class-wide discussions. In a developmental class, this type of technology would be particularly useful because most students in a developmental class do not want to ask questions because they are afraid of how they might look to others in the class. Martyn (2007) stated that “one of the best features of the student response system is that it allows students to provide input without humiliation or having to worry about other students dominating the discussion” (p. 72). The clickers are anonymous, and students in the class do not know who answered a question correctly. This gives the instructor a chance to explain a concept again without singling out any particular student. Bruff (2007) found, “Research on classroom response systems indicates that when used with active learning techniques such as peer instruction, clickers can improve student

learning in measurable ways” (p. 7). Jaffee (1997) found that when technology was integrated in the classroom, active learning occurred and students became more focused on the task and were able to apply the skills learned.

College of Lake County biology instructor Mark Coykendall used a classroom response system and received mostly positive feedback from his students (Carnevale, 2005). Several of Coykendall’s students said “they see the benefit of the remotes” (Carnevale, 2005, p. B3). But there are a few who are not thrilled with the technology and commented, “It smelled like a distraction” while others felt it was more stressful using the remotes for tests because they had “test anxiety and need more time” (Carnevale, 2005, p. B3). Coykendall summarized by stating that a small number of students feel using clickers is a waste of time and a hassle, while a fraction of other students wonder why more instructors do not use the same technology. Students want quicker feedback (Carnevale, 2005).

The argument against clickers is that not enough research has been done on the impact on student learning. O’Donough and O’Steen (2007) found that there was increased participation and engagement in classrooms that used clickers, but this is not the assumption of instructors who do not like the clickers. The research in classes where clickers were used had slightly lower scores than the classes-using traditional discussion methods. According to O’Donough and O’Steen (2007), the rationale for using clickers is to “increase participation and active engagement in class, to address the need for students to remain anonymous, and to provide frequent feedback” (p. 776). Some instructors who use clickers are looking for increased learning outcomes. But as O’Donough and O’Steen (2007) pointed out, instructors have begun to fall away from this idea because they are finding that any type of technology, including clickers, is not the end all solution to solving the problems of instruction and learning in the classroom.

Hafner (2004) interviewed college professors across the nation concerning the use of classroom clickers. One instructor who used the clickers in her classroom responded, “I believe these devices have absolutely revolutionized my class” (Haffner, 2004, p. 61). Most of the professors surveyed had positive results with using clickers in the classroom. Dr. Cuban commented, “The innovative professors will desperately scramble for things that keep students involved and avoid the e-mail and instant messaging” (Haffner, 2004, p. G1). But Levin and Hansen (2008) noted, “None of the faculty quoted by Hafner discuss a link between the conditions that favor technology use in the classroom and learning outcomes” (p. G1).

O’Donough and O’Steen (2007) pointed out “that a theme that is not present in most of the literature on clickers is the impact on student learning” (p. 773). Martyn (2007) conducted a study and looked at the usage of clicker systems and the effect on student learning outcomes. The study concluded that while students perceived the clickers as beneficial, “the learning outcomes (as measured by pre-and post-tests) were slightly lower than the class using traditional methods” (Martyn, 2007, p. 72). Another study conducted by Barnett (2006) found that students value the use of clicker systems in the classroom for receiving immediate feedback, peer comparisons, and in showing how well they actually understood the material, but not explicitly in the learning process.

An internal study conducted at the United State Military Academy (USMA) found that while there were some changes in learning outcomes in classrooms that used clickers, it was not substantial enough to draw any definitive conclusions between using the clicker technology in the classroom and learning outcomes. A major goal of the academy was to “improve the performance of the students in the course” (Blackman, Dooley, Kuchinski, & Chapman, 2002, p. 28). There were two sections of a chemistry course; one used the classroom performance system

and the other did not. The section averages and test scores of the classroom performance system sections did improve during the semester; “however, the averages of non-classroom performance system sections also rose” (Blackman et al., 2002, p. 28) The final conclusion that was that “if a technology increases enjoyment or fun and does not hurt learning, then it is beneficial” (Blackman et al., 2002, p. 28).

Behind any decision to adopt a classroom performance system is the idea of how the clickers will affect learning in the classroom (Trees & Jackson, 2007). For many who use a classroom performance system, there “is a common assumption that a clicker system is beneficial to student learning because it can provide immediate feedback” (Trees & Jackson, 2007, p. 25). Trees and Jackson (2007) also found that many instructors use clicker systems to involve peer teaching because teachers assume more learning will happen when students work together. The research on classroom performance systems and the learning environment “must consider what elements of the learning environment are likely to impact the success of clickers” (Trees & Jackson, 2007, p. 25).

Sawyer (1994, para. 3) noted, “There is a growing realization that learning the same things the same way we learned twenty years ago isn’t enough to prepare students for today’s ‘global’ environment.” Sawyer (1994, para. 4) went on to state that “changing demographics, declining budgets, workforce dissatisfaction, and social and cultural changes are a driving force in the integration of new technology into the education process.” A new type of technology that is being used in classrooms is the Personalized System of Instruction (PSI) (Brothen, 1998). This type of technology provides material to students using textbooks and CD-ROMS and is individualized for each student. Instructors select or create appropriate reading materials for the course that will measure student progress rather than present the information orally. Students

complete the assigned material at their own pace, and once a unit is mastered, they can move to the next unit until all course objectives are met (Brothen, 1998). Brothen (1998) concluded that instructors who began using this approach had more resources to work with and were more open to implementing different types of technology into their teaching methods. Some of the technologies that are incorporated in the PSI models are computerized quizzes and tests that give students feedback on how much they know on the material just covered and how much work they need to do in order to master the skill. Instructors are acting more as facilitators in covering the material for the course (Brothen, 1998). Proponents of personalized instruction state, “Face-to-face instruction is not always best, and not all students excel in the lecture format” (Young, 2002, para. 3). Proponents also understand that “face-to-face is not the gold standard that it’s held up to be” (Young, 2002, para. 3).

While some faculty are implementing a more individualized, self-paced approach to teaching, some researchers found that using personalized instruction, or computer assisted programs, are “setting our students up for failure” (Schwartzman, 2007, p. 113). Studies on computer assisted instruction reveal that the type of system used in the course that provides the immediate feedback may not be effective because the software may have limitations (Schwartzman, 2007). Schwartzman (2007) went on to state, “The older the students, the more likely they are to encounter challenges in using unfamiliar technology” (p. 115). But Schwartzman (2007) also found that while the non-traditional age students (those 25 or older) may not have the newest computers or best Internet access, they will learn and use the technology that is available or required of them more than the traditional age students. Research shows “Many non-traditional and special needs students not only appreciate but require the flexibility” of the computerized instruction (Schwartzman, 2007, p. 115).

Computerized instruction also offers students “the greatest chance to discover their strengths and weaknesses as learners and the best opportunity to find their own paths to achieving success” (Beard, Harper, & Riley, 2004, p. 29). Virtual learners are now responsible for setting their own pace and creating their own expectations for their work (Livingston, 2008). Students are embracing computerized learning but, “the relationship between instructional technology and the affective side of learning remains largely unexplored” (Schwartzman, 2007, p. 115).

The classroom response systems and individualized instruction are two trends in technology that are being introduced into the higher education arena. Both of these methods are ways for instructors to “step out from behind the podium on a regular basis and ensure that students are doing more than listening to lectures in the classroom” (Lang, 2006, p. C1). But as Lang (2006, p. C1) stated, many in education argue that “lecture should never constitute the sole teaching technique in a course, or even perhaps the dominant one.” Because one of the roles of the community college is to prepare students for the future, then technology needs to be part of that preparation. While many classrooms are incorporating technology, should these technology methods be introduced in the developmental classroom? Milliron (2004) pointed out,

The community college is one vehicle that can help adults access the hardware, software, and training necessary to work in an information economy and gain the savvy necessary to live in a connected world and not be manipulated by it. (p. 55)

Higher education needs to look at the effects of using technology in developmental courses because as instructors teach these underprepared students and try to change their behavior, exactly how technology can assist in changing behavior must be spelled out (Brothen, 1998).

Effects of Technology Use

Differences in learning styles and different types of technology lead the education community to rethink how they teach and what they teach (“The academy in a changing world,” 1995). The consensus in higher education is that the process of getting a college education should be more flexible and accommodating as technology continues to change and advance. Using computerized methods in the classroom seems to “reinforce the job of teaching, making some things easier and more efficient” (Dirx, 2004, para. 2). Dirx goes on to state that the use of technology in the classroom helps organize the material better for the students. But Sherer and Shea (2002) pointed out that using technology does not always affect the classroom learning environment or the learning outcome in the classroom. Dunn (2002) asked, “Does technology help or hinder learning?” (para. 1). It seems there are two arguments on this subject. Jason, Kennedy, and Taylor (2001.) noted that when one observer visited classrooms where technology was being used, he saw a lack of depth and connection to learning. Jason et al. (2001.) also noted that students felt like things were covered too quickly when technology was used and they felt they needed more time. Grasha and Yangarber-Hicks (2000) were also concerned about students who did not have any choice in the matter. What about the students who find themselves in classes where technology is used as the primary method of delivery? There is not much research that focuses on technology as the method of delivery and its effectiveness on student learning outcomes.

Dunn (2000) also pointed out the positive elements of using technology in teaching. As he stated, one observer of classrooms using technology witnessed enthusiasm for technology from both students and some instructors. But he cautioned that “we will be well into the 21st century before we see whether technology is a step forward or a step backward, whether it’s

really positive or a reinforcement of the worst inertias in our culture” (Dunn, 2000, para. 1). Very little is known about the influence of technology on instruction (Grasha & Yargarber-Hicks, 2000).

One study conducted by Grasha and Yargarber-Hicks (2000) examined “how teaching and learning styles varied within both a technology-dominant and a traditional course taught by the same instructor” (p. 6). The instructors, not the students, were surveyed and asked to evaluate and compare their experience in a course that focused more on the technology that was used to deliver course material with a course that used more of a traditional method of course material delivery. The study found most of the faculty members who participated in this study said they had used at least “four different types of instructional technology in their courses” (Grasha & Yargarber-Hicks, 2000, para. 37). Grasha and Yargarber-Hicks (2000) found several instances where faculty members did not “buy in” to using technology, but the major concern from the study related to the need for faculty to develop a reason to use the technology in their classrooms as part of their teaching methods. One area Grasha and Yargarber (2000) said needs more research is how the technology used in the classroom affects how students learn in the classroom and how technology affects student learning outcomes.

Assessment

According to Savin-Baden and Major (2004, p. 118), when analyzing a “widely accepted definition of assessment,” some important ideas from the definition were identified such as “the primary function or purpose is on improving student learning; as such, assessment is part of teaching and learning, not ancillary to it.” They continued by stating, “Finally, teaching learning and assessment are part of a bigger purpose and pattern on campus, and should not be done in

isolation” (Savin-Baden & Major, 2004, p. 118). Assessment is part of the process for evaluating the teaching process and “student knowledge is one outcome that is frequently assessed” (Savin-Baden & Major, 2004, p. 149).

There is little research available on how technology affects student learning in developmental education. The studies that do evaluate student learning outcomes in developmental education mostly deal with how students who take developmental courses do in the next-level class compared to those students who did not take developmental classes. One such study was conducted by Germanna Community College in Virginia and discussed the quality and effectiveness of developmental education (Curtis, 2002). The study looked at how many students needed to take developmental courses and what proportion of those who enroll in these courses complete them successfully (Curtis, 2002). One of the main focuses of the study was the success rate of the students who enrolled in college-level courses after having completed their developmental coursework (Curtis, 2002). The results compared ENG 111 scores of students who had taken ENG 01 before taking ENG 111 with the scores of students who placed directly into ENG 111. At the conclusion of the study, it was determined that the developmental students received lower grades on average in ENG 111 than students who were directly placed in this course, although the majority obtained passing grades (Curtis, 2002).

Another study conducted at Tennessee’s Walters State Community College looked at the validity of remedial and developmental English courses in preparing students to pass freshman-level English courses (Hopper, 1997). This study compared the success rates of students in freshman composition who had previously had developmental English courses with those who had not. At the conclusion of the study, it was determined that students who completed a remedial course tended to have only slightly higher grades in the next level course. Some of the

data showed “students exposed to remedial course work performed as well as other students in a college level course” (Hopper, 1997, p. 5). The results of the study also showed no substantial difference in “academic performance” between students who had taken a remedial course and those who did not need any remediation (Hopper, 1997). The study also addressed the issue of further research and concluded that while research has been conducted on factors contributing to success in college in general, further research is needed to determine what factors contribute to success in passing freshman composition specifically (Hopper, 1997).

The research on how technology influences student learning is focused on college level courses and not in developmental education. One study was conducted comparing scores on tests in classes that were straight lecture courses with those courses where computer-based technology in addition to lecture was used (Taraban & Rynearson, 1998). The study compared two classes: one where there was straight lecture and the other where there was lecture and some supplemental computer-based material. The study concluded students who attended class and listened to the lecture scored higher on an in-class test compared to the students who learned the same material on their own on computers. Another part of the study showed that students who attended the class and lecture and who also had access to computerized material did slightly better on an in-class test compared to those students who just worked independently using computerized material (Taraban & Rynearson 1998). While this study was conducted on a college psychology course, it showed there are some differences in student learning outcomes when some type of technology is used in their course work. While the data are encouraging in showing that technology does have some benefit in learning, more research needs to be conducted to look at the impact of technology on developmental courses. There seems to be some evidence that “in order to make visible improvements in learning outcomes using

technology, the technology must be used to enable large scale changes in the methods and resources of learning” (Ehrmann, 1995, p. 24).

Research is beginning to look at how technology impacts student-learning outcomes. One study showed positive effects on learning in courses where technology was used (Brothen, 1998). The study showed even greater effects for developmental students and concluded that “computer-assisted instruction to be effective for developmental students” (para. 10). Boylan and Saxon (1998) in their article “What works in remediation: Lessons from 30 years of Research,” suggested that a variety of teaching methods is important because developmental students are diverse and are underprepared for college work. They go on to outline in the same article the methods most often used in best-practice institutions include self-paced instruction, individualized instruction, peer review of student work, collaborative learning, computer based instruction, mastery learning, and small-group work (Boylan & Saxon, 1998). There needs to be more research done on how interactive and self-paced technology based methods of course delivery affect student learning in developmental courses.

There is a need for more data on how technology affects the developmental education student. Some researchers suggested looking at new ways for teaching with technology and see this as a balance of infinite possibilities never before possible (Taraban & Brothen, 1999). Some also feel that research is unfortunately vague in exactly how the new technology can be effective in transforming students. The technology is there and is available for instructors to use in the classroom. There is currently a growing openness and enthusiasm toward the possibilities afforded by recent technological advances, and administrators are allocating large amounts of capital for the new instructional technologies (Taraban & Brothen, 1999). The focus is that “developmental educators need a new context within which to integrate technology into

developmental education” (Brothen, 1998, para. 16). The main objective in developmental education is for students to learn, but, actually, so will instructors if they properly evaluate and change class activities. If developmental educators learn how to apply the new technology effectively, students will surely benefit (Taraban & Brothen, 1999). As one researcher stated, “With technology, people can continue to learn throughout their lifetime . . . it’s just a continuum” (Brown, 2000, p. 4).

The only way to know for sure if the technology used in developmental education is truly effective is to assess the student learning outcomes for the course. One researcher indicated that the key is to make technology “subservient to teaching” (Nantz, 1998). Instructors are reluctant to make any drastic changes in their teaching methods unless they have evidence that changing will have a positive effect on instruction (Nantz, 1998). The current problem is that there are no data showing how students in developmental education courses where technology was not used compare to students in developmental education courses where technology was used. Studies that look at the effectiveness of developmental programs often compare the performance of students who completed recommended developmental classes to that of students who did not require developmental coursework (McMillan, 1997). There is extensive research on student learning in higher education, but there is not a lot known about community college students, especially those who need remediation, and how to best facilitate their learning experiences (Bragg, 2001). While this type of data is relevant for effectiveness, instructors can only see the effectiveness of technology use when compared to students who did not have technology through their coursework. By comparing test scores of students who had lecture and technology through their coursework with students who had straight lecture, only then will instructors get a true

understanding of how technology in the classroom affects student-learning outcomes. Higher education must now focus on the assessment process of developmental education.

Part of the process for determining the effectiveness of any program is assessment. There is an increased sense of urgency in higher education concerning “institutional effectiveness, student outcomes, and performance-based funding” (McMillan, 1997). This renewed focus is centered around the new “accountability movement” (McMillan, 1997). Most institutions of higher education must follow some type of accountability or accreditation. Along with this increased emphasis on accountability comes the increased pressure to keep pace with technological advances (McMillan, 1997). Institutions are trying to keep up with the technological advances and making sure they assess the success of using this new technology. There is limited evidence on outcome measures that could provide a deeper understanding of how students participate in and benefit from a community college education. Research needs to look at the benefits of learning in various contexts and with alternative delivery methods (Bragg, 2001). Institutions need to keep current with technology while assessing what they are doing. One method for assessing student-learning outcomes is the competency-based model.

Competency-Based Learning Models

One approach that can be applied to the effects of technology on student learning is the competency-based, or outcome-based, learning models. Competency is defined as “a combination of skills, abilities, and knowledge needed to perform a specific task” (Voorhees, 1997, p. 8). This approach “emphasizes performance and results” (Thompson, 1991). Barkley, Cross, and Major (2005), outlined that in competency-based grading, “students’ grades are based on achievement of specified competencies” (p. 88). They go on to state that instructors “develop

an appropriate definition of the competencies desired and then develop adequate criteria for assessing achievement of each competency” (Barkley et al., 2005, p. 89). Competency-based learning models were once the exclusive domain of vocational education and had no application at the baccalaureate-level or higher-level institutions (Voorhees, R., 2001). Richard Voorhees (1997) outlines the conception of the competency-based movement and “traces its roots to entities and institutions outside traditional four-year colleges and universities, especially community colleges” (p. 7). He emphasized that institutions that are searching to be different and want to stay ahead of the game are finding many advantages to implementing the competency-based learning models (Voorhees, R., 2001). Higher education is moving toward mimicking concepts from the business sector because the idea of academia taking its lead from the business sector is a rare but necessary occurrence for higher education. This transition to competency-based learning in the higher education arena is something that has been a long time coming and is especially prevalent now with the current focus in higher education on accountability (Thompson, 1991).

Competency-based learning can work well in evaluating student learning outcomes in developmental education because there are specific state-mandated skills that need to be mastered by a student in developmental English before students can move on. If students do not master these essential skills, they cannot move on to the next level because courses will only pass students who have successfully demonstrated that they have learned and mastered the skills and material that they were supposed to learn (Thompson, 1991). For example, the syllabus for ENG 093 outlines that a student in a developmental English course at Snead State must master the basic elements of English grammar, create coherent writing that uses a variety of sentence structures, organize and compose paragraphs and short essays, and accomplish those skills

necessary for success in freshman composition. These learning objectives are outlined on the course syllabus, and each of these skills is covered and tested throughout the semester. When looking at curriculum in general, almost all classes require one or more skills that must be mastered in order to complete the curriculum assignments. However, the teaching and learning of these skills may be so imbedded in the classroom activities that neither instructors nor students are aware that something other than content is being taught. By focusing on the need to assess skills, instructors and students can learn how to place equal value on process and product. There needs to be evaluation of the process in order to understand the product (Gfroerer, 2000).

There are educators who have traditionally resisted being held accountable for the success of their students and who oppose the use of competency-based learning in education (Thompson, 1991). However, competency-based learning does not hold the instructor totally responsible for what the students have learned and how well they have performed. If students have done well in the classroom on assignments and show they understand the material, but then do poorly on a test that is designed to assess their knowledge of those skills, the poor test grade does not mean that effective learning did not take place in the classroom. Other variables beyond the classroom environment can affect performance (Thompson, 1991). While the delivery method of the material is not the focus of competency-based learning, it is evident there are other variables that could affect learning. When applying competency-based learning to developmental education, it is important to look at how the student learned best to achieve the desired outcomes. Ainsworth (1977) stated, "Under a competency-based system, the student can reach the desired competencies via a variety of pathways, only one of which is the formal coursework, and these competencies can be met in an independent time frame" (p. 323). Gfroerer (2002) contended that "competence is determined by assessment against a performance standard that is supported not

only by skill attainment, but knowledge and understanding in a variety of contexts or applications” (p. 123).

The competency-based models “enjoy an obvious connection to aspirational student learning statements because the shift of the focus is from instructional delivery to student performance” (Voorhees, A., 2001, p. 90). If developmental education courses are moving more toward the trend of technology where students are learning at their own pace and at their own level, then student performance is the key to their success. While technology is a form of instructional delivery, when any technology is used by students and students are in control of their learning, then the learning shifts from instructional delivery to student performance. The student is responsible for his or her own success. Richard Voorhees (1997) stated that competency-based is effective in higher education, especially developmental education because when course-based assessment is applied, “it is dominated by the professional judgment of individual faculty” (p. 10). Opposite to this idea, competency-based learning often relies on the judgment of those external to the learning process. Another researcher stated that when instructors shift their thinking away from focusing so much on assessment and the notion that they alone are responsible for how successful a student is in the classroom, a different approach to providing the most effective learning will emerge and can be implemented in the classroom (Voorhees, A., 2001). These external judgments will come from the assessment tools that are used outside of the classroom such as standardized tests or individuals outside the institution who will validate whether the student has mastered the skills (Voorhees, A., 2001).

Why then should competency-based learning be applied to determining student performance in a developmental education classroom? Research shows that the

competency theory would predict that students with low-level information-literacy skills will proceed with their assignments confidently, unaware that they do not possess the

level of skills they think they do, and that they will be relatively unaffected by their resulting low grades, which they may attribute to variables other than their information-literacy skills. (Gross, 2005, para. 10)

Research further emphasized that different ways of presenting material in a classroom that helps students improve skills can also help improve students' capability to see and understand their own strengths and weaknesses and use this as a way of further improving their learning (Gross, 2005). Competency-based learning can be successfully implemented in developmental education courses based on the number of students who are entering college and who need some type of remediation.

What needs to be assessed in developmental education is whether technology is having an effect on student performance and ultimately is affecting student learning outcomes in the course. Developmental courses have a set of skills that must be mastered before a student can move on to the next level. As McMillan (1997) noted "Coursework becomes increasingly structured around competencies; once those competencies are achieved, students are allowed to advance to the next level" (p. 24).

There are two types of feedback for assessment: summative and formative. Summative assessment is the most useful at the course level whereas formative assessment is used more effectively at the program level (Bers, 2001). When looking at developmental education courses, summative assessment would be best used. Summative assessments "gather evidence to assign grades that will combine to form a course grade, becoming part of a students' official transcript" (Barkley et al., 2005, p. 88). One researcher concluded,

Summative assessments occur after a course is complete. They provide feedback about the totality of the experience after it has ended, but they are not useful for those seeking to modify and improve the experience while it is in progress. (Bers, 2001, p. 31)

Summative assessment would then be useful feedback to evaluate the effectiveness of a course.

Theoretical Framework

The theoretical framework for this study was based on the transactional model of the teaching/learning process developed by W. Huitt. Huitt based his model of the teaching/learning process on models that were developed in the 1980s by several researchers to summarize what was known about increasing test scores (Huitt, 2003). Part of Huitt's work is modeled after the work of Gage and Berliner's 1992 model, which is "a model of the instructional process that focuses on the variables that must be considered by the classroom teacher as he/she designs and delivers instruction to students" (McIlrath & Huitt, 1995, para. 23). The basic model by which researchers devised their own models answers the question, "Why do some students learn more than others?" The answers to this question can be classified into four categories: context, input, classroom processes, and output.

The context category looks at the environments of the student. In particular, context looks at the home, school, and community environments. The input category analyzes what each student brings to the classroom as well as the knowledge and tools a teacher brings to the classroom. The classroom process of the model focuses on what goes on in the classroom in terms of what is being taught and how the material is being presented. The final part of the model is output, which measures the learning done. Huitt (2003) believed that output is the most important of the categories.

Context, according to Huitt (2003), includes all external variables beyond the classroom that can affect both teacher and student characteristics, classroom processes, and output. The most important of these are school characteristics and school processes. School variables include the characteristics such as the size and organizational structure of the school. The school processes variable includes factors related to activities such as leadership, supervisory practices,

and school climate (Huitt, 2003). Other variables that are important and need to be considered are home, peer group, community, religious institutions, society, culture, and international conditions. Variables related to home issues can include how much money the family makes, how much education the parents obtained, how many books and magazines are in the home, and to the most important variable concerning home issues, how much technology is in the home. Studies have found that how teachers in higher education view their own concepts of learners, their own knowledge about how students learn best, and their own cultural views of students will greatly affect how they will use technology in the class (Dirx, 2004). This study looked at final grades and broke them down into age, ethnicity, and educational background to see if there were any distinctions among these variables when it comes to technology used as the primary method of course delivery.

The input category of variables focused on the knowledge and background of the teacher and the students before they begin a class. The input category focused on both the teachers' and students' characteristics prior to the class. Teacher characteristics are beliefs, knowledge, thinking, communication skills, and personality, to name a few. There were many others, but according to Huitt (2003), these were the most important. There are a wide variety of student characteristics, but Huitt (2003) stated the most important is a student's prior knowledge. The current system of the teaching/learning process, according to Huitt (2003), is "that ability is more important and that only the most capable individuals can learn everything they are supposed to learn" (para. 18) and this needs to change. Instructors need to refocus and understand that all students have the potential to learn and that learning is an important element in their development. With diverse student populations in the classroom, most specifically age-traditional and non-traditional- these students' skills and knowledge coming into the classroom

was a variable that was observed. The other variables that were measured were ethnicity and educational background--GED or high school graduate. There were students who had extensive computer skills while others did not. If technology was being used as the primary method of course delivery, the knowledge and ability of a student was taken into account. The final grades were broken down to those students who have high school diplomas with those who earned a GED after dropping out of high school, traditional and non-traditional students, and ethnicity.

Huitt (2003) believed the classroom process is an important category of the process. Within this process there are three subcategories: teacher behavior, student behavior, other/miscellaneous. Teacher behavior involves all aspects that a teacher would implement in the classroom through their planning, management, and instruction. Planning refers to the preparation a teacher does to get ready to instruct students in the classroom. Management refers to controlling student behavior in the classroom, and instruction refers to the actual teaching and guiding of the students in the classroom. Huitt (2003) explained that if instructors want to change the learning outcomes, they must change and focus on different instructional methods. One study noted that although an instructor may “be responsive to individual students with her classroom, there is little evidence that his/her practice behaviors suggest he/she is moving towards a learning-centered approach” by incorporating technology into the class (Dirx, 2004, para. 1). Because different types of technology were used in the classroom, this category of the model was incorporated to see how it impacted student learning.

Output measures student learning outside or apart from the normal instructional process. When we apply the question of why do some students learn more than others, the term learning needs to be clearly defined. Educators need to look at what they want to know in terms of what is learned. Once the learning has been clearly defined, it impacts the importance of the variables

involved in the learning process (Huitt, 2003). This study looked at placement test scores and final grades to see if the interactive technology and self-paced online material had any effect on the learning outcomes of the students in developmental education classes. There were specific guidelines for the classes that outline what a student is expected to achieve in the course. The final grade was used to determine whether these outcomes had been achieved when technology was the primary method of delivery in the class.

There are a number of different models that are drawn from Huitt's basic model of context, input, classroom processes, and output. According to McIlrath and Huitt (1995), these models provide insight into what are the best methods used in the classroom to provide the most effective learning and best learning outcomes. For this study, Gage and Berliner's model (1992) answers the question "What is happening in this classroom that facilitates learning better than in another classroom?" (McIlrath & Huitt, 1995, para. 4). This model focuses on the instructional process and those variables that must be considered by the classroom instructor as he/she designs and delivers instruction to students. This model "attempts to define more precisely what is meant by quality instruction" and presents "five tasks associated with the instruction/learning process" (McIlrath & Huitt, 1995, para. 1).

Teachers that use this model begin with a specific goal and objective and end with assessment. The instruction and learning in the classroom are directly connected to the goals and objectives established by the instructor and by the instructor's knowledge of students and how best to engage them in learning. If the assessments do not show that the goals and objectives were met, the instructor then must re-evaluate his/her method of delivery and re-teach the material in another manner. This will be an ongoing process until the desired objectives and goals have been achieved.

This chapter focused on developmental education in the community college and the need for more research on how technology in developmental education affects student learning outcomes. This chapter also addressed the types of technology being used in the classroom today and the types of students who are using this technology. The chapter concluded with the need for assessment and the competency-based learning theory as a way of assessing the effectiveness of technology use in the developmental education classroom.

CHAPTER 3

METHODOLOGY

The purpose of this study was to assess how the method of delivery lecture-based or certain types of technology-based course material delivery in a developmental English classroom affects student learning outcomes. The study focused on classes where personalized instruction supported with technology was the primary method of delivery by analyzing final grades. These scores were compared to courses where the course material delivery was only lecture-based. The technology that was evaluated in the classroom was personalized instruction that utilized computer-generated programs as well as a classroom performance system.

Distance education courses were considered in this study because some of the technology used in this study was not available and cannot be utilized by distance education. The PassKey program is a licensed product and can only be used on campus. The classroom performance system did not have the capability to be used over the internet for distance education students. This chapter consists of research questions, descriptions of participants, setting, types of technology, data collection procedures, and research instrument.

Context of Study

According to the Alabama Community College System's (ACCS) Website, the Alabama Community College System has been serving people in the state for over 35 years. The system is

characterized by statewide geographic locations, open enrollment, low tuition, and a variety of programs. There are 22 community colleges and four technical colleges in Alabama. According to the Website, in the 2005-2006 school year, there were 284,368 total people served by the Alabama Community College System. Of this total population, 33% of those people were members of a racial minority. The percentage of Hispanic students enrolling in community colleges in Alabama has seen an increase of 29% in the last 5 years.

Data found on the ACCS Website shows the average age of students is 27.9, and over 27% of the students in the Alabama Community College System are over the age of 40. Technology is a growing part of the Alabama Community College System. Of the total 26 colleges in the state, 24 offer online education. All community colleges in the state offer developmental courses in math, reading, and English. The ACCS has formed committees to look at ways to centralize and expand the technology capabilities of all the colleges in the state, as well as to standardize the developmental education courses throughout the state and offer the best practices to all students who need some type of remediation (www.accs.cc).

Snead State Community College in Boaz, Alabama, is one community college that offers remedial courses in math, reading, and English. The specific learning outcomes for students in developmental English at Snead State Community College are basic skills of English grammar, usage, organization, and composition. Specifically, students who take developmental English courses will be able to understand and correct basic errors in grammar such as subject and verb agreement, pronoun antecedent agreement, commas, sentence fragments, run-on sentences, tense shifts, and mechanics. Students were assessed on coherent writing that used a variety of sentence structures. Upon completion of the course, students were able to write a well-developed paragraph containing a topic sentence, supporting details, and a conclusion.

Research Perspective

This study was a quantitative study. It was based on longitudinal data because the data was looking at eight semesters of data. From the fall 2003 through spring 2005 semesters, the developmental English courses at Snead State were lecture based. From the fall 2005 through spring 2008 semesters, different types of technology were used in the developmental English courses at Snead State. This study looked at the final grades for these 5 years. There was a comparative analysis of the final grades for these 5 years.

Research Questions

This study was a quantitative study to analyze the final grades for 5 years of developmental English courses. The first 2 years were courses where the method of course material delivery was lecture based. The last 3 years were courses where specific types of technology were used as the primary method of course material delivery. For the purposes of this study, when referring to technology, the technology that was used in the classes was the classroom performance system (CPS) and personalized instruction using computer-based programs and material along with textbook material on CD.

The study compared the two methods of course material delivery and the affects of student learning outcomes in relation to the outlined objectives for successful completion of the course. The study identified the students by using the COMPASS test scores of students who took the test during the admissions process and were placed in the developmental English class. The final analysis was to look at their final grade for the course. This was done for each English 093 day class to see if there was any significant change between the final grades of the different classes. Successful completion of the course was defined as a final grade of a “C” or higher.

The following research questions were considered:

1. Is there a significant difference in final grades between classes where lecture was the primary method of material delivery and classes where the Sirius course material, PassKey program, and CPS system were the primary method of course material delivery?

2. Is there a significant difference in final grades relating to age--traditional and non-traditional students--in the developmental English classroom where lecture was the primary method of course material delivery and classes where the Sirius course material, PassKey program, and CPS system were the primary method of course material delivery?

3. Is there a significant difference in final grades relating to ethnic background of students in the developmental English classroom where lecture was the primary method of course material delivery and classes where the Sirius course material, PassKey program, and CPS system were the primary method of course material delivery?

4. Is there a significant difference in final grades relating to educational background--GED and high school graduate--of students in the developmental English classroom where lecture was the primary method of course material delivery and classes where the Sirius course material, PassKey program, and CPS system were the primary method of course material delivery?

5. Is there a significant difference in final grades in the next level English course between students in the developmental English classroom where lecture was the primary method of course material delivery and classes where the Sirius course material, PassKey program, and CPS system were the primary method of course material delivery?

Description of Participants

The students for this study were students who were placed into developmental English based either on their ACT score in English or by not having a current ACT score. As is the case for most community colleges, Snead State students tend to be older than undergraduates at four-year institutions. Half of all students are age 22 or older, and more than 20% are aged 30 or older (Snead State Fact Book, 2008-2009. p. 15). If students do not have current ACT scores, they are required to take the COMPASS test.

COMPASS is a nationally marketed diagnostic test used for student placement, and institutions that use the COMPASS test for placement pay a yearly usage fee for this test (Compass-Test.com). COMPASS is a required test for all students who did not take the ACT in high school or who did not score a 20 or higher on the ACT in English. It is part of the admissions process. Once students have submitted their application for admission, they are then directed to see the campus academic advisor to take the test. The COMPASS test is given on a computer and the results of this self-paced, no time limit test, identifies areas of weakness in math, reading, and English and places student in the appropriate college-level courses. According to Amanda Harbison, Snead State academic advisor, in the English section of the COMPASS test, there are a number of different paragraphs so that random selection is part of the system. Students who are sitting next to each other have different paragraphs, so there can be no cheating. Also, students can retake the test once more if they feel there were distractions that kept them from achieving a better score or if they were just not prepared to take the test. If they retake the test, they will not be given the same paragraph they previously had.

Some of the skills covered on the English part of the test are apostrophe use, comma mistakes, agreement errors, parallelism, and other grammatical errors. The test is set up in

paragraph form where students who take the test are asked to correct the errors in the paragraph. Students move their cursors over each sentence in the paragraph, and along the right hand side of the page, they are given multiple-choice possibilities for correcting the sentence. Some sentences in the paragraphs are correct and do not need to be changed, and the student must be able to identify the correct sentences as well as identify and correct those sentences with grammatical errors. The test ends for students after they have incorrectly answered three consecutive questions of the same type. They are then assigned a numerical score from 0-100.

COMPASS is the test required in the state of Alabama for course placement once a student has applied for admission to college. If students do not have an ACT score taken within the last 7 years or did not score a 20 or higher on the English grammar section of the ACT, they must take the COMPASS test. Currently in Alabama, it is up to each institution to set the scores for placement into developmental courses. Snead State Community College set the score for placement into developmental English at 70. Any student who scores lower than 70 out of 100 on the COMPASS test must take developmental English. Students who test into the developmental English courses work on basic grammar and language skills. In order for a student to pass the English 093 course enabling them to advance into English 101, they must have a 70% or higher average at the end of the semester. This 70% average is taken from course work, tests, and a final exam.

Setting

The classes that were evaluated were on the campus of Snead State Community College in Boaz, Alabama. Snead State “is the oldest college in The Alabama College System to award associate degrees” (Snead State Fact Book, 2008-2009). The school opened in 1898 as a

Methodist-based high school, and in the fall of 1935, Snead was chartered by the State of Alabama and became a junior college, still under the supervision of the North Alabama Conference of the Methodist Church. Snead Junior College received accreditation from the Commission on Colleges of the Southern Association of Colleges and Schools in 1941. In 1967, Snead became a part of the Alabama two-year college system under the control of the Alabama State Board of Education. After becoming a part of the two-year college system, the name of the college was changed to Snead State Junior College. Then in May 1992, the name of the college was again changed to its current name, Snead State Community College. In January 2008, Dr. Robert Exley was named permanent president of the College, following 2 years under Interim President Lavell Thrasher (Snead State Fact Book, 2008-2009, p. 2).

Snead State's service area includes all of Marshall County and portions of Blount and DeKalb counties. According to the 2000 U.S. Census, the population of the service area was just under 200,000 (Snead State Fact Book, 2008-2009, p. 6). Snead State has maintained 17 consecutive semesters of increases in enrollment. As of the spring 2008 semester, the enrollment numbers were 2,113. Minority enrollment overall had more than doubled over the past 6 years, from 4% to around 9% (Snead State Fact Book, 2008-2009, p. 8).

Part of the mission of any two-year college is to help prepare students for success at four-year colleges and universities. Unfortunately, many of the students who enroll at Snead are not fully prepared for college-level work. The general trend is that developmental enrollment has increased as the overall enrollment has increased. The enrollment in developmental courses over the last 5 years has increased slightly less than the overall student population (Snead State Fact Book, 2008-2009, p. 1).

Types of Technology

Most students who are placed in developmental English classes have had some exposure to technology, whether through work experience or being exposed to it through children or grandchildren. Since 2005, developmental courses on the campus of Snead State have been using technology in the classroom. For example, Smart classrooms, Powerpoint, and Camtasia are used to enhance classroom lecture-based instruction. The types of technology that were used in the classroom and evaluated for this study were the Classroom Performance System (CPS), computer generated material called PassKey and personalized instruction material called Sirius.

The CPS system is an interactive system using remotes to allow students to answer questions anonymously. The software is loaded on a computer where an instructor types in questions and answers. Then during class, the instructor can distribute numbered remotes to the students, project the questions on a screen, and have students answer the questions using the remotes. The remotes are numbered so that the instructor has a record of student scores. The system allows an instructor to create a class and assign each student a particular remote number. The instructor and the student are the only ones who know which number remote is for which student.

To engage a CPS lesson, the instructor sets a time limit for each question. This is the amount of time a student has to answer the question. For example, an instructor might allow 30 seconds to answer each question. The maximum amount of time that can be given is 5 minutes. After the allotted time has ended, the correct answer will be shown on the screen. Students will be able to see how many students answered the question correctly and how many missed the question. Because the remotes are numbered and anonymous, no one in the class knows who answered correctly or incorrectly. This then gives the instructor an opportunity to evaluate

whether or not students understand a particular concept. If more students miss the question than get it right, instructors are able immediately to explain and review the question and answer before moving on to another question.

One problem commonly observed in most classrooms, especially in the developmental classes, is that students are afraid to ask questions. After a lesson is taught and the instructor asks if there are any questions, few students will raise their hands and ask questions in front of their peers. Many times they will leave the class session not understanding what was just covered in class. When they try to do homework and prepare for a test they tend to get more confused and frustrated. If students were able to ask questions anonymously, through the use of a CPS system or other anonymous means such as computerized lessons, they might feel less intimidated, and the instructor can get a truer sense of what concepts students really understand and which ones need more reviewing.

The PassKey program is a licensed computer program that is available for on-campus students to reinforce material they are struggling with. The instructors use PassKey lessons to give students more work on certain problem areas the student may be having. PassKey contains a database of pre-tests, tutorials, and then a post-test in grammar. There are five different levels of each lesson, with five being the highest level and one the lowest. Instructors assign students a lesson based on their work in class and on tests.

Each lesson begins with a pre-test. This pre-test contains five questions, and students must score 80% or higher in order to bypass the tutorial. If students do not score an 80% on the pre-test, they will then be guided through a tutorial that gives students more practice in that skill. Students read material and then answer a question where they will be given an immediate response of whether the answer is correct. If the answer is correct, they will be taken to the next

section. If they answer incorrectly, they will be given an explanation on why their answer was incorrect and give them another question similar to the previous one to see if they understand the concept. Once they grasp the concept, they will move on to the next section.

After students complete the tutorial, they will be then given a five question post-test. Students must score 100% on the post-test. If students do not score 100% the first time, they have two more opportunities to go through the tutorial and take the post-test again. The material students see again is the same, but the specific questions within the tutorial are different; students cannot memorize answers. Once students successfully score 100% on a lesson, they are then able to move on to the next concept. If they do not successfully pass the post-test after three tries, an instructor can reset the lesson or give them a different level of lesson.

The Sirius program was a faculty-based project at Florida Community College Jacksonville (FCCJ). The college recognized that many students withdrew or failed “high risk” courses; these courses were defined as courses that experienced high enrollment but low retention. Two classes that were identified and designed initially were remedial English and remedial math. In May 2002, the faculty initiated the project to improve student retention and success. Named “Sirius,” after the brightest star in the sky, the project contains online resources for helping students become the best they can be. The McGraw Hill Publishing Company partnered with FCCJ to publish the textbooks, CD-ROM, and online components for the Sirius courses.

A number of the items covered on the tests in Sirius also have links where students can go to get more instruction on the material. Once students have taken a test, they immediately see a score. They can also go back into their tests and see which questions they missed. They can click on the missed questions and be taken to a link where they will get some examples and more

detailed explanations on what type of error it is and how to correct it. There are usually two tests available for each lesson, so if students do not do well on one test, they can review and take the second test.

All material for the Sirius course is available online through Snead's learning management system, Blackboard, and also through interactive CDs that are packaged with the textbook. When students access the learning objectives, they are able to improve their understanding of the course material before they take a graded quiz or exam. The characteristics of these learning objectives are text, multimedia, interactive exercises, assessment, and immediate feedback. By allowing completion of the assignment through the learning objectives and the taking of the practice test, the Sirius program is designed to help students succeed in the course (Introduction to Sirius).

Data Collection Procedures

This study focused on the fall and spring semesters beginning with the fall 2003 semester through the spring 2008 semester. The primary method of data collection for the material from this semester came from data obtained from Snead State's Institutional Research Office, Dr. Jason Watts, and from computerized data obtained from the college's ACCESS program which contained age, race, educational background, and COMPASS test scores. This program also contained the final grades of all courses.

From the fall 2003 through spring 2004 semesters, the primary method of course material delivery was lecture. The textbook used was a workbook where pages could be removed and turned in. Classroom instruction was given verbally by the instructor and exercises were completed in the textbook. Department-generated quizzes and tests were given throughout the

course and a departmental final exam was given in each course. If a student needed additional resources, they were given handouts and worksheets created by their instructor from other sources to take home and complete.

In the fall 2004 semester, Snead State Community College was awarded a Title III grant. The first year of this 5-year grant was to incorporate instructional technology in developmental courses. Beginning at the end of the fall 2004 semester and into the spring 2005 semester, developmental courses were identified, and the College purchased instructional technology. The college purchased computer software that would enhance classroom instruction and a computerized Classroom Performance System (CPS). The selected developmental instructors created lesson plans and structured the courses to incorporate the CPS system technology and the computerized lessons. From fall 2004 to spring 2007, developmental English courses on campus used both of these programs.

In the fall semester of 2007, the developmental English courses began using the Sirius textbook in addition to the CPS system and computerized lessons. The Sirius material gave students access to online quizzes in Sirius and supplemental material on CD that came with the Sirius textbook. The instructors for these courses were also continuing their use of the CPS system and PassKey lessons. All developmental English now use the CPS system, PassKey lessons, and Sirius course material

On average, Snead State Community College offers five on-campus developmental English courses in the fall semesters with the maximum number of students set at 25. Typically, in the fall semesters, these classes have the maximum number of students in each. Taking into account students who withdraw themselves from the course or are withdrawn for not attending, there are over 100 students who complete developmental English courses in the fall semester. In

the spring semester, the College typically offers three developmental courses with the maximum number of students set at 25. These courses in the spring tend to be small; some do not make because of the small number of students enrolling in the course. The sample group for the spring semester was 50 or fewer participants per semester.

In the fall semester 2003 and spring semester 2004, the COMPASS cut-off score was set at 61 for placement into developmental English. In the fall 2004 semester, the COMPASS cut-off score was raised to 70 for placement into developmental English. For the purpose of this study, the COMPASS cut-off score was left at 70 for all semesters used.

The instructors for these courses were two adjunct instructors and three full-time instructors who had been teaching developmental English courses at Snead State for the 5-year period covered by this study. There was a departmental syllabus that all instructors followed. Instructors were following the same lesson plans and were using the same CPS lessons and material in the Sirius along with the same computerized programs for lessons.

The primary analysis for this study was to compare the final grades of students who were in courses where lecture was the primary method of course delivery with those of students who had some type of technology used as the primary method of course material delivery. Further analysis was conducted to see if there were any significant changes in final grades based on age, ethnicity, and educational background of students in lecture courses and students in courses where some type of technology was used. The final analysis was a group analysis of students' final grades based on age, ethnicity, and educational background between the two different methods of course material delivery.

The final analysis was to track students from developmental English courses to the next level, which is English 101. An analysis of their retention and successful completion of English

101 was conducted. A passing grade in English 101 was a final grade of a “C” or higher. If students scored below a “C” in English 101, they must re-take the course. The analysis focused on how many students successfully completed English 101 and on the average grades made by these students (on a 4-point scale).

Research Instrument

The quantitative analysis of the data collected from the COMPASS test given as an indicator of placing students into developmental English, and the final grade were generated using the computer software package Statistical Package for Social Sciences, (SPSS®). Independent-samples tests using Levine’s Test for Equality of Variances were used to compare the final grades of students in English 093 based on age, ethnicity, and educational background. There was also an independent t test to make a comparison between the final grades between those classes where lecture was the primary method of course material delivery and those classes where technology was the primary method of course material delivery. Levine’s test was used because the before and after results tell a “higher” or “lower” value where a chi-square test would have combined the before and after and given a “similar” or “different” value. These data were used to determine whether there was any correlation between final grades based on how the course material was delivered.

Following the t -tests, a follow-up analysis of variance (ANOVA) test with a Tukey post-hoc analysis, was used for research question 2-4. This test was used to divide the students into the four groups used in the t -tests to determine whether there was any significance between the groups and to validate the t -test results. The ANOVA tests were also generated using the computer software package SPSS,

Research Design

The quantitative design selected was a longitudinal design. An independent-samples *t* test was used to answer Research Question 1, which compared the final grades of the classes where lecture was primary and where specific types of technology were primary. These data were used to determine whether there were any significant changes between methods of delivery.

Independent-samples tests were conducted to answer Research Questions 2, 3, and 4 that compared the final grades of English 093 classes that were straight lecture courses with courses where some type of technology was used in course material delivery. There were two comparisons done for each demographic category. The first compared grades of each category of the demographic (for example traditional vs. non-traditional) before and after the change in delivery. The second compared grades before and after the change in delivery for each category of each demographic. This not only allowed a before-and-after look at each demographic category, but also gave some insight as to whether the “instructional effect” of the change in teaching method is somehow dependent on demographics. An independent-samples test was conducted to answer Research Question 5, which compared the final grades of students in English 101 classes that had taken an English 093 course and those students who went straight into an English 101 class without any remediation.

Ethical Considerations

When students log in for the COMPASS test, they use their name and a student number. The student number is a number that is assigned to students when they apply for admission to the College. It is a five-digit, random number that is not part of any information related to the student, such as a social security number. When the scores are printed for the student to see, their

name is the only identifier on the form. When test scores are accessed from a computer through the COMPASS Website, the only identifier is the student number. Names and any personal information of the student on the pre-COMPASS score were anonymous. The only data that were available when the information was retrieved was the student number and a score. The end-of-the-semester grades were provided from the students' transcript files by the College's IT department with the assistance of the Director of Institutional Research. No personal information (other than the unique ID number assigned by the school) was included in the data. The ID number was used exclusively to match English 093 grades to COMPASS scores and English 101 grades. No personal information was accessed or stored as part of this project.

Student numbers, course numbers, and course section numbers were used to match COMPASS scores with final grades. The placement scores and final grades of students registered for the developmental English courses chosen for the study were accessible. The scores were the only items used for the analysis and were entered into the SPSS system for analysis.

Quality Assurance

The test scores were kept in a locked closet during the analysis process. Student numbers were secured at all times. Once all the test scores were added into the SPSS system, the test scores were kept in a locked closet in an office until the research was complete. Once the research was complete and the data were no longer needed, it was shredded and burned.

CHAPTER 4

RESULTS

The purpose of the study was to see whether there was any significant difference in final grades between developmental students in English courses where lecture was the primary method of course material delivery and courses where different types of technology were used as the primary method of course delivery. The analysis further examined whether there were significant differences between these two methods of course delivery based on age, ethnicity, and educational background of the students. The final analysis considered whether there were any significant differences in final grades in English 101 courses of those students who had developmental English with lecture and those who had developmental English with different types of technology.

This chapter is presented in three sections. The first section summarizes the methodology of the study. The second section analyzes each of the research questions further and applies it to the purpose of the study. The third section summarizes the results.

Summary of Methods

This study examined data dating back to the fall 2003 semester through the spring 2008 semester. From the fall 2003 through spring 2005 semesters, the developmental English courses taught at Snead State Community College were taught using lecture only. The instructors who taught these courses used a textbook and provided the information for this course through

lectures. Students completed assignments from the textbook and turned them in to the instructor for grades.

From the fall 2005 semester through the spring 2008 semester, the developmental English courses at the College were taught using three different types of technology. The technology used in these classes were the Sirius program, a computer generated program called PassKey, and the Classroom Performance System (CPS). Students in these later classes were presented some of the material through lecture, but the primary method of course material delivery was through the use of these three different types of technology. Classroom Performance System technology was used specifically in the classroom during class sessions, while PassKey and Sirius were used during class, but students were able to use these outside of class as well.

The student sample for the study was from classes where the instructors taught classes from the fall 2003 through the present. The instructors taught courses using lecture as the only method of course material delivery and also taught classes where different types of technology were used as the primary method of course material delivery. The sample for this study was students who scored below a 70 on the COMPASS placement test and were placed in the developmental English course. Data for this study were gathered from on-campus classes and by instructors, both full- and part-time, who had been teaching at the College for over five years. Using these specific instructors was to minimize the possibility that any difference in student performance related to which instructor the student had. This decision was made because a preliminary analysis suggested a strong instructor influence on grades for some of the adjunct instructors.

Along with looking at the overall difference between the final grades between these two types of course material delivery, the analysis also looked at differences in the final grades in

age, ethnicity, and educational background of the students in these two groups. The initial analysis was whether there were any differences among age, ethnicity, and education background within each of the course delivery methods. The final analysis was to see whether there was any difference between age, ethnicity, and educational background between the two different course material delivery methods.

The final analysis for this study involved comparing the final grades of students who completed English 101 classes to see whether there was any significant difference between students who had completed developmental English who had the lecture-based course or the different types of technology. English 101 was the next course after completing developmental English. It was important to see whether students who were introduced to and used technology as part of their course material delivery in English 093 were better prepared for English 101 (as evidenced by higher grades) than students who were in English 093 courses that used straight lecture.

Results

Research Question 1

This question looked at the difference between student grades between students who were in lecture only classes and those who had some type of technology as the primary method of course material delivery. There were 255 students used in this study from fall 2003 through spring 2005 who were in courses where lecture was the primary method of course material delivery. From spring 2005 through spring 2008, there were 755 students in this study who were in classes where different types of technology were used as the primary method of course material delivery. Table 1 shows a comparison of the grades.

Table 1

Mean Grades Before and After Change in Instructional Method

Time Period	<i>n</i>	Mean Grade (4-point scale)	<i>SD</i>
Before Fall 2005	255	1.86	1.47
Fall 2005 to Spring 2008	755	2.25	1.30

An independent samples *t* test revealed a significant difference between the grades of the two groups ($t(419.96) = -3.75, p < .001$). The average final grades between those students who were in lecture only courses is significantly lower than the final grades of those students who were in courses where different types of technology were used. The very strong *p*-value makes it very unlikely that this difference is due to random chance. It is reasonable to conclude that the change in instructional delivery is responsible for the increase in student grades.

Research Question 2

This question looked at differences in final grades concerning the age of students. Students were divided into two groups--traditional and nontraditional age college students. Traditional students are defined as those students 18-24 years of age, and the nontraditional students are 25 and older.

The first analysis of the question looked at the change in grades among traditional-age students after the change from a lecture-driven course to a technology-driven course. The second part of the analysis looked at the final grades of the nontraditional students who had lecture courses with the nontraditional students who had some type of technology as the method of course material delivery.

Table 2

Mean Grades for Traditional and Nontraditional Students Before and After Change in Instructional Method

Time Period	Traditional Students			Nontraditional Students		
	<i>n</i>	Mean Grade	<i>SD</i>	<i>n</i>	Mean Grade	<i>SD</i>
Before Fall 2005	163	1.77	1.37	50	1.22	1.49
Fall 2005 to Spring 2008	571	2.24	1.35	172	2.29	1.54

There is a significant gain for the traditional students who had some type of technology as the primary method of course material delivery ($t(326.45) = -3.96, p < .001$). The difference in grades before and after the change, therefore, is almost certainly related to changes in the course and not due to random chance.

There was also a significant gain in the final grade of the nontraditional students who had some type of technology compared to the nontraditional students who had straight lecture-based courses. The final grades for the nontraditional students improved dramatically from the final grades of the nontraditional students who had lecture only ($t(220) = -4.34, p < .001$). In fact, the gain is over twice as large as with traditional-age students. A group GPA of 1.2 prior to Fall 2005 means that the majority of older students were not making the minimum grade of “C” (2.0 on a 4-point scale) required to move on to English 101. This means the nontraditional students who were in courses where technology was used were better prepared to move on to English 101.

The final analysis for the research question compared the final grades of the traditional and nontraditional students who had lecture with those of the traditional and nontraditional students who had some type of technology in their course work.

Table 3

Mean Grades for Traditional and Nontraditional Students with Lecture Only and Some Type of Technology

Time Period	Traditional Students			Nontraditional Students		
	<i>n</i>	Mean Grade	<i>SD</i>	<i>n</i>	Mean Grade	<i>SD</i>
Before Fall 2005	163	1.77	1.37	50	1.22	1.49
Fall 2005 to Spring 2008	571	2.24	1.35	172	2.29	1.54

The grades of traditional and nontraditional students were significantly different prior to the change in delivery method ($t(326.45) = .79, p < .001$). Nontraditional students were at a statistically significant disadvantage in the lecture-based courses. However, as the following table shows, this is not the case after the course was redesigned.

An independent-samples t test comparing traditional to nontraditional students after the change to heavy technology use demonstrates that the grades are no longer significantly different ($t(732) = -3.96, p < .001$). The introduction of technology in course material delivery closed the gap between the final grades of the traditional and nontraditional students.

Following the t -tests, the researcher conducted a follow-up analysis of variance (ANOVA) test with a Tukey post-hoc analysis, dividing the students into the four groups used in the t -tests (traditional before, traditional after, nontraditional before, nontraditional after). The ANOVA result was statistically significant which affirms the t -test result. The Tukey post-hoc analysis, which compares the differences among the mean scores of each of the four groups, was similar to the t -test, indicating that the traditional and nontraditional students had statistically similar grades both before ($F(3) = .46, p = .122$) and after ($F(3) = .001, p = 1.00$) the change in instructional delivery. The Tukey post-hoc analysis did, however, affirm the t -test results showing a significant change in scores following the change in instructional delivery as for both

the traditional age student ($F(1006), = .40, p = .004$) and the nontraditional age students ($F(106), = .86, p = .000$). Because the t test showed a significant difference in grades before the change in instruction that the ANOVA did not detect, that result may be questionable. The ANOVA may have been a Type I error (a false negative) or the t test may have been a Type II error (a false positive). Nevertheless, closing the gap between the traditional and nontraditional students may still be viewed as a good thing, even if the statistical significance of the result is in doubt.

Table 4

ANOVA Test for Age

Eng. 093 GPA	Sum of Squares	<i>df</i>	Mean Square	<i>F</i>	<i>p</i>
Between groups	57.40	3	19.13	9.78	.000
Within groups	1906.02	1006	1.96		
Total	2026.42	1009			

While there were significant improvements in final grades within the traditional and nontraditional groups when comparing final grades, when looking at the differences between the two groups as a whole, the differences were not as significant. The change in teaching method seems to have eliminated the small difference in final grades that existed before. Although it was not a statistically significant shift, it can nonetheless be viewed as a desirable result.

Research Question 3

This question analyzed the relationship between race/ethnicity and developmental English grades before and after the change in delivery from a lecture-based to a technology-based course. Due to the demographics at the research site, the only possible analysis was Caucasian and minorities. The different races on Snead's campus were identified as African-

American, Latino, Native Americans, Asians, and others. No separate group had a large enough random sampling. Each non-White ethnic group had less than 100 students, so these groups were combined into one group called minority students.

The first analysis looked at the White students who had lecture courses and who had courses that had some type of technology used as the primary method of course material delivery. The second analysis looks at the minority students who had lecture and technology.

Table 5

Mean Grades for White Students and Minority Students Before and After Change in Instructional Method

Time Period	White Students			Minority Students		
	<i>n</i>	Mean Grade	<i>SD</i>	<i>n</i>	Mean Grade	<i>SD</i>
Before Fall 2005	171	1.60	1.42	42	1.81	1.40
Fall 2005 to Spring 2008	584	2.23	2.23	159	2.35	1.27

The change in instructional method resulted in a significant increase in final grades among the White students. There was a significant rise in grades among White students after the introduction of technology into the courses ($t(753) = -5.08, p < .001$). There is also an improvement in minority students' grades after the change in instructional delivery ($t(199) = -2.41, p < .001$). However, the change is not as dramatic as was the case with the White students.

The final analysis for the research question was to compare the final grades of the White and minority students who had lecture with those of the White and minority students who had some type of technology in their course work.

Table 6

Mean Grades for White Students and Minority Students with Lecture Only and Some Type of Technology

Time Period	White Students			Minority Students		
	<i>n</i>	Mean Grade	<i>SD</i>	<i>n</i>	Mean Grade	<i>SD</i>
Before Fall 2005	199	1.71	1.43	46	1.91	1.40
Fall 2005 to Spring 2008	541	2.23	1.46	138	2.42	1.28

In this case, the grades of White and minority students were statistically identical both before ($t(243) = .86, p < .001$) and after ($t(182) = .03, p < .001$) the change in delivery. Using a t test to determine whether the two groups had significantly different scores, the minority group had slightly better grades before and after; neither difference was significant.

The researcher conducted another ANOVA test with a Tukey post-hoc analysis, dividing the students into the four groups used in the t -tests (White students before, White students after, minority students before, minority students after). The ANOVA result was significant within the groups before and after which affirmed the t -test result. The Tukey post-hoc analysis, which compares the differences among the mean scores of each of the four groups, was also consistent with the t -test, indicating that the White and minority students had statistically similar grades both before ($F(1006) = .20, p = .82$) and after ($F(1006) = .10, p = .84$) the change in instructional delivery. The Tukey post-hoc analysis also affirmed the t -test results showing a significant change in scores following the change in instructional delivery for both the White students ($F(3) = .52, p = .000$) and the minority students ($F(3) = .43, p = .264$).

Table 7

ANOVA Test for Ethnicity

Eng. 093 GPA		df	Mean Square	<i>F</i>	<i>p</i>
Between groups	50.68	3	16.90	8.60	.000
Within groups	1975.74	1006	1.97		
Total	2026.42	1009			

While there were significant improvements in final grades within the White and minority students when comparing final grades, when looking at the differences between the two groups as a whole, there were not significant differences. There was a significant improvement with the White student group. Again, the change in teaching method seems to have eliminated the small difference in final grades that existed before. Although it was not a statistically significant increase, it can nonetheless be viewed as a favorable result.

Research Question 4

This question looks at whether the instructional effect of the change in methodology was related to the students' educational background. The students under consideration in this study were divided into two groups--high school graduates and students who had earned a GED.

The first analysis is whether the change in instructional methodology affected the final grade of the GED students. The next analysis is of the high school graduates who had lecture-based courses and those that had some type of technology.

Table 8

Mean Grades for GED and High School Students Before and After Change in Instructional Method

Time Period	GED Students			High School Students		
	<i>n</i>	Mean Grade	<i>SD</i>	<i>n</i>	Mean Grade	<i>SD</i>
Before Fall 2005	57	1.14	1.38	188	1.94	1.39
Fall 2005 to Spring 2008	133	1.72	1.55	545	2.40	1.35

Does the instructional effect of the change in instruction vary with the student's background? While the grades of the GED students in English 093 are lower than most other demographic groupings--1.72 after the change in method, lower than the "after" GPA of any other group analyzed in the previous sections--the change in delivery nonetheless seems to have been beneficial. The independent samples *t* test showed a significant change in the GED group's final grades after the change in instructional method ($t(188) = -2.44, p < .001$).

As has been the case with all of the analyses so far, the change in instructional method resulted in an increase in grades that is statistically significant ($t(731) = -4.10, p < .001$). The lower *p*-value for the high school graduate group suggests an even stronger instructional effect for the high school group than for the GED group.

The final analysis compares the final grades of the two groups (GED and High School Graduate) before and after the methodology change from lecture-driven to technology-driven.

Table 9

Mean Grades for GED and High School Students with Lecture Only and Some Type of Technology

Time Period	GED Students			High School Students		
	<i>n</i>	Mean Grade	<i>SD</i>	<i>n</i>	Mean Grade	<i>SD</i>
Before Fall 2005	188	1.94	1.39	57	1.14	1.38
Fall 2005 to Spring 2008	545	2.40	1.35	133	1.72	1.55

While both groups showed significant gains in achievement resulting from the change in teaching method, the GED group has failed to close the gap with the high school graduates. The GED group scored statistically lower before ($t(243) = 3.79, p < .001$) and after ($t(183.94) = 4.686, p < .001$) the change in methodology. This is an interesting result because the gaps between age and race disappeared between the groups after the change. It appears that GED students are not as well-prepared for college as high school graduates, and one semester of remediation is not enough to bridge the gap, regardless of methodology.

The researcher conducted an ANOVA test with a Tukey post-hoc analysis, dividing the students into the four groups used in the t tests (GED students before, GED students after, high school students before, high school students after). The ANOVA result was significant (21.636, $p < .001$), which affirmed the t -test result. The Tukey post-hoc analysis, which compares the differences among the mean scores of each of the four groups, was also consistent with the t -test, indicating that the GED and high school students had significant changes in grades both before ($F(3) = .80, p = .001$) and after ($F(3) = .63, p = .000$) the change in instructional delivery. While the change between the two groups is slight, nonetheless, both groups had significant changes in grades. The Tukey post-hoc analysis also affirmed t -test results showing a significant change in

scores following the change in instructional delivery for the high school students ($F(1006) = .44$, $p = .001$), and for the GED students ($F(1006) = .60$, $p = .026$).

Table 10

ANOVA Test for Educational Background

Eng. 093 GPA	Sum of Squares	<i>df</i>	Mean Square	<i>F</i>	<i>p</i>
Between groups	122.82	3	40.94	21.64	.000
Within groups	1903.69	1006	1.89		
Total	2026.42	1009			

While there were significant improvements in final grades within the GED and high school students when comparing final grades, when looking at the differences between the two groups as a whole, there was a significant change in the scores of the high school students and not a significant difference for the GED students. Again, the change in teaching method seems to have eliminated the small difference in final grades that existed before. Although it was not a statistically significant shift, it can nonetheless be viewed as a desirable result.

Research Question 5

The final research question determined whether there was a difference in student performance in the next level English course between students who had straight lecture courses and those in courses where some type of technology was used as the primary method of course material delivery.

Table 11

Mean Grades in Eng. 101 of Students Who had Lecture and Students Who had Some Type of Technology in Eng. 093

Group	<i>n</i>	Mean Grade (4-point scale)	<i>SD</i>
Students who took English 093 before fall 2005	138	1.87	1.34
Students who took English 093 from fall 2005 to spring 2008	403	1.85	1.33

An independent samples *t* test indicated that there is no significant change in English 101 grades between the students who had the developmental English class with lecture and those who had the developmental class with some type of technology use. The *p* value is greater than .050 ($t(539) = .16, p < .001$).

Summary of Results

The results in this study suggest that some type of technology, when used in a classroom as a mode of course material delivery, is beneficial to students. There were significant results when looking at the age of students. There was a slight improvement in overall grades of both White and minority students in the courses where technology was used as part of course material delivery. The educational background of the students also showed a slight improvement with technology. However, when tracking these students through the next level of course work, there was no significant difference in the final grade of the students who had lecture in English 093 courses with those who had some type of technology in English 093 courses. In fact, there was a slight (but non-significant) decline in the final mean grade of the students who had some type of technology than those who had straight lecture. Chapter 5 will discuss further the interpretations and recommendations of this study.

CHAPTER 5
INTERPRETATIONS AND RECOMMENDATIONS

Summary of Results

This study focused on the use of certain types of technology in developmental English courses. Research Question 1 was the overarching question of whether there is a significant difference in final grades between classes where lecture was the primary method of material delivery and classes where the Sirius course material, PassKey program, and CPS system were the primary method of course material delivery. The overall conclusion is that technology use in the developmental English classrooms did benefit students. The final grades for students who were in courses where some type of technology was used as the primary method of course material were higher than those students who had lecture as their primary method of course material delivery. When looking at age, ethnicity, and educational background, the results were the same; the final grades for students with some type of technology were higher than the students with lecture only.

The second research question in this study focused on the age of the students and whether there was a significant difference in final grades between traditional and non-traditional age students. The data from the research show there was a gain in final grade scores in both the traditional and non-traditional age students in the classes where some type of technology was used. It is evident that technology use was beneficial for students in both age groups. The significant result of this research question came when looking at the final grades of traditional and non-traditional age groups between those who had lecture and those who had some type of

technology. The non-traditional age students had lower final grades in the lecture-based course when compared to the traditional students who had straight lecture. This gap decreased when looking at the scores of the non-traditional students and the traditional students who had some type of technology. The results show that non-traditional students greatly benefitted from the use of technology when compared to the traditional age students.

Research Question 3 looked at the difference between ethnicity of students and whether there was a significant difference in final grades between White and minority students. The minority students comprised African Americans, Latinos, Native Americans, Asians, and others, as there were not a valid number of students in each separate group. When looking at the White students, the students who had some type of technology had better final grade averages than the White students who were in straight lecture courses. There was also a difference in final grades between the minority students who had some type of technology when compared to the students had lecture courses. While there was an increase in the grades of the minority students, the rise in final grade was not as high as it was in the White group. When looking at both groups, the grades of the White and minority students were almost identical when compared looking at those who had lecture and those who had some type of technology. While there were improved grades in both the White and minority groups when technology was used in the classroom compared to the lecture courses, when looking at the groups together, the grades were almost identical between the White and minority students who had some type of technology. Again, this showed that technology was beneficial to both groups and, in this case, they were very close in the final grades.

The fourth research question looked at the educational background of the students to see if there was a significant difference in final grades between students who had a high school

degree and students who earned a GED. The students who earned a GED initially had a lower final grade average than any of the other groups with both lecture and some type of technology. But the final grade average for the GED students who had some type of technology in the developmental English course was higher, again showing that some type of technology was beneficial to the students. There was also an increase in the final grade average for the students who had a high school degree when technology was used. The significant increase came between the two groups: the students who had a high school degree had significantly higher scores when some type of technology was used than the students who earned a GED.

Based on the data analysis for Research Questions 2, 3 and 4, it is evident that when some type of technology was used in the developmental English classroom, there was an improved final grade average. While some of the increases were significant, there was an overall improved final grade average based on the age, ethnicity, and educational background of the students who were in developmental English. The data support the idea that technology use did affect the final grades of students.

Research Question 5 followed these developmental English students into the next English course, which was English 101. The data from the research show there is not a significant difference in the English 101 final grade average between those students who had some type of technology in developmental English and those who had lecture only in developmental English. In fact, the data show the students who had some type of technology in developmental English had a slightly lower final grade average in English 101 than those students who had lecture in developmental English. The next section will discuss the results further.

Discussion of Results

Technology used in the classroom does affect learning outcomes, specifically final grades for the course. The data from this study does show that some type of technology used in the developmental English classroom does benefit students. The results of this study do seem to support the current research on technology in classrooms.

There was a significant gain in final grades between the traditional and non-traditional age students when some type of technology was used. This was somewhat surprising given that research shows the traditional age students, or the “Net Generation,” are the ones who are more familiar with technology and are more willing to use different forms of technology (Carlson, 2005). These students are the ones who are bored with and want to see different methods of course material delivery. The traditional age students are more technological savvy than the non-traditional students (Carlson, 2005). But the data show that the non-traditional age students had slightly higher final grade averages when some type of technology was used as the primary method of course material delivery when compared to the traditional age students. Non-traditional students, then, are embracing the technology use in the classroom and doing as well, even slightly better than, the traditional age students. One researcher stated that the current higher education system is geared toward the “baby boomer generation,” but these baby boomers are embracing the technology, and are doing just as well with it as their “Net Generation” counterparts (Carlson, 2005, p. A36). It does not seem that other obligations such as family and jobs or their lack of skills from being out of school for a long period of time affects the non-traditional age students when it comes to keeping up with the traditional age students in the classroom (Kim, 2002).

The ethnicity of the students was not a significant factor in student grades. Again, while there was an improvement in both the White and minority students between those who had some type of technology use and those who had lecture, the overall difference between the two groups was about even. There was not a significant change between the White students and the minority students. This may have to do with the fact that the majority of students enrolled in community college are White (Saxon & Boylan, n.d.).

The change in student grades following the change in instructional method was not dependent on the students' prior backgrounds. The students who had high school degrees had overall higher final grade averages than those who earned their GED. While the students who earned a GED had a much lower final grade average in both the lecture and technology enhanced classroom to begin with than those with a high school degree, or any of the other groups in this study, the data does show that there was an increase in the final grade average of students who earned a GED in the classroom where some type of technology was used. One study stated that students in developmental courses had low self-esteem, and confidence and skills such as working at their own paces was lacking (Saxon & Boylan, n.d.). The data show that students who earned a GED and are coming back to school to earn a degree are doing just as well as those who have not had any lapse in their education.

One possible reason that the data supports an increase in final grade averages among students in classrooms where some type of technology was used could be because this methodology more closely matches students' learning styles than a lecture-based method. Learning styles and their influence on achievement have been an important issue in educational course development (Sherer & Shea, 2002). Some instruments used to identify learning styles identify three main learning styles: auditory, visual, and tactile. The auditory learners learn best

by hearing information. The visual learners learn best by seeing and visualizing ideas, while the tactile learners learn best through hands-on experiences. Sherer and Shea (2002) also found students today have many opportunities for applying different learning styles as they work through course content. They are encouraged to not just focus on the learning style that best suits them, but to explore the other learning styles in which they are weaker. The introduction of some type of technology into a classroom as an instructional method would seem to meet the needs of more students than traditional lecture. It is clear that there is no one instructional method that will reach all learners; therefore, it is up to instructors designing courses and delivering the material to offer a variety of approaches.

The use of a variety of different teaching methods is recommended for developmental education. Boylan and Saxon (1998) stated that students in remedial courses have been lectured to in the past without much effect. The argument for this is that if the traditional method of lecture had worked for these students before, then they would not be in remedial courses. That may even be a reason why some of the students dropped out of school before completing high school and later on earned a GED. If a student has a high school teacher who was a poor lecturer, this may have been a driving factor for that student to drop out of school. This supports the data by showing all groups had higher final grade averages in the classrooms where some type of technology was used when compared to those who had just lecture. The gains were consistent across all demographics under consideration in this study.

Sherer and Shea (2002) pointed out that technology or, more specifically electronic delivery, does not automatically mean that a student will learn and understand the material. While this is true, the data from this study show that the students did better in the courses where some type of technology was used. While some of the research supported the idea that the

traditional age students would do better in classrooms where there were more interactive activities (Carlson, 2005; O'Banion 1997), the data from this study showed that the non-traditional students had slightly higher final grade averages than the traditional age students, thus supporting the idea that non-traditional students are embracing the different methods of course material delivery whether they came in with prior knowledge or experience did just as well, even slightly better than, the students who were familiar with the different styles. Instructors must choose information and activities that will foster all types of learning styles.

Grasha and Yangerber-Hicks (2000) noted that some students do not want to depart from the old traditional ways. The students who were not familiar with technology and had to learn how to use computers as well as try to grasp the material being covered said it was too much. However, the result from this study contradicts this; non-traditional students did just as well, even better, than the traditional students. However, the data from this study does support Grasha and Yaregarber-Hicks' (2000) assertion that we should not overestimate what students are capable of doing. They feel that more time needs to be spent looking at the learning process and how technology affects the learning outcome.

While the use of some type of technology did produce higher English 093 final grade averages in all the groups studied, student grades and achievements in English 101 actually declined slightly. This stand is seemingly contradictory to the other results from this study. There are several plausible reasons.

The final English 101 grade averages of the students who had straight lecture in developmental English was statistically the same as the final English 101 grade averages of the students who had some type of technology use in developmental English. Because there had been an increase in English 093 final grade averages of all groups across the board in the classes

where some type of technology was used, it was reasonable to speculate that there would be increased achievement in the next course. That was not the case in this study.

There are a number of possible reasons why there was this discrepancy. The first, and perhaps most likely, reason is grade inflation in the redesigned developmental English courses. That is, in the redesigned, technology-driven course, grades were higher because of the way the points were assigned. In the classes where the material presented was strictly lectured based, the grades were based on exercises, in-class work or homework, and tests. In the classrooms where some type of technology was used, students were also graded on exercises and tests, but they were also given grades/points for other computer-based assignments such as the Classroom Performance System or individualized computer assignments. Students in the redesigned course could conceivably achieve the same average with lower exam scores. There may have been more opportunities for a student in the technology enhanced class to earn more points, thus invariably giving them a higher grade at the end of the course.

A second possibility for the discrepancy in the English 101 grades could be the lack of technology use in the English 101 classroom. If the students who had some type of technology use in their developmental English course advanced to a class where technology was not used, this may have adversely affected their performance in English 101. If a student became comfortable with and used to being able to complete some work or get help from the use of computer software and they were not given that opportunity in English 101, they may not do as well in a course where there is no technology. This would support the data, which show the students who had straight lecture in their developmental course had slightly higher final grade averages in English 101 than the students who had some type of technology in developmental English. A study conducted by Boylan and Saxon's (1998) supported the idea that computer-

based instruction is most effective in developmental courses when it is used as a supplement to regular classroom activities. The data in this study also support this study, but if it is effective in developmental courses and students are using this, how do they do in follow-up classes where technology is not used?

Another possibility could be instructor bias. Some instructors may like the use of technology in the classroom. When they use the technology and they think that students do well, they may also adjust the scoring of assignments and put more emphasis on the assignments completed using the technology. This could then cause subjectivity in the final grades for the course.

Implications for Further Research

Because the final result for this project seems to contradict the other four, additional qualitative studies regarding technology use in developmental courses are needed. While much of the data presented in this study support the research that shows technology use in the developmental English classroom is effective, there is a need for more research that looks at specific types of technology and other types of classrooms. There are new types of technology being implemented each year that instructors are embracing. Smartboards, updates to Classroom Performance Systems, and new computer-based programs are constantly being improved to do more and provide more for students. Besides developmental English, more research needs to focus on other developmental courses as well as other college courses.

Further studies need to include looking at particular types of technology and their effectiveness in the classroom. This study focused on three different types of technology use. Future studies would focus on one specific type of technology and track its effectiveness. There

has been research done on the effectiveness of classroom performance systems by Carnevale (2005) and others. More research could be conducted on the individualized computer programs and the textbooks that utilize computer-generated material and their effectiveness in the classroom.

Other studies need to focus on how different types of learning affect different ethnic groups. There is data that focuses on age and how students learn, but there is not much data on ethnicity and how different types of technology, and learning, affect them. The studies need to focus on specific ethnicities such as African-Americans, Latino, Asian, Native Americans and others. Since there is a diverse population in higher education, more studies need to be done that focus on how best to meet their needs so they can succeed.

More study needs to be conducted on learning styles and the different methods of course material delivery that meet the needs of students with different learning styles. The different learning styles of students should be taken into account when designing courses, but students must also adapt to all the learning styles, not just the one they are more comfortable and better with. Thus, says Grasha and Yangarber-Hicks (2000), instructors who are teaching with technology must take into account all learning styles when designing courses. Learning styles alone should not determine how best students will learn or that only certain types of people will benefit from the course technology. The authors believe that people possess a number of different characteristics and should not be labeled or restricted to one certain idea. More research needs to be conducted on learning styles and which methods of course material delivery work best for each type. Then as instructors begin to incorporate the technology, they can use different types that meet the needs of the different learning styles while introducing students to other means of obtaining information.

Further studies also need to include the inclusion of technology in other classes as well. While this study focused on the use of specific technology in developmental English classrooms, future studies could include developmental math courses or other level courses. There are studies that focus on college level courses that compare test grades of students who were in straight lecture courses with those whose courses where computer-based technology was used along with lecture (Taraban & Rynearson, 1998). There needs to be more studies done that focus on developmental courses.

Along with studies on technology in other classes, there needs to be qualitative studies conducted on student and teacher perceptions of technology. If instructors are not properly trained or are being forced into using technology, their attitude and morale may be imposed in the classroom. Students also have different perspectives on technology as well. Carlson (2005) talks about how technology is constantly changing and that students' are not interested in technology of the past. Students want the most up to date material that is available. If teachers are ill-equipped and not fully supportive of the use of technology in the classroom, they may not use it correctly or have the enthusiasm in the classroom that will motivate students.

Implications for Practice

The results of this study need to be used by community colleges for re-evaluating and improving developmental education programs. The data in this study showed that technology was beneficial to students. There was a benefit to traditional and non-traditional students, Caucasian and minority students, and high school and GED students. These groups are a large part of the student population on most community college campuses. As institutions evaluate

their current developmental programs, technology needs to be part of the discussion for improvement to meet the needs of the diverse student body.

Each year, institutions undergo budget reviews and make decision on what is essential and what they can do without. With the current economic climate and funds for higher education tight, technology may not be a priority. Even during hard times and budget cuts, technology must still be part of an institutions budget. But how do colleges keep up with the constant changing and updating of technology? While this can be a costly issue on most college campuses, there are programs and technology that are free or cheaper when bought in packages or bulk. Colleges need to find creative ways of purchasing and using technology.

While technology needs to continue to be improved and implemented into developmental education, there is also a need to evaluate developmental education as a whole. At some community colleges, there is more than one level of developmental English offered. Some have two or more sections of developmental English courses that start with basic grammar and progress through more advanced grammar. While the data showed improvement in final grades of students who had some type of technology, grades may have been even higher or there may have been better grades in Eng. 101 if students had been gradually introduced to technology and the technology was part of every course. In this study, there was only one level of developmental English course. While students did benefit from the use of some type of technology, there needs to be a closer look at whether there should be more levels of developmental courses with an inclusion of technology. As a student moves to the next level course, there would be more technology introduced and incorporated into the course. By offering more levels of developmental English and implementing different types of technology at each level, this would

give educators an opportunity to see which types of technology are the most beneficial for students.

If technology is being introduced and used in developmental courses and it is shown to be beneficial for students, there needs to be more collaboration between developmental programs and the next level course. As this study showed, there was a discrepancy between Eng. 093 grades and Eng. 101 grades. The students who had some type of technology in their Eng. 093 course had slightly lower Eng. 101 final grades than the students who had lecture in Eng. 093. While the cause could have been from grade inflation or lack of technology in Eng. 101, there must be more communication and working together between these two programs. One area of collaboration may be the continued use of technology in Eng. 101 courses. By using similar technology in Eng. 101 courses, students will continue to build and improve their English skills. There needs to be some type of continuity. On some college campuses, the developmental education program is a separate program. On other campuses, developmental English may be under the humanities division and developmental math may be under the math department. When developmental courses are conducting classes one way and there is no continuity or overlapping at the next level, there may be lower grades. There must be more overlapping and working together between these two programs.

If technology is going to be incorporated into classes, institutions must provide training and ongoing support for those who choose to use it in the classroom. All too often, a new type of technology is purchased by someone who is familiar with the program, and they assume that everyone will be able to use it. Then technology experts install the equipment in a classroom, leave the remotes and are gone. The instructor is then left to figure out how to use it on their own. If technology is going to be purchased and used, there must be support from the

administration to provide the proper training and technical support needed to be effective in the classroom.

If institutions are going to provide technology in the classroom, educators and administrators must take into consideration the student population of their college and what programs and technology would best serve these students. The student population on any community college is diverse. There are more minority and non-traditional students attending college so they can get a better job. Students who dropped out of high school are now going back and getting a GED and then attending college because they lost their job and are finding in today's job market, college is essential. While this study focused on age, ethnicity and education background, and the data from the study support the idea that technology use was beneficial to these students, there needs to be more done to help these students succeed. There needs to be some type of language lab where non-English speaking students can go to get more help with English. There needs to be a tutoring center that offers both in person and online resources for GED students who want a little extra help in a course. There needs to be some type computer training for all students who may not be familiar with technology. If we are going to provide training for instructors who are going to be using the technology, should we not provide tutorials or training for the students as well? If community colleges are going to continue to explore and use technology within the classroom, then they need to make sure all students are familiar with and comfortable with using the technology. Technology should be a part of that process.

Relationship of Results to Theory

The theoretical framework for this study was based on the transactional model of the teaching/learning process developed by Huitt (2003), which focuses on the teaching/learning

process models that were developed in the 1980s by researchers who wanted to analyze what is known about increasing test scores (Huitt, 2003). Part of Huitt's work is modeled after the work of Gage and Berliner's (1992) model, which is "a model of the instructional process that focuses on that variables that must be considered by the classroom teacher as he/she designs and delivers instruction to students" (McIlrath & Huitt, 1995, para. 4). For this study, Gage and Berliner's model (1992) answers the question "What is happening in this classroom that facilitates learning better than in another classroom?" (McIlrath & Huitt, 1995, para. 4). This model focuses on the instructional process and those variables that must be considered by the classroom instructor as he/she designs and delivers instruction to students.

For this study, the variable was the method of instructional delivery--heavy use of technology versus a heavy emphasis on lecture. The data from this study generally support the idea that some type of technology used in developmental English courses was beneficial to students, regardless of age, ethnicity, or educational background. It further supports the idea that the use of technology in developmental English does facilitate learning better than in the classroom where straight lecture was used, except in the follow-up English 101 course where the students who had some type of technology in English 093 had slightly lower final average grades in English 101 than students who had straight lecture in English 093. Because this study focused on a number of different types of technology use in the developmental English classroom, it is not evident which specific type of technology had the most impact on the students. While this study broadly addressed the question of "what is happening in the classroom that facilitates learning better than in other classrooms" (McIlrath & Huitt, 1995, para. 4), future research would need to focus on a particular instructional process (a specific type of technology). This would

then provide specific data that could be used by the classroom instructor to help them to reevaluate and revise their method of course material delivery.

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APPENDIX
IRB APPROVAL

Office for Research
Institutional Review Board for the
Protection of Human Subjects

THE UNIVERSITY OF
ALABAMA
R E S E A R C H

November 2, 2009

Annette Cedarholm
Department of ELPTS
College of Education
Box 870302

Re: IRB#: 09-OR-306 "The Use of Technology in Developmental English Courses"

Dear Ms. Cedarholm:

The University of Alabama Institutional Review Board has granted approval for your proposed research.

Your application has been given expedited approval according to 45 CFR part 46. You have also been granted the requested waiver. Approval has been given under expedited review category 7 as outlined below:


(7) Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies

Your application will expire on November 2, 2010. If your research will continue beyond this date, complete the relevant portions of Continuing Review and Closure Form. If you wish to modify the application, complete the Modification of an Approved Protocol. Changes in this study cannot be initiated without IRB approval, except when necessary to eliminate apparent immediate hazards to participants. When the study closes, complete the appropriate portions of the Continuing Review and Closure Form.

Should you need to submit any further correspondence regarding this proposal, please include the above application number.

Good luck with your research.

Sincerely,


Carpantato T. Myles, M.S.M., CIM
Director & Research Compliance Officer
Office of Research Compliance
The University of Alabama



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