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An Analysis of the Academic Success Achieved by Five Freshman Cohorts
Through a Community College Developmental Education Program

A dissertation

presented to

the faculty of the Department of Educational Leadership and Policy Analysis
East Tennessee State University

In partial fulfillment

of the requirements for the degree

Doctor in Education

by

Nancy K. Gray-Barnett

December 2001

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Dr. Sally Lee

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Dr. Russell West

Keywords: Academic success, Developmental, English, Mathematics, Remedial

ABSTRACT

An Analysis of the Academic Success Achieved by Five Freshman Cohorts Through a Community College Developmental Education Program

by

Nancy K. Gray-Barnett

The challenge of underprepared students' entering America's colleges and universities is not new. Because of their "open door" policies, community colleges are more likely to enroll students who are not college prepared. This retrospective study focused on the performance of students who had completed required developmental education courses compared to the performance of students without developmental requirements. The study examined developmental education success measures for five cohorts of first-time degree-seeking freshmen each tracked for a six-year period enrolled at Walters State Community College located in Tennessee.

The success measures compared included grade point averages earned in college-level mathematics and English courses, cumulative college-level credit hours earned, cumulative college-level grade point averages earned, and number of graduates. Existing data, gathered from the college's student information database, were analyzed through the application of two univariate approaches—the t-test for independent samples and the chi-square.

The study found that nondevelopmental students earned statistically higher grade point averages in college-level mathematics and statistically higher cumulative college-level grade point averages. The study found that significant statistical differences did not exist between the two student groups in grade point averages earned in college-level composition and in graduation rates. The study's findings relative to the comparison of average cumulative college-level credit hours earned by the two student groups were mixed. Although statistically significant differences were found for some performance variables, they were not so large as to conclude that the college's developmental education program was ineffective.

For this study to be useful for future decision making, it must be compared with results of future studies designed to measure performance and effectiveness. Therefore, it is recommended that the analysis be updated annually. Practitioners at other state colleges should undertake research directed at establishing the level of overall effectiveness of developmental education across the state.

DEDICATION

This study is dedicated to my husband, William H. Barnett II, my parents, Anna and Floyd Gray, my sister, Deborah Gray, and my father-in-law, William Barnett, who have encouraged me for many years to complete this degree and who have taught me to believe that education only can help to diffuse the hate, ignorance, and fear that continues to plague our world.

In that regard, I also dedicate this study to the thousands of men, women, and children who died on September 11, 2001, in the terrorist attack on the United States of America and the many other individuals who have suffered and died because of hate crimes. A more educated world society can hopefully lead to a more civilized world society.

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CHAPTER 1

INTRODUCTION

If your children are attending college, the chances are that they will be unable to write ordinary expository English with any real degree of structure and lucidity. If they are in high school and planning to attend college, the chances are less than even that they will be able to write English at the minimal college level when they get there (“Why Johnny Can’t Write,” 1975, p. 58).

Twenty-six years later, Johnny still cannot write, perform simple mathematical procedures, or read and think critically in everyday life. The challenge of underprepared students’ entering America’s colleges and universities is not new and is not likely to disappear in the near or distant future. Surprisingly, many entering freshmen have been reported to consider themselves adequately prepared for college, regardless of their actual level of academic preparedness (Chickering & Reisser, 1993). However, educators have realized for years the difference between freshman optimism and students’ commitment to and responsibility for being involved in their learning process (Tinto, 1987).

The lack of preparation for college-level work has not been ignored by higher education in America. Efforts to remediate entering freshmen have grown substantially over the years, as has the body of research evaluating these efforts. “The list of things we know from research is long. The list of things we still need to learn is substantially longer” (Malinowski, O’Hear, & Williams, 2000, p. 25). Effectiveness of developmental education is dependent upon the success or failure of individual efforts in colleges and universities across the land. Whereas national

studies designed to evaluate overall institutional efforts in America are informative and useful, research designed to assess the effectiveness of programs of developmental education at individual colleges and universities holds the most promise for helping improve the academic success of at-risk students.

In 1984, the Tennessee Board of Regents (TBR) (then State Board of Regents), the governing body for the State University and Community College System of Tennessee, adopted a policy requiring a comprehensive program of mandatory assessment and remediation designed to expand access to and enhance the quality of education for its constituency. Walters State Community College (WSCC) developed its own developmental education plan under the guidelines established at the state level. In the 17 years since authorization of the Academic Assessment Placement Program (AAPP), only limited research has been undertaken to assess the success of developmental education efforts under the plan.

WSCC is an open-door community college located in Hamblen County, Tennessee, encompassing 10 rural counties within its area of service. The college, serving approximately 6,000 students on four campuses, is guided by a vision statement that describes its institutional philosophy:

Walters State Community College shall be a regional college of choice with twenty-first century campuses, dedicated to excellence in teaching and service, guided by shared values and principles, and inspired to exceed student and community expectations. (Walters State Community College, 2000, p. 6)

The State of Tennessee is currently undergoing a protracted public debate concerning the extent to which state government should provide services to its citizenry and the way to raise the necessary monies to pay for them. The state recently passed its 2001-2002 fiscal-year budget calling for no new tax revenues and requiring state departments and agencies to cut \$110 million in spending (de la Cruz, 2001). Publicly supported higher education institutions are under financial pressure and have responded to the funding shortfall with budget cuts and substantial tuition increases. WSCC has reduced all operating budgets by nine percent. TBR approved an unprecedented 15% tuition increase to help compensate for the funding shortfall (Green, 2001). Secondary education in Tennessee is also suffering from inadequate funding sources, that does not bode well for the level of needed future remediation efforts at the state's colleges and universities. Those representing the people of Tennessee in the legislature have decided that the state will pay for only what its current tax structure will allow. It has become essential that monies appropriated for developmental education be spent wisely and prudently.

Statement of the Problem

Tennessee community colleges enroll students through an open-admissions policy designed to encourage greater access to Tennessee's statewide system of higher education. This policy has led to a significant number of students arriving at the "open door" of Tennessee community colleges academically underprepared

to succeed at the college level. A study by the Tennessee Higher Education Commission (THEC) (2001) concluded that 61.1% of students enrolling in Tennessee community colleges who had graduated from high school in 2000 needed remedial or developmental coursework. A study by Van Allen and Belew (1992) revealed that 85% of students under 21 and 95% of students over 21 at Tennessee community colleges were placed into one or more remedial or developmental courses.

Large numbers of students who need remediation require significant institutional resource commitments. Funding for higher education in Tennessee as a percentage of the state's budget is declining. During the period 1991-1992 to 1999-2000, the percentage of total state appropriations devoted to higher education declined from 15.1% to 14.7% (THEC, 2001). The future of funding for remediation programs for Tennessee public colleges and universities is likely to be dependent upon the ability to show that such programs are effective in preparing students for college-level work.

Effective remedial education is best demonstrated when students entering college-level courses after completion of remediation are able to complete the courses at the same level of success as their peers who did not require remediation (Beck, 1996). Likewise, Weissman, Bulakowski, and Jumisko (1997) stated that "...the purpose of developmental education is to enable students to gain the skills necessary to complete college-level courses and academic programs successfully"

(p. 74). Efforts at assessing effectiveness of remediation programs have been few. A study of more than 100 two- and four-year institutions revealed that only a small percentage conducted any systematic evaluation of their developmental education programs (Boylan, Bonham, & Bliss, 1994). One difficulty in attempting to gauge overall effectiveness is the variety of testing approaches and standards used. Also, some programs require mandatory placement, whereas other remediation programs are totally voluntary, with many variations in between (Lombardi, 1992).

The State University and Community College System of Tennessee has required mandatory placement into remedial and developmental courses at all of its institutions for 16 years. Limited research has been conducted to determine the success of this state-wide program for underprepared students. Each institution needs research designed to validate the specific methods used within its developmental programs to determine the degree to which students are prepared to complete college-level courses and to achieve their academic goals. The problem of this study was to assess the developmental studies program at WSCC for five entering freshman cohorts each over a six-year period.

Purpose of the Study

This retrospective study was designed to compare the performance of academically underprepared students who were required to enroll in remedial and developmental courses at WSCC with students deemed to be prepared for college-

level work. The variables identified as measures of program effectiveness were each measured over a six-year period and included cumulative college-level grade-point averages (GPAs) earned, degrees earned, cumulative college-level credit hours earned, and successful completion of related college-level courses in English composition and mathematics.

Providing academic remediation for East Tennesseans not fully prepared for college-level work is a core component of WSCC's institutional mission. As with most community colleges, WSCC is committed to the education of a non-racially identifiable student body and promotes diversity and access without regard to race, gender, religion, national origin, age, disability, or veteran status. Any student with a high school diploma or GED equivalent is eligible for enrollment. This study was undertaken to discover how well students with academic weaknesses achieved their academic goals at WSCC.

Research Questions

The research questions were posed to ascertain if, or to what extent, a relationship existed between the developmental education program at WSCC and overall student academic achievement. The questions are referenced to five cohorts of first-time, degree-seeking students at WSCC. Student enrollment in each cohort was tracked for a six-year period.

1. Did developmental mathematics courses at WSCC prepare students for success in their first college-level mathematics course?

2. Did developmental writing courses at WSCC prepare students for success in their required English composition course?
3. Did students completing developmental requirements graduate at the same rate as students not requiring developmental courses?
4. Did students completing developmental requirements earn college-level credit hours equal to those college-level credit hours earned by students not requiring developmental courses?
5. Did students completing developmental requirements maintain a GPA equal to or better than GPAs maintained by students not requiring developmental courses?

Significance of the Problem

Roueche and Roueche (1999) identified several troubling aspects of the state of developmental education in America today. They found that illiteracy was widespread. The growing demand for workers who could communicate, perform simple mathematical procedures, and think critically left many people potentially at risk for being unemployed. Poverty and undereducation were closely linked to each other, as well as to decaying neighborhoods, crime, unemployment, welfare, hopelessness, and cynicism. Almost 50% of all students entering community colleges in the United States were underprepared for college-level work and tested into one or more remedial classes. This percentage had not changed much in the last 20 years, and there has been no evidence that it would be reduced in the near

future. The majority of current remediation efforts in higher education were not considered effective.

As noted above, ineffective remediation programs carry potentially heavy social costs. The perception that most remediation programs are not effective calls for formal research directed at forming logical and factual conclusions relative to the successes and failures of such programs. The research conducted at WSCC will be directly beneficial to the college itself and could serve as an impetus for additional baseline research at other colleges and universities in Tennessee.

Delimitations

1. This study restricted its analysis to the effectiveness of developmental education at one Tennessee community college.
2. For the study, the data used are limited to five freshman cohorts tracked over a six-year period. The cohorts include the 1991-1992, 1992-1993, 1993-1994, 1994-1995, and 1995-1996 academic years.
3. This study will compare the academic progress of students who have completed a program of developmental education with students who did not require remediation. The study did not compare students who completed a program of developmental education with students who require remediation and have not completed requisite developmental education courses.

4. Student success in individual courses was limited to mathematics and English composition. No other courses were identified or evaluated in this study.

Limitation

Results of this study may not be generalized to any institution beyond Walters State Community College.

Definitions

Terms used throughout this study are defined as follows:

1. College-level course – A course that is applicable to degree requirements and is included in the computation of the cumulative college-level GPA. College-level courses do not include developmental education courses and non-credit courses offered by the college.
2. College-prepared student – A student who does not require any form of remediation upon enrollment in a college or university (same as nondevelopmental student).
3. Degree-seeking student – A student who indicates on the application for admission to the college an intent to graduate from the institution with an associate degree.
4. Developmental mathematics – Courses classified by WSCC as arithmetic, elementary algebra, and intermediate algebra.

5. Developmental reading – Courses classified by WSCC as remedial reading and developmental reading.
6. Developmental student – A student who has completed remedial and/or developmental prerequisites for college-level coursework.
7. Developmental writing – Courses classified by WSCC as remedial writing and developmental writing.
8. Nondevelopmental student – A student who has entered college-level courses without the requirement of remedial and/or developmental prerequisites (same as college-prepared student).
9. Developmental course – A remedial or developmental course that is designed to prepare students for college-level coursework.

Admission is by the college assessment procedure only.

Developmental courses are not intended for transfer, nor do they satisfy degree-credit requirements for any associate degree or academic/technical certificate program (Walters State Community College, 2000).
10. WSCC cohort – A group of first-time degree seeking students composed of all summer first-time freshmen returning in the fall term and fall first-time freshmen. L. Hsu (personal communication, June 27, 2001)

Overview

Chapter 1 is an introduction of the study and summarizes the applicability and importance of the research. Chapter 2 is a review of the pertinent literature related to the characteristics of successful developmental education programs. Chapter 3 includes the methodology that will be used to answer the research questions included in this study. Chapter 4 will analyze the data and present findings. Chapter 5 will summarize the research, present conclusions, and make recommendations to improve practice and for further research directed at increasing the success rates of developmental education students.

CHAPTER 2

LITERATURE REVIEW

Brief Historical Perspective

The educational approaches to preparing the underprepared student entering college have been identified by a variety of terms. Preparatory education, compensatory education, remedial education, developmental education, and basic skills education all commonly have been used to describe a wide range of educational techniques designed to prepare students lacking the requisite skills necessary for success in college (Cohen & Brawer, 1996; Hashway, Sandeford-Lyons, & Carter 1999; Miller, 1996; Roueche & Snow, 1977). Some states use different terms to distinguish between different levels of preparation. Clowes (1980) stated that the lack of well-defined terminology inhibited educators' ability to address the problems related to underprepared students. Kulik, in an interview with Bonham (Bonham, 1990), suggested that the identity of the area termed "developmental education" was unclear to many researchers. Regardless of the name attached and the effectiveness of the effort, formal attempts by collegiate institutions to prepare the underprepared is as old as higher education in America itself.

As observed by Breneman and Haarlow (1999), "...it would be the worst type of nostalgia to assume that we have somehow slipped from a golden age when all college students were bright and well prepared" (p. B6). Brier (1984)

concluded, “The popular belief that the academically underprepared student and developmental education efforts are by-products of the open admissions of the 1960s is no more than a widely believed myth” (p. 2). In fact, remediation has been necessary in some form since the beginning of higher education in America. In the 1630s, Harvard College needed to provide tutoring in Latin and Greek, because the students who were fortunate enough to attend were lacking the necessary skills needed to read and interpret the scholarly works then available (Landesman, 2000).

In 1849 the University of Wisconsin offered the first remedial education program with courses in reading, writing, and arithmetic. Other institutions followed in establishing “preparatory” education departments during the nineteenth century (Breneman & Haarlow, 1999; Brier, 1984). In 1889, James H. Canfield reported to the National Council for Education meeting in Nashville, Tennessee, that of the nearly 400 institutions of higher education in the United States, only 65 did not maintain a preparatory program (Brier, 1984). Significant in the increase of underprepared students seeking higher education during the last quarter of the nineteenth century were the Morrill Acts of 1862 and 1890. This legislation allowed for the establishment of land grant universities, and new colleges began opening their doors to a growing number of students otherwise unlikely to attend college (Roberts, 1986). The two-year public junior college had

its beginnings in the late 1800s leading to the establishment of Joliet Junior College in 1901 (Witt, Wattenbarger, Gollattscheck, & Suppiger, 1994).

The 1920s brought an expansion of the two-year junior college. Few jobs required more than a high school diploma; however, as the decade progressed, technical and white-collar jobs were becoming more plentiful, often requiring advanced training. As a result, middle-class America began to view college as the “road to success” (Witt et al., 1994, p. 44). The junior colleges started to take over the responsibility for remedial education, although not exclusively (Breneman & Haarlow, 1998).

On January 22, 1944, the Serviceman’s Readjustment Act (better known as the GI Bill of Rights) was enacted by Congress. It opened college doors to returning veterans. By the fall of 1946, nearly 43% of all junior college students were veterans. This influx of students presented substantial challenges for junior colleges. Many veterans had forgotten basic skills during the war, and some had not finished high school. In 1947, the President’s Commission on Higher Education, established for the purpose of reexamining America’s system of higher education, recommended a national effort directed at creating new two-year colleges (Witt et al., 1994).

Roueche and Snow (1977) stated, “By the 1950s and 1960s, enrollment pressures were being felt dramatically by universities and four-year colleges as more and more Americans sought further educational opportunity. Especially in

the 1960s, four-year institutions turned away those students who had any discernible learning problems” (p. 6). This selective admissions approach at senior institutions resulted in the shifting of remediation to “open-door” community colleges during the 1960s. By the late 1960s, practically every two-year institution was making some institutional effort to provide remedial education to the increasing numbers of students who enrolled without the basic rudiments of a high school education (Roueche & Snow, 1977).

By the 1960s, public junior colleges, increasingly referred to as “community colleges,” were becoming “open-door” institutions. Thornton (1966) defined open-door admissions in these words: “Any high school graduate, or any person over 18 years of age who seems capable of profiting from instruction offered is eligible for admission” (p. 34). Witt et al. (1994) described the remediation challenge facing “open-door” community colleges in this manner:

The wide diversity of students coming through the open doors of community and junior colleges included high school dropouts and others with marginal academic achievements, adult students returning to college, and students with limited command of English. To serve these students, most colleges developed remedial programs. Usually, these programs included basic mathematics, grammar, and study skills. Students could enroll in these developmental courses to prepare for the regular college curriculum. With the arrival of new technologies, many colleges opened learning centers that allowed students to work at their own pace. (p. 187)

Cross (1976) depicted the urgency of remedial education of the 1960s as a product of the social ills brought to the forefront during the decade whose perceived solution was the proliferation of remedial courses.

When remediation was catapulted into national prominence in the 1960s, it was with the clear perception of socioeconomic factors as “cause.” Other causal factors that had surfaced from time to time were forgotten in the urgency of the times to do something about the inadequate educational experiences of students from disadvantaged backgrounds. It was assumed that the way to correct for “not enough” skill development was to provide “more.” Remedial courses in English and mathematics proliferated. Remedial instruction moved from counseling and other specialists to the regular faculty, who were subject-matter specialists with no training and sometimes little sympathy for the learning problems of eighteen year olds reading at the level of eight to ten year olds. Not surprisingly, many faculty reacted with alarm, and some with desperation, to the flood of “unqualified” college students. Almost no teacher specializing in an academic discipline with the notion of teaching at the college level had any background to cope with the learning problems of their New Students (pp. 28-29).

Cohen and Brawer (1996) stated that the 1970s, much like the 1950s, had brought a greater emphasis on programs designed to “catch” at-risk students and screen them into remedial courses before allowing them to attempt college-level courses. This trend accelerated during the 1980s. Enrollments in remedial education courses increased during the 1990s. A report by the American Council on Education indicated that in 1992 1.6 million students were enrolled in at least one remedial course, and that 91% of all two-year colleges and 84% of all four-year colleges offered some form of remedial coursework (Knopp, 1995).

The challenge for the 21st century may well lie in the ability of educators to demonstrate that remediation is successful at overcoming poor preparation for college. It is estimated that the annual investment in all forms of remediation designed to help students succeed in college approaches \$1 billion (Breneman & Haarlow, 1998; Roueche & Roueche, 1999). Legislatures are looking closer at

appropriations for remediation. For example, South Carolina has assigned total responsibility for remedial education to community and technical colleges, and Florida has limited time and money that students can devote to remedial education (Roueche & Roueche, 1999). Likewise, Tennessee's budget woes have led TBR to consider removing remedial and developmental programs from the system's four-year universities and giving responsibility for remediation solely to its two-year colleges (Cass, 2001). Reacting to strong political pressure, the trustees of The City University of New York (CUNY) implemented a plan to end remedial courses within three years at the system's 11 four-year colleges (Romer, 1999). Almost all states now require from their colleges and universities some form of outcome evidence, and link funding to performance. The political fire and public debate is far from over.

Ikenberry (1999) observed that early criticism of remedial education had only grown:

I have never met a state legislator, reporter, or parent who liked it. I never met a student who liked being assigned to remedial English. Nor have I ever met a professor who enjoyed teaching remedial education courses. (p. 8)

The question that never seems to be answered in the minds of members of the public and their political representatives is "If secondary education is effective, why should we have to pay twice?." But the fact remains that students needing remediation are there for a variety of reasons, all not related to the isolated failures of the secondary educational system. Nevertheless, individual institutions must be

able to show that their efforts at remediation are effective, but even with conclusive data supporting the success of individual programs, the political debate is likely to continue unabated.

Attributes of Effective Developmental Education

The success of modern developmental education is widely debated. Grant and Hoerber (1978) asserted that the ultimate goal of a developmental education program should be its discontinuance based on lack of need. However, they also concluded that such an ideal was unrealistic. The continuing need for remediation programs across America has been met through a variety of programs that differ from state to state as well as among institutions within the same state. Many studies have attempted to identify the characteristics that result in effective developmental education. McCabe and Day (1998) stated, “The ideal comprehensive developmental education programs capitalize on contemporary understanding of individual growth and learning theory, and address both cognitive and affective development” (p. 20).

In a study conducted by Roueche and Snow (1977), the authors concluded that the following three characteristics were essential to an effective developmental education program:

1. The individual teacher is the key to the design and implementation of an effective program. (p. 114)
2. Supportive services are vital for success. (p. 121)
3. Proper organizational support is essential. (p. 125)

Weissman et al. (1997) reviewed the research literature and concluded that the following policies were conducive to improved performance and retention of underprepared students.

1. Underprepared students should be required to enroll in a program of developmental education.
2. Underprepared students should be required to begin their developmental education program on initial enrollment.
3. Underprepared students should be allowed to enroll in college-level courses before completing their developmental education programs as long as they are simultaneously working on remediation.
4. Students underprepared in reading and writing and students underprepared in reading, writing, and math should be required to focus on their developmental education program before beginning college-level courses (pp. 78-79).

McCabe and Day (1998) reviewed numerous studies and concluded that effective developmental education programs should:

1. Be context-specific and highly valued by the learning community;
2. Be centrally structured or well coordinated within the organization;
3. Use instructors committed to the students and the field;
4. Provide multilevel curricula with credit options and exit criteria;
5. Ensure the integration of a variety of instructional methods;
6. Integrate learning and personal development strategies and services; and
7. Employ an evaluation system focused on outcomes as well as continuous program improvement. (p. 22)

McCabe and Day identified 10 exemplary programs across the United States in which all the key characteristics of successful developmental education programs identified above were represented. In addition to the above characteristics, the following common attributes were observed at the institutions identified as outstanding in developmental education.

1. Each recognizes that the programs must deal with all aspects of student development—personal, as well as academic;
2. Most of the programs are thoroughly integrated within the institution, from the mission and philosophy through the planning, research, and evaluation functions;
3. The program designs are based on theoretical foundations and educational research;
4. Underprepared students are identified through a standardized assessment and placement process;
5. Almost every program mentions the integration of coursework within and beyond the developmental program, and most award college credit for course completion (though most developmental credits do not satisfy degree requirements);
6. Most of the programs use computer-assisted learning;
7. Most of the programs acknowledge the importance of faculty and the quality of their teaching, yet many also note that significant numbers of the faculty work part time;
8. Almost every program links advising and counseling to the program; and
9. Almost all of the programs are linked by the college institutional research department to institutional planning for purposes of evaluation (pp. 24-25).

Roueche and Roueche (1999) identified academic standards that they said would improve student success at the developmental level leading to success in college-level coursework.

1. Initiate proactive pre-enrollment activities;
2. Require orientation and initiating student-support structures;
3. Abolish late registration;
4. Mandate basic skills assessment and placement in appropriate courses;
5. Eliminate dual/simultaneous enrollment in skill and [related] regular academic courses;
6. Encourage working students to take a reduced number of hours;
7. Provide more comprehensive financial aid programs;
8. Establish critical safety nets with faculty mentors and peer support;
9. Require increased problem-solving and literacy activities in all college courses;

10. Increase the impact of classroom instruction and supplement instruction with skill practice and tutoring;
11. Recruit, hire, and develop the best faculty available (the key to student success resides in the faculty);
12. Evaluate student and program outcomes regularly and disseminate the findings; and
13. Become a more humane organizational structure (pp. 16-18).

No two developmental education programs are likely to be identical.

Programs are apt to be comprised of a combination of characteristics that work in a particular environment. Colleges and universities must validate their unique approaches with appropriate research directed at identifying the effectiveness of their remediation efforts.

Outcomes Assessment in Developmental Education

According to Boylan and Bonham (1992), most of the information supporting the effectiveness of developmental education programs had come from localized evaluation of specific programs, as opposed to regional or national studies. Weissman et al. (1997) stated, “The purpose of developmental education is to enable students to gain the skills necessary to complete college-level courses and academic programs successfully” (p. 74). The authors concluded that several outcomes signifying effectiveness should be examined, including successful completion of developmental courses, successful transition to and completion of college-level courses, and persistence in pursuing academic goals. Common success indicators among the many localized studies assessing the effectiveness of developmental education programs include parity in GPAs, persistence at

achieving academic goals, completion of related college-level courses, and graduation/transfer rates.

GPA Parity

Several individual efforts at assessing developmental education have compared GPAs of students exempt from the need of developmental education to students who successfully completed required courses in developmental education and students who were not successful at completing developmental requirements. Those researchers who have found that significant differences existed in cumulative GPAs between students successfully completing developmental education and students who were not successful at completing required courses include Amey and Long (1998), Batzer (1997), Napoli and Hiltner (1993), Rosella (1975), and Schoenecker, Bollman, and Evens (1996).

In her doctoral dissertation, Batzer (1997) studied 766 full-time, degree-seeking students at Ivy Tech State College in Indiana. Students completing all required remediation were compared with students completing some remediation; students completing some remediation were compared with students completing no required remediation; and students completing all remediation were compared with students completing no required remediation. In each comparison, the greater the remediation, the higher was the GPA, and the differences were significant. Batzer also compared GPAs of students completing remedial reading, writing, or mathematics with students not completing the required courses. Again,

GPA of students completing the remedial course were significantly higher than GPAs of noncompleters.

Napoli and Hiltner (1993) compared developmental reading students to a matched control group of students who had been placed in developmental reading but had never attended classes to a group of students who were exempt from developmental reading requirements. The students enrolled in developmental reading were assessed as having equivalent reading deficiencies to those of the control group not enrolled in the required course. The results indicated that developmental reading students earned significantly higher cumulative GPAs than did students who were not successful at completing developmental requirements. Further analysis revealed that when GPAs were statistically adjusted for total credits completed and initial reading levels, students completing developmental reading “out-performed” students not required to take the required course (p. 16).

Other researchers compared GPAs of students completing developmental courses with students who were exempt from the need for remediation. Studies by the Basic Skills Council in Morante (1986), Castator and Tollefson (1996), Cunningham (1995), Maring, Shea, and Warner (1987), Pierson and Huba (1997), Schoenecker et al. (1996), Thornley and Clark (1998), and Weismann, Silk, and Bulakowski (1997) concluded that GPAs of developmental course completers were not significantly different from those of college-prepared students.

Thornley and Clark (1998) reported on institutional research of Trident Community College in South Carolina that compared GPAs of cohort groups for seven consecutive terms starting fall 1995. The research found that the developmental cohort achieved nearly the same mean GPA in credit courses as did the nondevelopmental cohort. GPAs for students in the developmental cohorts were slightly lower than those for the nondevelopmental cohorts on college core courses, but the researchers concluded, “Their achievement is sufficiently high to warrant expectations for success in college-level work” (p. 112).

The 1985 New Jersey Basic Skills Council Report (Basic Skills Council in Morante, 1986) also reported that students who had completed remediation courses had achieved slightly lower cumulative GPAs in college-level courses over a four-semester period than the cumulative GPAs earned by students not needing remediation. The council concluded that those students completing remediation courses had “...virtually the same probability of passing college-level courses as nonremedial students” (p. 29). Weismann et al. (1997) found that, although the mean GPA for students taking remedial courses was not as high as the mean GPA of college-prepared students, the students who had been remediated had performed at or above a C average in their college-level coursework.

In contrast, Boylan and Bonham (1992), in their report on a study of over 150 institutions representative of all colleges and universities in the United States, observed that at most institutions, the first-term and cumulative GPAs of

developmental students were lower than the average GPAs for those institutions. The researchers concluded that developmental programs did not significantly impact cumulative GPAs; however, GPAs for students taking developmental courses were consistently above 2.0, the minimum GPA required for graduation. Similarly, in a 1994-1995 Maryland statewide survey of remedial education, the Maryland State Higher Education Commission (1996) concluded that students who had received remediation trailed nonremediated students in cumulative GPAs, and the greater the amount of remediation that was required of community college students, the lower were their four-year success rates.

Persistence

Underprepared students are at substantial risk of not completing their academic goals. The purpose of developmental education is to reduce such risk. Most research directed at determining the effectiveness of specific developmental programs has focused on some measure of persistence as an indicator of success. Generally, persistence is measured by researchers using two approaches. Researchers who have evaluated the number of credit hours (or courses) attempted and earned include Batzer (1997), Grosset (1989), Schoenecker et al. (1996), Tedrow and Rust (1994), and Weismann et al. (1997). Studies that have followed students or cohorts of students from academic term to academic term to measure persistence include the Basic Skills Council study cited in Morante (1986); Brien, Duffy, Fulwiler, Neill, and Siegrist (1998); Haeuser (1993); Hoyt (1999); Jones

and Jackson (1990); Maring et al. (1987); McCornack, Dukes, and McLeod (1985); Pierson and Huba (1997); and Rosella (1975).

Schoenecker et al. (1996), in their study of 21 community colleges in Minnesota, determined that at most of the institutions students who had completed developmental requirements had significantly higher ratios of credits earned to credits attempted than was the case of students who had failed to complete developmental requirements. Weissman et al. (1997) found that students taking remedial courses had persisted at rates similar to those of students not requiring remediation. Underprepared students who did not take remedial coursework had low persistence rates, completing only 32% of the courses in which they had enrolled. Batzer (1997) also found that students who had completed remediation persisted longer as measured by comparing their accumulation of greater numbers of credit hours than the number of credit hours accumulated by underprepared students not completing remediation.

Grossett (1989), in her study of student outcomes at the Community College of Philadelphia, found that students who entered at the remedial level and participated in remedial and developmental enhancement programs persisted for the same number of credit hours as did students entering prepared for college. Remedial students who did not participate in remedial and developmental enhancement programs dropped out more frequently than remedial students participating in the programs.

Maring et al. (1987) found that students participating in a reading and study skills course remained at the university in significantly greater numbers than those who refused to take the class. Haeuser (1993) found that first-time freshman developmental students had higher retention rates than the college average. The 1985 New Jersey Basic Skills Council Report (in Morante, 1986) reported that of students who had completed remediation at New Jersey community colleges, 90% of the 1983 cohort and 87% of the 1982 cohort continued their enrollment after one semester. Of those students not needing remediation at the community colleges, 83% and 79% of the 1983 and 1982 cohorts, respectively, continued their enrollment after one semester.

In contrast, Pierson and Huba (1997) found that students who were exempt from developmental coursework and those completing developmental coursework did not continue into the second year any more than did students who failed to complete developmental requirements. Jones and Jackson (1990) found that 40% of the students advised to take a remedial reading course, but who did not, had persisted to the next term, as compared to a 21% persistence rate for those completing the remedial reading course. Both Hoyt (1999) and Lyons (1990) concluded that high remediation rates had negatively impacted student persistence. Hoyt found that 64% to 72% of students who required remedial education in three areas eventually dropped out of the college.

Transition to College-Level Coursework

A remedial student's ability to perform in subsequent college-level coursework at a level equivalent to the performance level of students exempt from remediation is a logical direct measure of program effectiveness. Studies that compared success rates of students completing some form of remediation in English and mathematics with subsequent success in college-level courses of the same discipline have become more numerous during the last decade. Most of those studies have concluded that students did as well as their nonremediated peers. Abraham and Creech (2001) reported that a Kentucky study that had examined the pass rates in college-level courses after remediation had found that pass rates for university students who had taken remedial mathematics were slightly higher than pass rates of all students in entry-level mathematics. However, in English, the pass rate for all students taking the college-level course was slightly higher than for those taking remediation. Furthermore, the study revealed that, at the community college level, those taking remedial courses were more successful in college-level courses than was the case for all students enrolled.

Haeuser (1993) stated, "Direct evidence of the effectiveness of the developmental program is provided by examining the student outcomes of students who have completed their developmental requirements and enrolled in the regular credit course sequence" (p. 6). She found that 66% of students taking

developmental English at a Maryland community college were successful in completing college-level English, but that 73% of students without a developmental English requirement were successful. She concluded, “No significant differences were found in success rates between students who had completed developmental requirements and those students who had no developmental requirements and could immediately enroll in the first credit English course” (p. 7). She also compared success rates among all students, students with no developmental requirements, students completing developmental requirements, and students with uncompleted developmental requirements in the four highest enrollment courses at the college. She found that students with no developmental requirements had the highest success rates; however, the success rates for students who had completed developmental courses, albeit lower, were not significantly different from students exempt from remediation. Success rates of students not completing remediation were, however, significantly lower. Haeuser concluded that students had a better chance at success if they were to complete developmental requirements before attempting subsequent college-level coursework.

Lyons (1990) tracked students from developmental courses into the next logical course. He found that students passing developmental English had performed better in college-level English than had students not taking developmental English, although the developmental students had a nine percent

higher rate of Ds and Fs than did the nondevelopmental students. Further, he found that students passing developmental mathematics did not do as well as their nondevelopmental peers in college-level mathematics.

On a national scale, Boylan and Bonham (1992), reporting on the results of a study conducted by the National Center for Developmental Education, found that 77.2% of students passing developmental mathematics with a C or better also had passed the regular college mathematics course with a C or better. For developmental English and reading, compared with introductory social science, the rates passing were 91.1% and 83.0%, respectively.

Other researchers have conducted localized studies and have concluded that students completing remediation efforts performed as well as students exempt from such efforts. Among them are: Brien et al. (1998), Klicka (1998), Levine (1990), Miller (1980), Rester (1996), and Rosella (1975). Levine (1990) found that students taking preparatory mathematics had pass rates similar to other students in college-level algebra. Rosella (1975) found that students participating in a basic skills program were found to be more successful in composition and mathematics than were students not participating in the program. Research by Klicka (1998) demonstrated that the developmental education students consistently did as well if not better than nondevelopmental students in college-level courses.

In a related study conducted in a community college in rural Mississippi, Rester (1996) found that developmental reading grades were potential predictors of student GPAs. Likewise, developmental English and mathematics grades were potential predictors of grades in college-level composition and algebra courses, respectively.

Graduation Rates

Receiving a college degree is almost universally accepted as a measure of success for students undertaking higher education. Tinto (1987) concluded that only about 27% of the students in entering two-year college cohorts would complete their programs in the institutions in which they first enrolled. It is not surprising that results have varied in studies examining graduation rates as success measures for students needing remediation. Students often finish degrees at later dates and at different institutions, and not all students attending college seek degrees. Sternglass (2000) conducted a study of underprepared students placed in her 1989 basic writing classes at CUNY. As of January 1996, 32% had graduated from the college, 19% had transferred to other colleges, 15% were still enrolled, and 34% had dropped out entirely. She concluded that those rates were not atypical of general college retention statistics. Fields and Holland (1998) found that after a seven-year period, 16% of students in a multipurpose institution of higher education in northern Louisiana who had enrolled in developmental education courses had graduated and nine percent were still enrolled.

Roueche and Baker (1994) found that students taking developmental education courses at Miami-Dade Community College had a 900% greater chance of graduating than those who needed developmental courses but had not taken them. McClenney and Flores (1998) stated that at the Community College of Denver, “Degree-seeking students who start with remedial courses are as likely to complete their first semester successfully, and even more likely to continue their studies and graduate and/or transfer, as other degree-seeking students” (p. 50).

In contrast, the Maryland Higher Education Commission (1996) concluded that, among students who had attended community colleges in Maryland, the greater the amount of remediation needed, the lower had been their four-year success rate. Likewise, Abraham and Creech (2001), citing information from the National Center for Educational Statistics, reported that 60% of those who took no remedial coursework and 45% of students taking two remedial courses had earned associate or bachelor’s degrees by age 30. Only 35% of students taking five or more remedial courses had earned degrees by age 30.

Brien et al. (1998) determined that at Delgado Community College, graduation rates for remediated students improved over time. The 1995-1996 graduation rate for students taking at least one developmental course was 43%, which represented a 29% increase over the 1992-1993 graduation rate. Graduation rates for students needing more than three developmental courses increased from 1.6% in 1992-1993 to 10% in 1995-1996.

Boylan and Bonham (1992), reporting on the results of a study conducted by the National Center for Developmental Education, concluded that rates of developmental students who had graduated or were still enrolled differed widely by institution type, from 48.3% enrolled at research universities to 24.0% enrolled at community colleges.

McCoy (1991) found that students entering Prince George Community College in the fall term of 1980 who had taken developmental courses were slightly less likely to graduate in the next eight years than were those exempt from the courses. However, Pierson and Huba (1997) ascertained that at a small Midwestern community college, students exempt from developmental courses and those who completed them did not do better than students who failed to complete them.

State University and Community College System of Tennessee and
Walters State Community College

Prior to 1985 colleges governed by the Tennessee Board of Regents (TBR) (then State Board of Regents) offered a variety of remedial and developmental education courses in which students could voluntarily enroll. In 1984 the TBR authorized the Academic Assessment Placement Program (AAPP) for all institutions under its governance. The comprehensive program was designed to expand access to and enhance the quality of education within the State University and Community College System of Tennessee. The program provided for mandatory assessment of all entering students and placement in a mandatory

remediation program for those determined not prepared for college-level work. A system-wide placement test designed to measure a student's writing ability, reading comprehension, and mathematics skill is administered to students considered to be potentially at risk of failure. Students who meet certain cutoff scores on the placement test are allowed to pursue college-level coursework. Students found to be deficient are placed in mandatory remedial and/or developmental courses (State Board of Regents, 1988).

Prior to 1985 students entering WSCC were asked to complete a placement examination, and during the advising process, students were given the opportunity to enroll in remedial and developmental classes if they chose. As part of TBR's initiative to establish a formal remediation program at all colleges under its governance, WSCC designed its approach to the TBR mandate as follows:

Because student lack of success in college can rarely be traced to a single deficiency, each component and subcomponent of the remedial/developmental studies program at Walters State Community College will be developed as an integral part of a comprehensive educational program for underprepared students. Alone, each component will be a valuable educational intervention; together, they will provide experiences to address varying levels of student need.

Interventions available to students will include structured, sequential courses in reading, writing, and mathematics to form a foundation of basic skills and competencies for academic success. Study skills and goal definition will be introduced early in the student's program to assist in providing a smooth transition into academic expectations. Learning laboratories, counseling, advising, and tutoring will supplement formal coursework for students with special needs. Activities designed to enhance speaking, listening, and reasoning abilities will be interwoven throughout the program.

Each component will complement other components while fulfilling specific academic functions within the overall scope of the program. From assessment through completion of freshman-level courses, student deficiencies will be identified and addressed. (Walters State Community College, 1985, p. 13)

Under the guidelines established by TBR for students entering in fall of 1985 and thereafter, each WSCC student under 21 years of age is required to earn a specified composite score on the ACT college entrance examination (students can substitute equivalent SAT scores for ACT scores). Students with lower scores are required to complete a placement test. Students 21 years old or more are required to complete the placement test, regardless of their performance on the ACT examination. The placement test scores result in mandatory placement in remedial and/or developmental coursework, depending on established AAPP cutoff scores.

Walters State require that students who score one or two on the holistically-graded writing essay be placed into remedial writing; those who score three be placed into developmental writing; and those who score four, five, or six be allowed to enroll in freshman composition. Students take either the arithmetic and elementary algebra placement tests or the elementary algebra and intermediate algebra placement tests depending on their high school mathematics' preparation. Students who score above 21 on the arithmetic test are placed into intermediate algebra; those who score 21 or below are placed into arithmetic. Students who score below 16 on the elementary algebra test are placed into arithmetic. Students

who score between 16 and 21 are placed into elementary algebra, and those who score above 21 are placed into intermediate algebra. Students who score at or below 17 on the intermediate algebra test are placed into intermediate algebra, whereas those who score above 17 are allowed to enroll in college-level mathematics. Students who score below 22 on the reading comprehension test are placed into remedial reading. Those who score between 22 and 27 are placed into developmental reading. Students scoring 28 or above are not required to take any remedial or developmental reading classes. Students placed into two remedial subject areas or three remedial and/or developmental subject areas are required to enroll in a study skills course. These placement scores are subject to review and modification by TBR (Walters State Community College, 1993).

TBR undertook an evaluation of its new program early in 1988 and issued a follow-up report in 1991. The 1991 study, conducted by the Ad Hoc Committee on Assessment and Evaluation, was designed to assess how the program had worked in the short time since its initiation and how it might be improved. The committee identified effectiveness as follows:

1. An effective program will result in a higher than usual retention rate through graduation of initially high-risk students; and
2. An effective program will produce student completers who subsequently perform as well as or almost as well as students who did not require remedial/developmental courses. (Tennessee Board of Regents, 1991, p. 3)

The follow-up evaluation tracked students at all TBR institutions who entered in the fall 1986 cohort through the spring of 1990. The study, however,

was not designed to statistically interpret the significance of the reported results. The study found that on average 83.0% of Remedial/Developmental (R/D) course completers had passed college-level courses compared to an 86.7% pass rate for non-R/D students. In writing courses 88.1% of R/D completers passed college-level English compared to 91.1% of non-R/D students. In mathematics courses 81.0% of R/D completers passed college-level mathematics compared to 78.6% of non-R/D students. On average 82.3% of R/D reading completers passed one or more college-level social science courses compared to 87.6% of non-R/D students. The committee's data also reflected that 27.7% of R/D students were still in school or had received academic credentials as of the spring of 1990, compared to 41.5% of non-R/D students (Tennessee Board of Regents, 1991).

At WSCC the following results were reported by the state committee. In writing courses 85.7% of R/D completers passed college-level English compared to 84.5% of non-R/D students. In mathematics courses 83.6% of R/D completers passed college-level mathematics compared to 88.4% of non-R/D students. On average 77.3% of R/D reading completers passed one or more college-level social science courses compared to 89.5% of non-R/D students. The committee's data also reflected that as of spring 1990 15.3% of all WSCC R/D students in the 1986 cohort were still enrolled or had received academic credentials compared to 31.4% of WSCC non-R/D students (Tennessee Board of Regents, 1991).

A limited number of localized research studies have been undertaken relative to WSCC. Hector (1983) studied the developmental program before mandatory placement was initiated. Hector found that of successful developmental writing students who later took English composition 70% passed the college-level course in 1977-1980 compared to 59% in 1978-1980, 71% in 1979-1981, and 60% in 1980-1982. Hector also found that of the successful developmental mathematics students who later enrolled in the college's first college-level mathematics class 75% passed the college-level course in each six-quarter period studied. Hector's research also concluded that the grade distribution of former developmental students compared favorably with the overall grade distribution in both college-level courses. Morrell (1994) found performance in the developmental intermediate algebra course, when coupled with student age, to be a significant predictor of performance in college-level mathematics at WSCC.

Hopper, Taylor, and Wolford (1997) compared the success of R/D students in English composition with non-R/D students. Their research revealed that most students who had completed R/D requirements in writing had passed English composition. When the data were adjusted to reflect only pass and fail grades, the study concluded that there were no significant differences in the successful completion of English composition between R/D students and non-R/D students. The study also found, however, that R/D students had withdrawn from the college-

level courses or received grades of incomplete in greater frequency than was the case of non-R/D students.

Goodman (1999), in her doctoral dissertation, studied the relationship between “persisters” and “non-persisters” at WSCC. Persisters were defined as “...students enrolled subsequent to their initial registration with no more than five consecutive semesters’ absence, including summer sessions” (p. 12). Goodman found that students who had taken one or two R/D courses had persisted longer than non-R/D students. She also found that there were no significant differences between persisters and non-persisters who took three or more R/D courses.

Conclusion

Remediation in our nation’s system of higher education is as old as America herself. Over time the form and the focus of remediation has changed, but the need has not diminished.

Much research has been done in the area of remediation and its effectiveness, and most of those studies have focused on levels of success achieved locally at colleges and universities. To date no clear-cut consensus has been forthcoming from research as to the overall effectiveness of remediation efforts around the country. The attributes of an effective remediation effort are not universal. Some colleges are not successful in every aspect of their remediation programs, but many colleges and universities operate highly effective programs, as demonstrated by research specifically tailored to their program’s uniqueness.

Research on a national level designed to determine the level of effectiveness of remedial education in America is lacking. More studies with a national focus would be useful; however, a possible explanation of this lack of research is that all remediation programs are different. To try to extrapolate the results of a national study to a community college in Tennessee or Idaho might not yield beneficial results. Some research relative to effective remediation in Tennessee and at WSCC has been conducted over the last decade, but the results are inconclusive. Additional research is needed and should be ongoing because today's successful program does not guarantee tomorrow's results.

The research designed to analyze the effectiveness of developmental education at WSCC is presented in Chapter 3.

CHAPTER 3

METHODOLOGY

The focus of this study was to compare the success measures of students comprised of five entering-freshman cohorts each tracked for a six-year period who completed developmental education at WSCC to students who were exempt from taking mandatory developmental education classes. This chapter details the population that will be studied, research design, data collection, research hypotheses, research methods, and data analysis.

Population

The scope of this study was limited to Walters State Community College (WSCC), with campuses located in Morristown, Sevierville, Greeneville, and Tazewell, Tennessee. WSCC serves an average of 6,000 students per semester at four campuses located throughout its 10-county service area in upper East Tennessee. The study examined developmental education success measures for five cohorts of first-time degree-seeking freshmen each tracked for a six-year period.

These WSCC cohorts were comprised of 5,153 students. Of the total population, 4,305 students were required to take at least one developmental education course; 3,426 students were required to take developmental writing; 4,057 students were required to take developmental mathematics; and 3,265 students were required to take at least one developmental writing course and one

developmental mathematics course. Total students by cohort year for the above categories are reported in Table 1.

Of the total population, 848 students had no developmental education course requirements in any subject area. Total students by cohort year for the above category are reported in Table 1. Of the total population, 2,406 students had completed all developmental course requirements during their six-year WSCC cohort period. Of the students required to take developmental writing courses, 2,319 had completed all such courses during their six-year WSCC cohort period. Of the students required to take developmental mathematics courses, 2,317 had completed all such courses during their six-year WSCC cohort period. Total students by cohort year for the above categories are reported in Table 2.

Of the total population, 1,574 students who had completed developmental writing requirements enrolled in college-level English composition, and 1,479 students who had completed developmental mathematics enrolled in college-level mathematics by the end of their six-year WSCC cohort period. Students who had completed college-level English composition and college-level mathematics by the end of their six-year WSCC cohort period without the prerequisite of writing or mathematics courses were 1,283 and 798, respectively. Total students by cohort year for the above categories are reported in Table 2.

Table 1

Student Placement Frequencies

	1*	2**	3***	4****	5*****	6*****
Cohort	<u>n</u>	<u>n</u>	<u>n</u>	<u>n</u>	<u>n</u>	<u>n</u>
1991	1,128	936	747	882	700	192
1992	1,011	858	715	815	693	153
1993	1,060	883	704	830	670	177
1994	968	799	619	747	583	169
1995	<u>986</u>	<u>829</u>	<u>641</u>	<u>783</u>	<u>619</u>	<u>157</u>
Combined	5,153	4,305	3,426	4,057	3,265	848

* Total students enrolled in cohort

** Total students placed in any developmental course

*** Total students placed in developmental writing

**** Total students placed in developmental mathematics

***** Total students placed in developmental writing and developmental mathematics

***** Total students who did not require any developmental coursework (college-prepared students)

Table 2

Student Enrollment Frequencies

	1*	2**	3***	4****	5*****	6*****	7*****	8*****
Cohort	<u>n</u>	<u>n</u>	<u>n</u>	<u>n</u>	<u>n</u>	<u>n</u>	<u>n</u>	<u>n</u>
1991	568	509	564	359	339	278	178	235
1992	511	500	511	333	339	231	136	188
1993	469	476	442	318	296	264	178	209
1994	413	403	379	276	241	256	159	196
1995	<u>445</u>	<u>431</u>	<u>421</u>	<u>288</u>	<u>264</u>	<u>254</u>	<u>147</u>	<u>202</u>
Combined	2,406	2,319	2,317	1,574	1,479	1,283	798	1,030

- * Total students who completed all developmental requirements
- ** Total students who completed all developmental writing requirements
- *** Total students who completed all developmental mathematics requirements
- **** Total developmental students who attempted college-level English composition
- ***** Total developmental students who attempted college-level mathematics
- ***** Total nondevelopmental students who attempted college-level English composition
- ***** Total nondevelopmental students who attempted college-level mathematics
- ***** Total students who earned associate degrees

Of the total population, 1,030 students had graduated with an associate degree by the end of their six-year WSCC cohort period. Total students by cohort year for the above category are reported in Table 2.

Students in the population who placed into developmental writing but had not completed all required writing courses were excluded from the study.

Likewise, students in the population who placed into developmental mathematics but had not completed all required mathematics courses were excluded from the study. These students were excluded because until they complete developmental requirements in English and mathematics, they are not allowed to take college-level courses in those subject areas. Also excluded were the few students who tested solely into developmental reading. The effectiveness of developmental reading courses was not studied because students are allowed to enroll in college-level social science courses prior to completion of developmental reading. The population does not include students not considered to be seeking degrees.

Research Design

This retrospective follow-up study was designed to compare the success of students who were exempt from mandatory developmental education courses to the success of students who had completed the required courses. The variables used to measure success are identified below:

1. GPAs earned in the first college-level mathematics course taken;
2. GPAs earned in the first college-level English composition course taken;
3. total students graduating with associate degrees by the end of the six-year period covered by the WSCC cohort;
4. total cumulative college-level credit hours earned at the end of the six-year period covered by the WSCC cohort; and
5. cumulative college GPAs computed at the end of the six-year period covered by the WSCC cohort.

Data Collection

Existing data were used to conduct this study and were gathered from student information maintained by WSCC's Student Information System (SIS). Each cohort was tracked for six years within this database. These data were downloaded to a networked personal computer and analyzed using the SPSS for Windows (Release 10.1) statistical package.

Upon registration as a first-time degree-seeking student for summer term returning fall term or for fall term, each student is permanently assigned to a particular WSCC cohort. Students who have taken the placement test and scored at a level requiring mandatory placement into developmental education courses are classified as underprepared students in need of remediation. Students subsequently completing developmental requirements are classified as

developmental students. Students who were not required to take remedial/developmental courses because of their ACT performance or because of their placement test scores are classified as nondevelopmental students.

Research Hypotheses

The null hypotheses statistically tested for this research study are as follows:

Hypothesis 1: There is no difference between developmental mathematics students and nondevelopmental mathematics students in the grades they earned in their first college-level mathematics course.

Hypothesis 2: There is no difference between developmental writing students and nondevelopmental writing students in the grades they earned in their first college-level English composition course.

Hypothesis 3: There is no difference in graduation rates between developmental students and nondevelopmental students.

Hypothesis 4: There is no difference between the number of college-level credit hours earned by developmental students and the number of college-level credit hours earned by nondevelopmental students.

Hypothesis 5: There is no difference between developmental students and nondevelopmental students in the cumulative college-level GPAs they earned.

Research Methods

The first step in the study was to test Hypothesis 1 by computing the average WSCC cohort GPA for the first college-level mathematics course taken by developmental mathematics students and nondevelopmental mathematics students. The averages were computed for each individual WSCC cohort and for all five WSCC cohorts combined into one. The results for developmental and nondevelopmental mathematics students were then compared.

The next step in the study was to test Hypothesis 2 by computing the average WSCC cohort GPA for the first college-level English composition course taken by developmental writing students and nondevelopmental writing students. The averages were computed for each individual WSCC cohort and for all five WSCC cohorts combined into one. The results for developmental writing and nondevelopmental writing students were then compared.

Hypothesis 3 was tested by determining the frequency of graduation for developmental and nondevelopmental students. A graduation percentage for each type student was computed for each individual WSCC cohort and for all five WSCC cohorts combined into one. The results for developmental and nondevelopmental students were then compared.

Hypothesis 4 was tested by computing the average number of college-level credit hours earned by developmental and nondevelopmental students. The averages were computed for each individual WSCC cohort and for all five WSCC

cohorts combined into one. The results for developmental and nondevelopmental students were then compared.

The final step in the study was to test Hypothesis 5 by computing the average WSCC cohort cumulative GPA for developmental and nondevelopmental students. The averages were computed for each individual WSCC cohort and for all five WSCC cohorts combined into one. The results for developmental and nondevelopmental students were then compared.

Data Analysis

Hypotheses 1, 2, 4, and 5 were analyzed using the t-test for independent samples. In addition, for Hypotheses 1 and 2, letter grade frequencies were compiled. Hypothesis 3 was analyzed using a chi-square test. Each variable was evaluated separately using the appropriate test statistic. An alpha level of .05 was used for each analysis. The statistical tests and findings are fully detailed and reported in Chapter 4.

CHAPTER 4

DATA ANALYSIS AND FINDINGS

Analysis of Performance in College-Level Coursework

One measure of gauging the effectiveness of a developmental education program is to compare college-level course grades earned by developmental students to college-level grades earned by nondevelopmental students. In the analysis that follows, this study compared the mean GPAs of nondevelopmental and developmental students taking their first course in college-level mathematics and college-level English composition. Stated in the null form, the hypotheses investigated were:

Hypothesis 1: There is no difference between developmental mathematics students and nondevelopmental mathematics students in the grades they earned in their first college-level mathematics course.

Hypothesis 2: There is no difference between developmental writing students and nondevelopmental writing students in the grades they earned in their first college-level English composition course.

Comparison of Performance in College-Level Mathematics

In the five identified cohorts of entering freshmen, 798 nondevelopmental students and 1,479 developmental students attempted college-level mathematics subject to the college's standard grading scale. The scale awards 4 quality points for an "A" grade, 3 quality points for a "B" grade, 2 quality points for a "C" grade,

1 quality point for a “D” grade, and zero quality points for an “F” grade. Non-standard grades such as withdrawals and audits were omitted from the analysis.

Each cohort was analyzed individually to determine if there were significant differences in the performance of nondevelopmental and developmental students completing their first college-level mathematics course. The cohorts were then combined and analyzed for significant differences over the 1991-2001 enrollment period covered by the five cohorts. Student GPAs earned in the first college-level mathematics course were used to compare performance among the two groups.

For each cohort a t-test was conducted on the mean GPAs of nondevelopmental and developmental students taking college-level mathematics. The test was applied in order to determine whether significant differences exist in GPAs earned in the first college-level mathematics course by the two groups. The results of this analysis are reported in Table 3.

In the 1991 cohort, nondevelopmental students ($\underline{M} = 2.87$) had an average GPA in their first college-level mathematics course that was statistically higher than that of developmental students ($\underline{M} = 2.51$). The null hypotheses was rejected.

In the 1992 cohort, nondevelopmental students ($\underline{M} = 3.13$) had an average GPA in their first college-level mathematics course that was statistically higher than that of developmental students ($\underline{M} = 2.47$). The null hypothesis was rejected.

Table 3

Comparison of GPA Statistics for Nondevelopmental and Developmental Students
Completing their First College-Level Mathematics Course

Cohort	Group	<u>n</u>	<u>M</u>	<u>SD</u>	<u>t</u>	<u>p</u>
1991	Nondevelopmental	178	2.87	1.27	3.270	0.001*
	Developmental	339	2.51	1.11		
1992	Nondevelopmental	136	3.13	1.06	5.757	0.000*
	Developmental	339	2.47	1.15		
1993	Nondevelopmental	178	2.83	1.18	3.161	0.002*
	Developmental	296	2.47	1.20		
1994	Nondevelopmental	159	3.05	1.11	3.596	0.000*
	Developmental	241	2.63	1.15		
1995	Nondevelopmental	147	3.02	1.18	3.716	0.000*
	Developmental	264	2.56	1.24		
Combined	Nondevelopmental	798	2.97	1.17	8.686	0.000*
	Developmental	1,479	2.52	1.17		

* $p < .05$; statistically significant difference

In the 1993 cohort, nondevelopmental students ($\underline{M} = 2.83$) had an average GPA in their first college-level mathematics course that was statistically higher than that of developmental students ($\underline{M} = 2.47$). The null hypothesis was rejected.

In the 1994 cohort, nondevelopmental students ($\underline{M} = 3.05$) had an average GPA in their first college-level mathematics course that was statistically higher than that of developmental students ($\underline{M} = 2.63$). The null hypothesis was rejected.

In the 1995 cohort, nondevelopmental students ($\underline{M} = 3.02$) had an average GPA in their first college-level mathematics course that was statistically higher than that of developmental students ($\underline{M} = 2.56$). The null hypothesis was rejected.

For the 1991-2001 combined enrollment period covered by the five cohorts, nondevelopmental students ($\underline{M} = 2.97$) had an average GPA in their first college-level mathematics course that was statistically higher than that of developmental students ($\underline{M} = 2.52$). The null hypothesis was rejected.

Table 4 reports the number of nondevelopmental and developmental students receiving a letter grade of “A,” “B,” or “C,” in college-level mathematics. The reported percentage reflects the ratio of students in that student group receiving a letter grade of “C” or better. Over the combined enrollment period covered by the five cohorts, 6.7% more nondevelopmental students earned a letter grade of “C” or better in college-level mathematics.

Comparison of Performance in College-Level English Composition

In the five identified cohorts of entering freshmen, 1,283 nondevelopmental students and 1,574 developmental students attempted college-level English composition subject to the college’s standard grading scale. Non-standard grades such as withdrawals and audits were omitted from the analysis.

Table 4

Frequencies of Nondevelopmental and Developmental Students Receiving a Letter
Grade of “C” or Better in College-Level Mathematics

Cohort	<u>Grade of “C” or Better</u>			
	<u>Nondevelopmental</u>		<u>Developmental</u>	
	<u>n</u>	<u>%</u>	<u>n</u>	<u>%</u>
1991	155	87.1	278	82.0
1992	125	91.9	281	82.9
1993	155	87.1	239	80.7
1994	143	89.9	202	83.8
1995	132	89.8	217	82.2
Combined	710	89.0	1,217	82.3

For each cohort a t-test was conducted on the mean GPAs of nondevelopmental and developmental students taking college-level English composition. The test was applied in order to determine whether significant differences exist in GPAs earned in the first college-level English course by the two groups. The results of this analysis are reported in Table 5.

Each cohort was analyzed individually to determine if there were significant differences in the performance of nondevelopmental and developmental students completing their first college-level English composition

course. The cohorts were then combined and analyzed for significant differences over the 1991-2001 enrollment period covered by the five cohorts. Student GPAs earned in the first college-level English course were used to compare performance among the two groups.

Table 5

Comparison of GPA Statistics for Nondevelopmental and Developmental Students
Completing their First College-Level English Course

Cohort	Group	<u>n</u>	<u>M</u>	<u>SD</u>	<u>t</u>	<u>p</u>
1991	Nondevelopmental	278	2.31	1.15	0.575	0.566
	Developmental	359	2.26	1.11		
1992	Nondevelopmental	231	2.51	1.06	1.956	0.051
	Developmental	333	2.32	1.16		
1993	Nondevelopmental	264	2.27	1.16	0.180	0.857
	Developmental	318	2.25	1.22		
1994	Nondevelopmental	256	2.54	1.22	2.788	0.005*
	Developmental	276	2.24	1.25		
1995	Nondevelopmental	254	2.39	1.22	0.307	0.759
	Developmental	288	2.36	1.24		
Combined	Nondevelopmental	1,283	2.40	1.17	2.559	0.011*
	Developmental	1,574	2.28	1.19		

* $p < .05$; statistically significant difference

In the 1991 cohort, nondevelopmental students ($\underline{M} = 2.31$) had an average GPA in their first college-level English course that was not statistically higher than that of developmental students ($\underline{M} = 2.26$). The null hypothesis was retained.

In the 1992 cohort, nondevelopmental students ($\underline{M} = 2.51$) had an average GPA in their first college-level English course that was not statistically higher than that of developmental students ($\underline{M} = 2.32$). The null hypothesis was retained.

In the 1993 cohort, nondevelopmental students ($\underline{M} = 2.27$) had an average GPA in their first college-level English course that was not statistically higher than that of developmental students ($\underline{M} = 2.25$). The null hypothesis was retained.

In the 1994 cohort, nondevelopmental students ($\underline{M} = 2.54$) had an average GPA in their first college-level English course that was statistically higher than that of developmental students ($\underline{M} = 2.24$). The null hypothesis was rejected.

In the 1995 cohort, nondevelopmental students ($\underline{M} = 2.39$) had an average GPA in their first college-level English course that was not statistically higher than that of developmental students ($\underline{M} = 2.36$). The null hypothesis was retained.

For the 1991-2001 combined enrollment period covered by the five cohorts, nondevelopmental students ($\underline{M} = 2.40$) had an average GPA in their first college-level English course that was statistically higher than that of developmental students ($\underline{M} = 2.28$). The null hypothesis was rejected.

Table 6 reports the number of nondevelopmental and developmental students receiving a letter grade of “A,” “B,” or “C,” in college-level English

composition. The reported percentage reflects the ratio of students in that student group receiving a letter grade of “C” or better. Over the combined enrollment period covered by the five cohorts, only 3.5% more nondevelopmental students earned a letter grade of “C” or better in college-level English composition.

Table 6

Frequencies of Nondevelopmental and Developmental Students Receiving a Letter Grade of “C” or Better in College-Level English

Cohort	<u>Grade of “C” or Better</u>			
	<u>Nondevelopmental</u>		<u>Developmental</u>	
	<u>n</u>	<u>%</u>	<u>n</u>	<u>%</u>
1991	229	82.4	292	81.3
1992	203	87.8	271	81.4
1993	217	82.2	254	79.9
1994	216	84.4	214	77.5
1995	208	81.9	229	79.5
Combined	1,073	83.6	1,260	80.1

Analysis of Degrees Earned

Effectiveness of developmental education can also be gauged by graduation rates. Students completing required developmental education courses would be expected to graduate at rates comparable to nondevelopmental students. This

study compared cohort graduation rates of nondevelopmental and developmental students. Stated in the null form, the hypothesis investigated was:

Hypothesis 3: There is no difference in graduation rates between developmental students and nondevelopmental students.

In the five identified cohorts of entering freshmen, 291 nondevelopmental students and 739 developmental students earned degrees. Each cohort was analyzed individually to establish if graduation rates for nondevelopmental students differ significantly from those of developmental students. The cohorts were then combined and analyzed for significant differences over the 1991-2001 enrollment period covered by the five cohorts. A graduate is defined as a student having received a degree granted by the college during the cohort tracking period.

For each cohort the frequencies of graduates and nongraduates were calculated for nondevelopmental and developmental student groups. The chi square test of independence was applied to the frequencies to determine if there were significant differences in graduation rates relative to the two identified student groups. The results of this analysis are reported in Table 7.

The distributions of the two student groups in the 1991 cohort were similar. Given a χ^2 of 0.087 and $p = 0.768$, the null hypothesis was retained. The test statistics did not indicate that significant differences exist between the two student groups relative to rates of graduation for the cohort.

Table 7

Analysis of Nondevelopmental and Developmental Students and their
Graduation Status

	<u>Student Classification</u>				χ^2	p
	<u>Nondevelopmental</u>		<u>Developmental</u>			
	<u>f</u>	<u>%</u>	<u>f</u>	<u>%</u>		
1991 Cohort						
Graduates	61	31.8	174	30.6	0.087	0.768
Nongraduates	<u>131</u>	<u>68.2</u>	<u>394</u>	<u>69.4</u>		
	192	100	568	100		
1992 Cohort						
Graduates	47	30.7	141	27.6	0.567	0.452
Nongraduates	<u>106</u>	<u>69.3</u>	<u>370</u>	<u>72.4</u>		
	153	100	511	100		
1993 Cohort						
Graduates	60	33.9	149	31.8	0.266	0.606
Nongraduates	<u>117</u>	<u>66.1</u>	<u>320</u>	<u>68.2</u>		
	177	100	469	100		
1994 Cohort						
Graduates	62	36.7	134	32.4	0.966	0.326
Nongraduates	<u>107</u>	<u>63.3</u>	<u>279</u>	<u>67.6</u>		
	169	100	413	100		
1995 Cohort						
Graduates	61	38.9	141	31.7	2.675	0.102
Nongraduates	<u>96</u>	<u>61.1</u>	<u>304</u>	<u>68.3</u>		
	157	100	445	100		
Combined Cohort						
Graduates	291	34.3	739	30.7	3.759	0.053
Nongraduates	<u>557</u>	<u>65.7</u>	<u>1,667</u>	<u>69.3</u>		
	848	100	2,406	100		

The distributions of the two student groups in the 1992 cohort were similar. Given a χ^2 of 0.567 and $p = 0.452$, the null hypothesis was retained. The test statistics did not indicate that significant differences exist between the two student groups relative to rates of graduation for the cohort.

The distributions of the two student groups in the 1993 cohort were similar. Given a χ^2 of 0.266 and $p = 0.606$, the null hypothesis was retained. The test statistics did not indicate that significant differences exist between the two student groups relative to rates of graduation for the cohort.

The distributions of the two student groups in the 1994 cohort were similar. Given a χ^2 of 0.966 and $p = 0.326$, the null hypothesis was retained. The test statistics did not indicate that significant differences exist between the two student groups relative to rates of graduation for the cohort.

The distributions of the two student groups in the 1995 cohort were similar. Given a χ^2 of 2.675 and $p = 0.102$, the null hypothesis was retained. The test statistics did not indicate that significant differences exist between the two student groups relative to rates of graduation for the cohort.

Given a χ^2 of 3.759 and $p = 0.053$ for the 1991-2001 combined enrollment period covered by the five cohorts, the null hypothesis was retained. The test statistics did not indicate that significant differences exist between the two student groups relative to rates of graduation over the 1991-2001 combined enrollment period.

Analysis of College-Level Cumulative Credit Hours Earned

Students attend community colleges for a variety of reasons. Some students pursue credit hours for transfer to senior colleges and universities without graduating from the community college. Other students take courses to improve job-related skills and never complete degrees. In some circumstances, students meet obstacles in life that prevent them from completing their education goals. Nevertheless, effective developmental education should provide the foundation and preparation for the earning of college-level credit hours at rates similar to hours earned by nondevelopmental students. Stated in the null form, the hypothesis investigated was:

Hypothesis 4: There is no difference between the number of college-level credit hours earned by developmental students and the number of college-level credit hours earned by nondevelopmental students.

Each cohort was analyzed individually to establish if cumulative college-level credit hours earned by nondevelopmental students differed significantly from hours earned by developmental students. The cohorts were then combined and analyzed for significant differences over the 1991-2001 enrollment period covered by the five cohorts.

For each cohort a t-test was conducted on the mean cumulative college-level credit hours earned by nondevelopmental and developmental students. The test was applied in order to determine whether significant differences exist in

cumulative hours earned by the two groups. The results of this analysis are reported in Table 8.

Table 8

Comparison of Cumulative College-Level Credit Hours Earned for
Nondevelopmental and Developmental Students

Cohort	Group	<u>n</u>	<u>M</u>	<u>SD</u>	<u>t</u>	<u>p</u>
1991	Nondevelopmental	192	47.0	29.7	1.388	0.166
	Developmental	568	43.9	26.6		
1992	Nondevelopmental	153	49.2	27.6	2.943	0.003*
	Developmental	511	42.1	25.7		
1993	Nondevelopmental	177	50.6	27.1	2.393	0.017*
	Developmental	469	45.1	25.7		
1994	Nondevelopmental	169	47.0	27.4	0.031	0.975
	Developmental	413	47.1	25.7		
1995	Nondevelopmental	157	50.3	27.9	1.783	0.075
	Developmental	445	45.9	26.8		
Combined	Nondevelopmental	848	48.8	28.0	3.879	0.000*
	Developmental	2,406	44.6	26.2		

* $p < .05$; statistically significant difference

Average college-credit hours earned by 1991 cohort nondevelopmental students ($\underline{M} = 47.0$) was not statistically higher than average hours earned by cohort developmental students ($\underline{M} = 43.9$). The null hypothesis was retained.

Average college-credit hours earned by 1992 cohort nondevelopmental students ($\underline{M} = 49.2$) was statistically higher than average hours earned by cohort developmental students ($\underline{M} = 42.1$). The null hypothesis was rejected.

Average college-credit hours earned by 1993 cohort nondevelopmental students ($\underline{M} = 50.6$) was statistically higher than average hours earned by cohort developmental students ($\underline{M} = 45.1$). The null hypothesis was rejected.

Average college-credit hours earned by 1994 cohort nondevelopmental students ($\underline{M} = 47.0$) was not statistically higher than average hours earned by cohort developmental students ($\underline{M} = 47.1$). The null hypothesis was retained.

Average college-credit hours earned by 1995 cohort nondevelopmental students ($\underline{M} = 50.3$) was not statistically higher than average hours earned by cohort developmental students ($\underline{M} = 45.9$). The null hypothesis was retained.

For the 1991-2001 combined enrollment period covered by the five cohorts, average college-credit hours earned by nondevelopmental students ($\underline{M} = 48.8$) was statistically higher than average hours earned by developmental students ($\underline{M} = 44.6$). The null hypothesis was rejected.

Analysis of College-Level Cumulative Grade Point Averages Earned

The traditional method of establishing relative success in college-level work is by comparison of cumulative college-level grade point averages. Students may establish a certain number of credit hours and even graduate, but the quality of the hours earned and the quality of the degree is measured by the student's

cumulative GPA. Students completing a developmental education program would be expected to earn equivalent cumulative GPAs in their college-level coursework when compared to nondevelopmental students. Stated in the null form, the hypothesis investigated was:

Hypothesis 5: There is no difference between developmental students and nondevelopmental students in the cumulative college-level GPAs they earned.

Each cohort was analyzed individually to determine if there were significant differences in the performance of nondevelopmental and developmental students relative to their overall earned college-level GPAs. The cohorts were then combined and analyzed for significant differences over the 1991-2001 enrollment period covered by the five cohorts. The computation of cumulative college-level GPA is based on the college's standard grading scale. Non-standard grades such as withdrawals and audits were omitted from the analysis.

For each cohort a t-test was conducted on the mean cumulative college-level GPAs of nondevelopmental and developmental students. The test was applied in order to determine whether significant differences exist in cumulative college-level GPAs earned over the cohort period by the two groups. The results of this analysis are reported in Table 9. For each cohort, missing cases were

observed in the data because some students failed to establish a cumulative college-level GPA due to their complete withdrawal from the college.

Table 9

Comparison of Cumulative College-Level GPA Statistics for Nondevelopmental and Developmental Students

Cohort	Group	<u>n</u>	<u>M</u>	<u>SD</u>	<u>t</u>	<u>p</u>
1991	Nondevelopmental	192	2.45	1.01	0.758	0.449
	Developmental	561	2.39	0.77		
1992	Nondevelopmental	152	2.69	0.84	3.251	0.001*
	Developmental	508	2.45	0.79		
1993	Nondevelopmental	175	2.62	0.93	2.171	0.030*
	Developmental	466	2.46	0.76		
1994	Nondevelopmental	165	2.70	1.00	2.555	0.011*
	Developmental	409	2.50	0.76		
1995	Nondevelopmental	154	2.74	0.90	2.194	0.029*
	Developmental	441	2.58	0.73		
Combined	Nondevelopmental	838	2.63	0.95	4.824	0.000*
	Developmental	2,385	2.47	0.76		

* $p < .05$; statistically significant difference

In the 1991 cohort, nondevelopmental students ($\underline{M} = 2.45$) had an average cumulative college-level GPA that was not statistically higher than that of developmental students ($\underline{M} = 2.39$). The null hypothesis was retained. For the

developmental group, there were seven missing cases due to students' complete withdrawal from the college.

In the 1992 cohort, nondevelopmental students ($\underline{M} = 2.69$) had an average cumulative college-level GPA that was statistically higher than that of developmental students ($\underline{M} = 2.45$). The null hypothesis was rejected. For the nondevelopmental group and the developmental group, there were one and three missing cases, respectively, due to students' complete withdrawal from the college.

In the 1993 cohort, nondevelopmental students ($\underline{M} = 2.62$) had an average cumulative college-level GPA that was statistically higher than that of developmental students ($\underline{M} = 2.46$). The null hypothesis was rejected. For the nondevelopmental group and the developmental group, there were two and three missing cases, respectively, due to students' complete withdrawal from the college.

In the 1994 cohort, nondevelopmental students ($\underline{M} = 2.70$) had an average cumulative college-level GPA that was statistically higher than that of developmental students ($\underline{M} = 2.50$). The null hypothesis was rejected. For the nondevelopmental group and the developmental group, there were four missing cases each due to students' complete withdrawal from the college.

In the 1995 cohort, nondevelopmental students ($\underline{M} = 2.74$) had an average cumulative college-level GPA that was statistically higher than that of

developmental students ($\underline{M} = 2.58$). The null hypothesis was rejected. For the nondevelopmental group and the developmental group, there were three and four missing cases, respectively, due to students' complete withdrawal from the college.

For the 1991-2001 combined enrollment period covered by the five cohorts, nondevelopmental students ($\underline{M} = 2.63$) had an average cumulative college-level GPA that was statistically higher than that of developmental students ($\underline{M} = 2.47$). The null hypothesis was rejected. For the nondevelopmental group and the developmental group, there were 10 and 21 missing cases, respectively, due to students' complete withdrawal from the college.

Summary of Findings

The analysis of GPAs of college-level mathematics clearly shows that students entering WSCC without the need of any form of remediation in mathematics perform significantly better than students completing developmental mathematics prerequisites. The null hypothesis for each cohort period as well as the combined period was rejected. This finding should not be construed to imply, however, that developmental mathematics has been ineffective. The placement examination taken by developmental students upon enrollment identified weaknesses in basic arithmetic and in elementary and intermediate algebra. The examination was used to place students in appropriate developmental courses. Upon completion of the required developmental courses, students who were

enrolled in college-level mathematics did not earn GPAs as high as those earned by their nondevelopmental peers. However, as can be determined by examining the frequency of grades awarded over the combined five-cohort period, 82.3% of developmental mathematics students attempting college-level mathematics passed with a grade of “C” or better as compared with 89.0% of nondevelopmental students. Developmental education courses provided a majority of at-risk students with sufficient remediation necessary to be successful at college-level mathematics, albeit not quite at the same grade level as nondevelopmental mathematics students.

The results of the GPA analysis of college-level English composition is not as clear as the results of the GPA analysis for college-level mathematics. For each individual cohort period except one, the analysis found that no significant differences existed in the performance of nondevelopmental students taking college-level English composition and developmental students taking college-level English composition. The null hypothesis was rejected for one individual cohort year as well as for the combined period. Troublesome is the finding that when the cohorts were combined, there was a reported significant statistical difference in performance between nondevelopmental students and developmental students taking college-level English composition. This result occurred although four out of five cohort years reported no statistical differences in performance between the two student groups. Lack of statistical significance is supported by examining the

frequency of grades awarded over the combined five-cohort period. This frequency indicates that 80.1% of developmental writing students who attempted college-level English composition passed with a grade of “C” or better as compared with 83.6% of nondevelopmental students. The majority of developmental students completing college-level English composition appeared to perform as well as their nondevelopmental peers.

Graduation rates, cumulative college-level credit hours earned, and cumulative college-level GPAs earned were individually compared for college-prepared students requiring no developmental courses and developmental students completing all required developmental courses. With regard to graduation rates, for all cohort periods including the combined period, the null hypothesis was retained, and graduation rates did not appear to differ significantly between the two student groups.

The significance of difference between the two student groups relative to the number of cumulative college-level credit hours earned is inconclusive. For three of the five individual cohort periods, the analysis showed no significant differences in the number of cumulative college-level credit hours earned by the two student groups. The null hypothesis was, however, rejected for two individual cohort periods as well as the combined period. Based on the combined five-cohort period, college-prepared students earned on average 48.8 college-level hours as compared to 44.6 college-level hours for developmental students. Assuming that

the difference is significant, developmental students still made substantial progress in earning credits for college-level coursework.

College-prepared students not requiring any developmental education prerequisites earned higher average cumulative GPAs in college-level work than did their developmental peers. The null hypothesis was rejected for all but one of the cohort periods including the combined period. However, it should be noted that in every cohort period, the average cumulative college-level GPA earned by developmental students was greater than 2.0. A GPA of 2.0 was important in that such a GPA is necessary to remain in good standing for continued enrollment at WSCC. A 2.0 GPA is also required for WSCC graduation and for transfer to most senior-level colleges and universities.

The results of the hypothesis testing is outlined in the Appendix. The conclusions derived from these findings, as well as implications for practice and future research, are examined in the following chapter.

CHAPTER 5

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

Developmental education programs go by many names and take many forms, but the one common element shared by all of these unique and varied curriculums is the goal of preparing underprepared students for the rigors of college-level study. Researchers have identified numerous attributes associated with effective developmental education programs. However, no clear consensus has emerged relating to the state of developmental education in America today. Perhaps, because of the uniqueness of developmental education efforts across the country, agreement with the degree of success of developmental education has achieved will never be forthcoming. However, research directed at a specific college's or university's developmental education efforts can help practitioners better understand their programs and improve the chances for academic success of at-risk students.

Walters State Community College (WSCC) has been providing developmental education under a formal policy requiring assessment and placement since mandated by the Tennessee Board of Regents (TBR) in 1985. The college designed a program to identify and prepare at-risk students to succeed at college-level studies. Only limited research has been undertaken to analyze the effectiveness of the program since its inception. Also, because of a serious

revenue shortfall in the state, TBR is having to cope with reduced budgets and increasing enrollments. These factors combined with a general lack of understanding by the legislature as to why developmental education is even needed at the collegiate level, have brought the future of developmental education into question. The ability to show that developmental education is adequately preparing at-risk students to meet their educational goals is likely to have impact on the future funding levels of this statewide program. The lack of research and the current budgetary and political climate in the state justify the need for this study.

This study used placement and enrollment data collected for five cohorts of first-time degree-seeking freshmen each tracked over a six-year period. Grades earned in mathematics by nondevelopmental students were compared to grades earned by developmental students who had completed all developmental mathematics prerequisites. Grades earned in English composition by nondevelopmental students were compared to grades earned by developmental students who had completed all developmental writing prerequisites. Also graduation rates, cumulative college-level hours earned, and cumulative college-level GPAs earned by college-prepared students without any developmental prerequisites and developmental students who had completed all developmental prerequisites were compared. The population contained 848 college-prepared students who did not require any developmental coursework, 798

nondevelopmental students who had attempted college-level mathematics, and 1,283 nondevelopmental students who had attempted college-level English composition. The population also included 2,406 students who had completed all developmental requirements, 2,317 students who had completed developmental mathematics requirements, and 2,319 students who had completed developmental writing requirements. Of the students who had completed developmental requirements, 1,479 had attempted college-level mathematics, and 1,574 had attempted college-level English composition. The study excluded cohort students who were placed into developmental coursework, but who had not completed the requirements prior to the end of their six-year cohort period.

As would be expected when reviewing the professional literature of localized research directed at many different developmental education programs, no consensus pertaining to performance differences between nondevelopmental and developmental students has emerged. The findings of this study revealed that students entering WSCC without the need of any form of remediation in mathematics performed significantly better than did students who had completed developmental mathematics prerequisites. These results are consistent with the work of Lyons (1990). However, as can be determined by examining the frequency of grades awarded over the combined five-cohort period, 82.3% of developmental mathematics students who had attempted college-level mathematics passed with a grade of “C” or better. On a national scale, Boylan and

Bonham (1992) found similar evidence that a large percentage of developmental mathematics students who had passed their developmental courses in mathematics also passed college-level mathematics with a grade of “C” or better.

This study found that on a cohort-by-cohort basis, no significant differences existed in the performance of nondevelopmental students who had completed college-level English composition and developmental students who had completed college-level English composition. These findings were consistent with the work of Hopper et al. (1997) who found that there were no significant differences in the successful completion of college-level English composition between the two student groups at WSCC. The findings were also consistent with a study by Haeuser (1993) who found that the success rates for students who had completed developmental courses, although lower, were not significantly different from students who were exempt from remediation. Other studies consistent with the finding that students who had completed remediation efforts performed as well as students who were exempt from remediation include Brien et al. (1998), Klicka (1998), Levine (1990), Miller (1980), Rester (1996), and Rosella (1975).

The professional literature is inconclusive with regard to the likelihood that developmental students would graduate at the same rate as college-prepared students. This study found that graduation rates between the two groups were not significantly different. This result parallels a study by Sternglass (2000) who found that graduation rates of students who took developmental writing did not

differ from students who were considered college-prepared. The study by Boylan and Bonham (1992) indicated that on a national scale 24% enrolled at community colleges would eventually graduate. This study found that over the combined five-cohort period 34.3% of college-prepared students graduated from WSCC compared to 30.7% of students who required developmental courses. Compared to the national study, graduation rates of all WSCC students were impressive.

The findings of this study with regard to persistence as measured by cumulative college-level credit hours earned, revealed mixed results similar to results reported in the professional literature. For three of the five individual cohort periods, the analysis found no significant differences in the number of cumulative college-level credit hours earned by the two student groups. The null hypothesis was, however, rejected for two individual cohort periods as well as the combined period. Weissman et al. (1997) and Grossett (1989) both found that students who took remedial courses had persisted for the same number of credit hours as did students who entered prepared for college. However, studies by Pierson and Huba (1997), Hoyt (1999), and Lyons (1990) concluded that high remediation rates were negatively correlated with student persistence.

This study found that cumulative college-level GPAs for college-prepared students who did not need any developmental courses were significantly higher than for developmental students. In their national study, Boylan and Bonham (1992) observed that at most institutions, the first-term and cumulative GPAs of

developmental students were lower than the average GPAs for those institutions as a whole. However, these researchers also found as did this study that GPAs for students who had completed developmental education were consistently above 2.0, the minimum for graduation. Other studies that reported similar findings include Weismann et al. (1997), Maryland State Higher Education Commission (1996), and The 1985 New Jersey Basic Skills Council Report (Basic Skills Council in Morante, 1986). But again, the professional literature is inconclusive. Studies by Castator and Tollefson (1996), Cunningham (1995), Maring, Shea, and Warner (1987), Pierson and Huba (1997), Schoenecker et al. (1996), and Thornley and Clark (1998) concluded that GPAs of developmental course completers were not significantly different from those of college-prepared students.

Conclusions

The conclusions that were drawn from this study are outlined below:

1. Developmental mathematics students earned GPAs in college-level mathematics that were significantly lower than their college-prepared peers. However, more than 82% of students deemed deficient in mathematics upon enrollment earned grades of “C” or better in college-level mathematics. Developmental mathematics at WSCC had adequately prepared a majority of at-risk students for college-level coursework.

2. Developmental writing students earned GPAs in college-level English composition that were not significantly different from their college-prepared peers. Also, more than 80% of students deemed deficient in writing upon enrollment earned grades of “C” or better in college-level English composition. Developmental writing at WSCC had indeed adequately prepared the majority of at-risk students for college-level coursework.
3. Developmental students graduated at rates that were not significantly different from graduation rates of college-prepared students. Developmental education at WSCC was successful in providing at-risk students the necessary skills needed to complete college-level requirements and earn degrees.
4. The comparison of average cumulative college-level credit hours earned by the two student groups was inconclusive. Assuming, however, that the differences were significant, developmental students still made substantial progress in earning credits for college-level coursework.
5. College-prepared students earned cumulative college-level GPAs that were significantly higher than their developmental peers. However, it should be noted that in every cohort period, the average cumulative college-level GPA earned by developmental students

was greater than 2.0. A GPA of 2.0 was important in that such a GPA is necessary to remain in good standing for continued enrollment at WSCC. A 2.0 GPA is also required for WSCC graduation and for transfer to most senior-level colleges and universities. A plausible inference is that participating in developmental education at WSCC adequately prepared students to earn GPAs necessary for the continuation of college-level work.

6. Although significant statistical differences were found for some measured performance variables between nondevelopmental and developmental students at WSCC, the differences were not so large as to dilute the benefits afforded society through the educational accomplishments of students less likely to succeed at higher education.

Recommendations

For Practice

Developmental education at WSCC is an integral part of the college's academic program. The need for developmental education in upper East Tennessee is great, and WSCC recognizes its role as the primary provider of developmental programs for college-bound students in its 10-county service area. This study established that developmental students, although they may not have performed quite as well as their college-prepared peers, achieved many

educational goals that they might not otherwise have achieved had they not completed developmental coursework. The challenge for the future is to maintain and improve, where possible, the level of performance achieved by the WSCC developmental education program.

One localized improvement that could possibly improve GPAs earned in college-level mathematics by developmental students is to implement a specialized tutoring program. This tutoring program would be designed for students completing developmental education in mathematics to assist them with their specialized needs in mathematics. Such a tutoring program would be more intensive than the traditional tutoring program directed at college-prepared students.

With regard to maintaining the quality of developmental education at WSCC, the administration should provide more professional development opportunities for full-time and part-time developmental education faculty. Faculty and administrators should learn how to collaborate and why collaboration is valuable and necessary for the future of the field.

One of the most challenging aspects of developmental education in Tennessee today is the product of the state's budgetary woes. Developmental education is under fire, especially at universities. Practitioners at other state colleges and universities should undertake unbiased research directed at establishing the level of overall effectiveness of developmental education across

the state. The results of other studies would be useful in evaluating instructional methods for improvements designed to enhance students' chances for academic success. Continual improvement in student success rates could help to reduce political opposition to college remediation programs in Tennessee. Reduced political pressure directed at higher education could help to improve the budgetary outlook for higher education in the state. Improved legislative appropriations could further increase the ability of the state's higher education system to provide needed opportunities to academically underprepared students.

For Future Research

The findings of this study are considered to be benchmark findings. For this study to be useful for future decision making, it must be compared with results of future studies designed to measure performance and effectiveness. Therefore, it is recommended that the analysis conducted on student cohorts be continued and updated annually.

Additional research studies need to be designed to answer questions beyond the scope of this study. This would include but is not limited to the following:

1. Research designed to explore the relationship between success in college-level coursework and the policy of allowing students to enroll in college-level coursework (other than mathematics and English composition) while pursuing developmental requirements.

2. Research designed to investigate the relationship between the structure of the developmental education program and the successful completion of the program.
3. Research designed to investigate the relationship between the initial level of deficiency and the success potential of developmental students.
4. Research designed to uncover factors that lead to placement into developmental coursework.
5. Research designed to investigate the relationship between the sources of developmental students entering WSCC and their subsequent performance in developmental education and college-level coursework.
6. Research designed to ascertain as to the extent other variables such as age, concurrent employment, financial ability, transportation, marital status, and child care impact the success of developmental education students.

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APPENDIX

SUMMARY OF HYPOTHESIS TESTING

Hypothesis	Table	Cohort	Results
Hypothesis 1: There is no difference between developmental mathematics students and nondevelopmental mathematics students in the grades they earned in their first college-level mathematics course.	Table 3	1991	Hypothesis rejected
	Table 3	1992	Hypothesis rejected
	Table 3	1993	Hypothesis rejected
	Table 3	1994	Hypothesis rejected
	Table 3	1995	Hypothesis rejected
	Table 3	Combined	Hypothesis rejected
	Hypothesis 2: There is no difference between developmental writing students and nondevelopmental writing students in the grades they earned in their first college-level English composition course.	Table 5	1991
Table 5		1992	Hypothesis retained
Table 5		1993	Hypothesis retained
Table 5		1994	Hypothesis rejected
Table 5		1995	Hypothesis retained
Table 5		Combined	Hypothesis rejected

Hypothesis	Table	Cohort	Results
Hypothesis 3: There is no difference in graduation rates between developmental students and nondevelopmental students.	Table 7	1991	Hypothesis retained
	Table 7	1992	Hypothesis retained
	Table 7	1993	Hypothesis retained
	Table 7	1994	Hypothesis retained
	Table 7	1995	Hypothesis retained
	Table 7	Combined	Hypothesis retained
Hypothesis 4: There is no difference between the number of college-level credit hours earned by developmental students and the number of college-level credit hours earned by nondevelopmental students.	Table 8	1991	Hypothesis retained
	Table 8	1992	Hypothesis rejected
	Table 8	1993	Hypothesis rejected
	Table 8	1994	Hypothesis retained
	Table 8	1995	Hypothesis retained
	Table 8	Combined	Hypothesis rejected

Hypothesis	Table	Cohort	Results
Hypothesis 5: There is no difference between developmental students and nondevelopmental students in the cumulative college-level GPAs they earned.	Table 9	1991	Hypothesis retained
	Table 9	1992	Hypothesis rejected
	Table 9	1993	Hypothesis rejected
	Table 9	1994	Hypothesis rejected
	Table 9	1995	Hypothesis rejected
	Table 9	Combined	Hypothesis rejected

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