

4-27-1995

# Remedial post-secondary education and subsequent college-level performance: a comparative study

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**REMEDIAL POST-SECONDARY EDUCATION AND  
SUBSEQUENT COLLEGE-LEVEL PERFORMANCE:  
A COMPARATIVE STUDY**

by  
Kelly Rapatski

**A THESIS**

**Submitted in partial fulfillment of the requirements  
of the Master of Arts Degree in the Graduate Division  
of Rowan College  
May 2, 1995**

Approved by

Professor

Date Approved 4/27/95

## ABSTRACT

Kelly Rapatski

Remedial Post-Secondary Education and Subsequent College-Level Performance:  
A Comparative Study

May 2, 1995

Master of Arts Degree in the Graduate Division of Rowan College

The purpose of this study was to examine the relationship between remedial instruction in a mathematics course, Basic Algebra, offered at Rowan College, and subsequent performance in a first college-level math course. The subjects utilized in the study consisted of remedial attendees or students who completed the course, test-outs, or students who were placed into the course but tested out of it, and non-remedial students, or those who never needed the course.

Mean grades for each of the three groups were then computed. A chi-square analysis indicated no significant difference between the three groups.

Based on the findings, the decision was made to retain the null for hypothesis I, which stated there would be no significant difference between the attendees and the test-outs. The null was rejected for hypothesis II and the alternate hypothesis, which stated there would be no significant difference between the remedial attendees and the non-remedial students, was retained.

## **MINI-ABSTRACT**

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**Remedial Post-Secondary Education and Subsequent College-Level Performance:  
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May 2, 1995

Master of Arts in the Graduate Division of Rowan College

The purpose of this study was to examine the relationship between remedial instruction in Basic Algebra, a course offered at Rowan College of New Jersey, and subsequent performance in first college-level math course. The three groups utilized in the study were remedial attendees, remedial test-outs, and non-remedial students. The grades achieved in first math course, which were used as the measure of performance, were collected, and a mean was calculated for each group. A chi-square analysis found no significant difference between the three groups.

## TABLE OF CONTENTS

<b>Chapter One – The Problem</b> .....	1
Need.....	1
Purpose .....	4
Hypotheses.....	5
Historical Overview.....	5
Theory.....	6
Definitions.....	7
Assumptions.....	9
Limitations .....	9
Overview.....	9
<b>Chapter Two – Review of Literature</b> .....	10
Introductions .....	10
Basic Skills in College: The Debate.....	10
Student Performance/Program Results .....	14
Effects of Remedial Education .....	16
Summary.....	17
<b>Chapter Three – Design of the Study</b> .....	19
Introduction.....	19
Design .....	20
Procedures.....	21
Testable Hypotheses.....	22
Analysis and Summary.....	23
<b>Chapter Four – Analysis of Data</b> .....	24
Introduction.....	24
Interpretation of Results .....	25
Summary.....	25
Graph I.....	27
Graph II.....	28
<b>Chapter Five – Summary and Conclusions</b> .....	29
Summary.....	29
Conclusions.....	30
Discussion .....	30
Implications for Future Research.....	32
<b>References</b> .....	33

## **ACKNOWLEDGEMENTS**

I would like to thank Betsy Collins and everyone else in the Testing/Basic Skills Office for all of their time and help. I would also like to thank my parents for their continued help and support.

## CHAPTER ONE

### The Problem

#### Need

A substantial number of entering college freshmen are considered in need of remediation in at least one of the three basic areas of reading, writing, and math. Need of remediation is identified through scores obtained on college placement exams, such as the NJCBSPT (New Jersey College Basic Skills Placement Test). Failure to meet the minimum required score in any given section, will result in placement into a remedial or basic skills course in that subject/area. Research conducted six years ago found that approximately one-third of all entering freshmen required remediation in at least one of these areas (Mickler, Chapel, 1989). Figures from the Institutional Report On Remedial Program Effectiveness for Rowan College (1990-1992), likewise, illustrate the substantial percentages of freshman identified as in need of remediation. Of the Fall 1990 cohort, the percentages of full-time students requiring remediation were as follows: 26% in reading, 26% in writing, 16% in computation, and 39% in elementary algebra.

The purpose of remedial courses/programs is to strengthen the student's skills in his or her area of deficiency. Successful completion of the basic skills courses is presumed to bring the student up to the college level in the given area. Completion is usually dependent on both completion of required assignments and a passing score on a post-test given at the end of the course.

Some oppose the idea of remedial programs in an institution of higher education. It is argued that individuals who can not achieve acceptable scores on college placement

tests should not be admitted to college in the first place. Others argue that without remedial programs, which allows skill deficient students into the college, with the condition that they successfully complete the related basic skills course, many individuals would not be given the opportunity to pursue a college education. Emphasized in particular, are students from lower socio-economic backgrounds, and non-traditional students.

Students from the lower socio-economic class are less likely to receive the strong college preparatory curriculum characteristic of schools in higher socio-economic settings. Thus, students from lower classes may have never been taught many of the skills needed to enter college. This is not to say that these individuals are not capable of learning the skills, only that they may never have been exposed to them. For many individuals from lower social classes, college offers a way for them to break out of their economic suppression, and to also become successful, productive members of society.

Older students who return to school after being out for several years, are labeled non-traditional students. Because of their prolonged absence from the instructional setting of the classroom, they are likely to have forgotten many of the skills necessary to succeed in college. Therefore, many of these individuals will be identified, through their placement test scores, as in need of remediation.

If post-secondary remedial programs did not exist, many individuals would not be afforded the opportunity to further their education and reap the benefits of a college degree, such as greater employment opportunity and job security. The remedial programs

are, therefore, designed not only to increase students' likelihood of academic success by reducing the risk of failure, but their subsequent professional success as well.

Regardless of one's opinions concerning remedial education, a large majority of colleges and universities offer some type of remedial/developmental education. A study conducted in 1985 by Lederman and her associates found that over 60% of four-year and 80% of two year colleges in the United States offered remedial courses. The demand for remedial courses seems to be increasing, despite many states efforts to end them. According to an official at the Community College of Philadelphia, an increasing number of applicants are so underprepared that one must wonder how they got through high school (Jacobson, 1993).

The fact that, nationwide, a great percentage of colleges offer these programs suggests strong need for them. Colleges that are admitting students with deficiencies in one or more of the identified three basic skill areas must provide a means of assistance and support for those students. Only by offering assistance in preparing students for college-level courses can the institution increase the underprepared student's likelihood for success. Indeed, "The school that accept a student for admission is morally obligated to develop instructional methods that will offer the student those skills he or she will need to be successful academically." (Mickler, Chapel, 1989, 3).

## Purpose

Given the amount of colleges offering these remedial programs, along with the high percentages of entering freshman meeting the criteria for placement into at least one of the areas of reading, writing, and math, an effective, successful program is essential. Thus, remedial programs must be subjected to continuous evaluation to ensure that they are adequately meeting the needs of students. In particular, success rates and subsequent effects of the remedial programs should be examined. How do students fare in these remedial courses? What effects will successful completion have? Will students attain higher grades in college-level area related subjects? Will the remedial courses cure students' deficiencies, or bring them up to the college level in the given areas? Will they have skill-levels comparable with students never requiring remediation, after completion of the courses? By addressing some of these questions, one can at least partially examine some of the effects of remedial programs.

The current study will address some of these questions, focusing on the subject area of math. Thus, the purpose of this study is to examine some effects of one remedial math program. The study will focus on a remedial basic algebra course at Rowan College. This will be done through comparisons of the remedial math students and their non-remedial peers, with respect to performance in first attempted college-level math course. Comparisons will also be made among the remedial math students and their remedial test-out, or exempted peers. The remedial test-out peers are students who originally had identified as in need of remediation and placed into the remedial basic algebra course, but prior to the start of their freshman year, took a challenge test and because they achieved

acceptable test scores, were exempted from taking the course. It must be noted that when students pick up the forms necessary to sign up for a challenge test, they are also given a review packet with the types of algebraic problems students must be able to solve in order to pass the challenge test. By comparing individuals who successfully complete the basic skills math with those who never required it, and with those who “tested out”, one can examine whether or not their skills will be relatively equivalent. As mentioned, grades, as well as pass/fail rates in a college-level math course will serve as the source of comparison.

### **Hypotheses**

- I. Of students with comparable math scores on the NJCBSPT, all of whom were originally placed in basic skills math (algebra), those who successfully complete and pass the course will go on to achieve higher grades in their first college-level math course, compared with those who “test out” of the course.
- II. Students who are identified as in need of remediation in the area of math and successfully complete the basic skills math course will have comparable pass/fail rates as their non-remedial peers.

### **Historical Overview**

The admittance of underprepared students into American Colleges is not a new or recent practice. Even back in the 1800s, colleges and universities admitted students considered to be below college-level standards (Brier, 1984). Especially in the United

States, where equal opportunity and chance for self-improvement and advancement through education are continually stressed, it is easy to see why this practice occurs today.

Several other reasons also accounted for the admittance of underprepared students. One of these reasons was the strong need for enrollment. Obviously, much of the money needed to keep colleges and universities in operation comes from enrollment or tuition fees. Thus, faced with both the need for enrollment and an abundance of underprepared applicants, many schools began admitting these students (Brier, 1984). Because of the practice of admitting underprepared students, programs designed to remediate these students were needed. Consequently, this led to the establishment of college remedial programs throughout the country.

### **Theory**

There is a concept of math phobia, or the fear of math that seems to be prevalent in literature on mathematics education. It has been found that developmental or remedial math students often hold negative attitudes about math and about themselves in relation to math (Gourgey, 1992). Fear of mathematics is thought to stem from negative views toward the subject as well as the individual's ability.

Mathematics, unlike reading or writing, is an abstract subject. Perhaps this is another reason why students often find it difficult, and, thus, tend to shy away from the subject. A self-defeating manner in which the student persists in the assumption that he or she is no good in math, only serves to foster negative attitudes concerning math. In addition, "Students' expectation that mathematical problems are solved quickly, leads

them to give up if they don't see a solution right away." (Gourgey, 1992, 10).

Mathematics is a subject requiring a great deal of practice, time, and effort, often greater than students are willing to give (Trillin, 1980).

Besides being abstract, mathematics is also of a cumulative nature. This means that each level or branch builds on another one. Thus, the student who has not mastered algebra can not learn advanced algebra, trigonometry, or higher branches of mathematics. (Trillin, 1980).

### **Definitions**

1. **NJCSPT** (New Jersey College Basic Skills Placement Test)- a test taken by all incoming freshmen to determine if the student is in need of remediation in any or all of the three areas of reading, writing, and math. Failure to achieve the minimum acceptable score, or cut-off score in any given area will result in placement into the remedial or basic skills course in that subject.
2. **remedial**- below the college-level standard. A remedial student is one who requires a remediation and/or review of skills to be brought up to the college level in the area of deficiency.
3. **developmental**- used interchangeably with both remedial and basic skills to have the same meaning.

4. Basic Algebra- an intermediate remedial, full semester math course, usually taken by freshmen during the first year of college.

5. non-remedial students- students who, because they achieved acceptable scores on a given section of the NJCBSPT, were never placed in remedial courses, nor were ever identified as in need of remediation.

6. test-out students- also referred to as exempted students, these are students who, because of failure to meet minimum required scores on a given section of the NJCBSPT, were originally placed into the corresponding basic skills or remedial course, but who achieved an acceptable score on a re-test, the challenge test and "tested-out".

7. remedial attendee students- students who are both originally identified as in need of remediation and successfully complete the remedial course.

8. challenge test- a re-test offered to freshmen, in the area they have been identified as needing remediation in, where a successful score will excuse them from having to take the course.

### **Assumptions**

1. Students placed into remedial or basic skills algebra courses will cover the same material, whether fulfilling the requirement through regular classes or through tutoring sessions, (an option of the student).
2. All instructors of the remedial math will generally follow the same guidelines, curriculum, and will have comparably effective teaching methods.
3. Scores on the NJCBSPT accurately measure the need for remediation in all three subjects of reading, writing, and math.

### **Limitations**

The sample size will be limited, with each of the three groups utilized in the study consisting of 33 students.

### **Overview**

Chapter Two will include a review of literature pertaining to college basic skills/remedial programs. Chapter Three will consist of the design of the study: sample, measures, and procedure. Chapter Four will include an analysis of the data, and Chapter Five will consist of a summary, conclusions, and implications for further research.

## **CHAPTER TWO**

### **Review Of Literature**

#### **Introduction**

The review of literature on college basic skills/remedial programs yielded research on various aspects of the programs. These include student performance and success rates, and the effects of remedial education. Also prevalent in much of the literature is the controversy surrounding the presence of remedial instruction among colleges, institutions of higher learning. This controversy will be addressed first.

#### **Basic Skills in College: The Debate**

Just as the admittance of underprepared students to college is not a new or recent phenomenon, neither is the controversy pertaining to this practice. As far back as 1828, a publication in the Yale Report demanded an end to this practice (Brier, 1984). This view, which has survived through over a century of time, is still held by many today.

Understandably, this view will also extend to include remedial programs, which have been designed to help these underprepared students achieve academic success. Those who oppose the practice of admitting these students, for instance, argue that developmental or basic skills programs should not be part of a college curriculum because if a student is underprepared, he or she does not belong in college. As an educational leader asserts, "We should be spending our time and money on educating those people who have already demonstrated the ability to learn." (Mickler, Chapel, 1989, 3). Nationally, with

approximately 90% of two-year and 64% of four-year colleges offering remedial courses, institutions of higher learning are spending millions of dollars each year just to bring students up to college speed (Lively, 1993). Many feel that valuable time, money, and effort is going to waste, through the existence of remedial programs. They question the value of remediation and believe that the decision of whether or not to take remedial courses, should remain at the discretion of the student (Rounds, Andersen, 1985). Because remedial courses are costly and time consuming to the student as well as to the institution, students with low test scores should be advised, but not required to take remedial classes.

The questionable value of remedial education to many individuals can, in part, be attributed to studies failing to provide solid evidence of improved performance for students in remedial or developmental studies programs. One such study, conducted by Peterson (1989), compared the achievement of three groups of remedial seventh grade math students. One group spent the entire year reviewing and studying skills which had been previously taught but not yet mastered. This group worked on concepts and skills up to the sixth grade level. Another group used a seventh grade test, but were taught the material at a slower pace than average students. The third group spent the year in a pre-algebra class designed for accelerated students. Unlike the other two groups, students in this group were not grouped according to ability, nor were identified as remedial students, except in the school records. Results of the study revealed that students in the ungrouped program designed for accelerated students, showed significantly more improvement in skill areas, than the students in the other two groups. Furthermore, while almost 20% of the

students in the third group qualified as either average or accelerated in the area of mathematics by the end of the year, none of the students in the other two groups were able to advance to a higher category.

Critics of remedial college programs, such as Wambach and Brothen (1990) further assert that current placement practices are faulty because they do not distinguish between low-achieving students with different needs. The programs tend to place individuals with different needs all under the label of underprepared and, thus, attempt to aid students in the same manner. In reality, however, there are three types or categories of students: those who seem unqualified based on unsatisfactory test scores, but actually do have the ability to succeed, those who are truly unqualified or underprepared but who can, through remediation, become prepared, and those who are unqualified but cannot be made qualified or prepared, regardless of remedial instruction.

These same researchers also criticize the practice of using college grades as a measure of skill level, often for the purposes of illustrating the academic successfulness of students who have completed their required remedial courses. It is argued that "The lack of a strong relationship between skills tests and grades calls into question the assumption that basic skill levels can be validly measured." (Wambach, Brothen, 1990, 15).

While critics of remedial education in college do recognize the abundance of underprepared incoming freshmen each year and a strong need for a solution to this problem, they do not feel that responsibility falls on the colleges. Instead they call for drastic reforms in high school curriculums, calling for more stringent and demanding high

school curriculums. Considering that developmental or remedial courses are offered at colleges, institutions of higher learning, the phrase "college basic skills", to these individuals, seems to be an oxymoron.

Not all individuals view college basic skills in a negative light. On the other side of the debate are the proponents of these remedial programs. They argue with the contention that these programs are unproductive, asserting that for students who complete these programs, many prove to be academically successful. In addition, "...when a potentially successful individual is denied admission, detrimental effects may result from deprivation of both the college experience and subsequent economic benefits." (Ervin, et. al., 1984, 319). For many individuals, these programs offer an opportunity to attain a college education and, consequently, become more productive members of society. Emphasized, in particular, are individuals from lower socio-economic groups who are less likely to have received an adequate education, and non-traditional students, who return to school after several years and, therefore, are likely to have forgotten skills and knowledge previously learned (Mickler, Chapel, 1989). For these two groups of students, many of whom will be identified, through low NJCBSPT scores, as underprepared, a means of remediation and preparation is needed so that their opportunity to attain a college education will not be hampered. As evidenced in the large number of college freshmen identified as in need of remediation, the two previously mentioned groups are not the only ones who benefit from the existence of such programs. By offering remedial programs, many sectors of the population are provided the opportunity to pursue a college education/degree.

Those in support with college remedial programs also counteract the assertion that they are forms of academic dissolution by offering the fact that students are usually not given college credit for basic skills courses (Brier, 1984). In addition, students are usually required to complete these courses before admission into subject and content related college-level courses. Thus, these programs are viewed as a form of the much needed remediation required to bring many students up to the college-level and, ultimately, increase their chances for academic success.

In an attempt to resolve the long-standing debate concerning developmental instruction at the college level, several remedial programs at various colleges and universities throughout the United States have been subjected to study and review. Specifically, such things as student performance, program outcomes, and overall effects of remedial education have been examined.

### **Student Performance/Program Results**

According to Lederman and her associates (1985), a substantial percentage of incoming college freshmen are identified as in need of remediation in at least one of the basic areas of reading, writing, and math. With so many students being placed into developmental instruction courses, it is important to know how students typically fare in these courses. Whether or not the student successfully completes the basic skills course, for instance, is the most direct measure of whether or not that student benefited from the instruction, and consequently, whether or not he or she can be deemed as "remediated".

One study, for instance, found that of students entering New Jersey state schools in the fall of 1982, 75% of students from four-year and 55% of students from two-year colleges, had successfully completed their developmental courses within two academic years (Morante, 1986). A more recent study, although only conducted at one of the state schools, Rowan College, yielded percentage rates comparable to that of four-year institutions. According to information compiled into the Institutional Report on Remedial Program Effectiveness, the percentage rates of full-time students successfully completing their remedial courses within two academic years were as follows: 81% in reading, 72% in writing, and 74% in elementary algebra.

Another study on post-secondary remediation compared the pre-test and post-test scores of students enrolled in a basic skills program, to serve as a means of evaluating the program's effectiveness. Results of the study found that for students who took developmental mathematics between 1981 and 1984, the mean pre-test score of 10.09, rose to a mean post-test score of 26.67. In addition, over 74% of the entire population enrolled in the program successfully completed their remedial/developmental courses during this time frame (Wepner, 1987). Thus, insofar as the pre- and post-test scores are concerned, the program had positive effects. In general, similar evaluations of student performance as well as overall evaluations of various remedial programs consistently indicate the positive effects of these programs.

### Effects of Remedial Education

In studying specific effects of remedial education or instruction, some questions likely to be asked are: Will the courses "cure" the students' deficiencies? Will remedial students have skill levels comparable with their non-remedial counterparts, after completion? Will students attain satisfactory grades in college-level courses related to their area of deficiency, after remediation? Will they attain higher grades as a result of the program?

In an attempt to answer some of these questions, one study by Napoli and Hiltner (1993), utilized students who were all originally identified as in need of remediation. Some of these students, for various reasons such as enrolling part-time, entering as non-matriculating students, or bypassing the advisement process, never enrolled in the developmental course. Mean GPAs, among courses related to the area of remediation, were calculated and compared. Students who did not receive developmental instruction had a mean, adjusted GPA of 2.17, compared to a significantly higher mean, adjusted GPA of 2.49, for the students who successfully completed the program. Even more interesting is the fact that the remedial students had a GPA that was higher than that of their non-remedial counterparts. Non-remedial students, never having been identified as in need of remediation, had a mean, adjusted GPA of 2.43. The results of this particular study support the contention that college-level remedial instruction brings the student up to the college speed and further illustrates the positive effects of developmental instruction. Likewise, Morante (1986), in a two-year follow-up report on the impacts of remedial/developmental programs, stated that these programs continually have shown

positive effects, with students who successfully complete remediation typically having slightly higher retention rates and GPAs than their non-remedial counterparts, and considerably higher than the remedial students who did not complete their developmental courses.

Similar results come from another study by Wepner (1987), in which final grades earned by remedial students (after completion of remediation) in a college algebra course were compared to the grades earned by their non-remedial counterparts. Results of the study showed that 81% of the former remedial students, compared with 80% of the non-remedial students, passed the course. This clearly implies that the remedial program had a positive and beneficial effect on the students. Although less equivalent, the percentages listed in the Institutional Report on Remedial Program Effectiveness (1990-1992), for Rowan College, are reasonably comparable. Of students who entered the college in the Fall of 1990, 97% of non-remedial students, compared with 88% of the former remedial students, achieved a passing grade in their first college-level math course.

The previously mentioned studies clearly illustrate the positive effects of some remedial programs. These programs offer underprepared students equal opportunity for academic success, by improving their skills and increasing their ability.

### Summary

The review of literature revealed a major controversy pertaining to post-secondary remedial education. Nonetheless, the majority of the studies tend to illustrate positive consequences and effects of remedial/developmental programs. Student test scores,

grades, retention rates, and GPAs have consistently shown to be higher, at the college level, for those who have successfully completed remediation. In some instances, these measures have even shown to be higher for the developmental student than for their non-developmental/remedial counterparts. The importance and benefits of remedial post-secondary education is strongly implied through the results of various studies.

## **CHAPTER THREE**

### **Design of the Study**

#### **Introduction**

The purpose of this study was to examine the relationship between successful completion of college basic skills mathematics and performance in subsequent college-level mathematics courses. This was accomplished by comparing remedial students who successfully completed basic skills algebra, with remedial students who were exempted from taking the course due to the attainment of an acceptable score on a retest offered to all remedial students the summer prior to their enrollment, with respect to grades in first college-level math course. In addition, non-remedial students, those never having been identified as in need of remediation, were compared with those students who successfully completed remediation, based on whether they passed or failed their first college-level math course.

#### **Sample**

The subjects utilized in the study consisted of Rowan College students who entered as Freshmen in the fall semesters of 1991 and 1992. The sample for Hypothesis I consisted of 66 students, 33 comprising the "exempted" group, those who tested out of the course prior to its commencement, and 33 comprising the remedial group, those who successfully completed the course. The sample for Hypothesis II also consisted of 66 students. One group consisted of the same 33 students who successfully completed

remediation, as used in the sample for Hypothesis 1, with the other group consisting of 33 students never having been identified as in need of remediation.

Students who are identified as in need of remediation are either placed into Basic Algebra or Developing Algebra. Basic Algebra is a full-semester course, while Developing Algebra is a half-semester course. Students are placed into the courses based on their scores on the math portion of the NJCBSPT, with higher scoring students being placed in Developing Algebra, which generally covers less material than the full-semester Basic Algebra course. For the sake of this study, the two groups of students originally identified as in need of remediation (both remedial attendees and test outs), were selected from those students whose scores on the NJCBSPT fell within the range designated for placement into the Basic Algebra course.

Due to the nature of this study, which involved the use of secondary records, no demographic information other than gender was available. However, given the general population of Rowan College Students, and the area surrounding the college, which is located in Glassboro, NJ, it is reasonable to conclude that the sample was reasonably heterogeneous, with respect to ethnic and socio-economic background.

### **Design**

The design of this study was correctional in nature. It encompassed the use of secondary records to assess the relationship between successful completion of a basic skills algebra course with subsequent success in college-level, credited mathematics courses. It also served to compare performance in the college-level math course between

remedial students and their remedial, exempted counterparts, and to compare remedial students (not including those exempted) with their non-remedial counterparts.

### **Procedures**

In order to gather the necessary data for the study, permission was secured from the director of Testing and Basic Skills, at Rowan College of New Jersey. This included access to master lists of incoming freshman for the falls of 1991 and 1992, which identified the original basic skills needs, if any, of all students, a file of answer keys of those students who tested out of basic skills (the exempted students), and access to student files.

Students in the exempted group were randomly selected from a file containing answer keys of students who had taken the challenge test the summer prior to their enrollment. Before randomly selecting the students to be used for the sample, the answer keys of students who did not pass the challenge test and, therefore, were not exempted or excused from taking Basic Algebra were extracted from the file. Students in the exempted group were excluded from the study if they had not yet taken and been given a grade for a college-level math course, or had transferred/dropped out prior to doing so.

Students in the remedial group were randomly selected from a list distinguishing those students in need of the basic skills from those not needing it. The record of each student was reviewed to be sure they had indeed taken and completed the Basic Algebra course. Subjects were excluded if they never completed the Basic Algebra course, either because they were among the “exempted” students, failed to enroll in the course, or

repeated the course once to several times before passing it. Students were also excluded if they had completed the basic skills course but had not yet taken a college-level math.

Students in the non-remedial group were randomly selected from the same list as the students in the remedial group. Subjects were excluded if they had not yet taken a college-level math course.

For all subjects in each of the three groups, it was noted whether they passed or failed their first college math course, and for each student, the final grade earned was recorded.

Grades achieved in first college-level math course served as the source of comparison for the groups in Hypothesis I (remedial attendees versus remedial test-outs). The groups utilized for Hypothesis II (remedial attendees versus non-remedial students) were compared on a pass/fail basis.

### Testable Hypotheses

There were two hypotheses to be tested in this study:

1. Of students originally identified as in need of remediation in basic skills algebra, those who successfully complete the course will subsequently attain higher grades in their first college-level math course than those who pass a challenge test exempting them from having to complete the basic skills algebra course and, therefore, receive no form of remediation.

2. Students who successfully complete the basic algebra course will have pass/fail rates which are similar to their non-remedial counterparts, in their first college-level math course.

Stated as null hypotheses, the two were as follows:

1. There will be no significant difference between the remedial attendee group and the remedial test-out group, with respect to performance in first college-level math course.
2. The remedial attendees and the non-remedial students will not perform similarly in first college-level math course.

### Analysis and Summary

The purpose of this study was to examine the relationship between successful completion of a basic skills math course offered at Rowan College, Basic Algebra, and subsequent success in college-level mathematics courses. For the sake of this study, success was measured by grades/determination of pass or fail in first completed college math course. The study used three groups in an attempt to make this comparison both thorough and meaningful.

This data will be presented and analyzed in Chapter Four using inferential statistics.

## CHAPTER FOUR

### Analysis of Data

#### Introduction

The purpose of this study was to examine the effectiveness of a basic skills algebra course at Rowan College, by examining the relationship between successful completion of the course and performance in subsequent college-level mathematics courses. Grades achieved in first attempted college-level math course for students in each of the three groups (remedial attendees, remedial test-outs, non-remedial) served as the measure of performance.

The total number of subjects utilized in this study was 99, 33 in each of the three groups previously mentioned. All of the subjects were Rowan College students who entered as incoming freshmen in the fall semesters of 1991 and 1992.

The grades for the remedial attendees were expected to be higher than those of the remedial test-outs or exempted students, for first college-level math course. It was also expected that the remedial attendees and the non-remedial students would have equivalent pass/fail rates, in first college-level math course.

A chi-square analysis yielded no significant difference between the three groups. The obtained  $\chi^2 = 3.87$ , was not significant at the .05 level. There is, however, a noticeable difference between the means of the three groups in relation to grades in the first college-level math course. The means were as follows: remedial attendees = 2.37, remedial test outs = 2.66, and non-remedial students = 2.55. Despite the lack of

significance pertaining to the results of this study, it is interesting to note that the remedial attendees not only had a higher mean for the grade attained in the first college-level math course, but also than the non-remedial students, those never having been identified as in need of remediation. (For additional information, including the frequency of grades achieved by each group, please refer to graphs I and II).

### **Interpretation of Results**

The purpose of this study was to compare the grades of remedial attendees and remedial test-outs, with respect to first college-level math course. It was expected that the grades of the remedial attendees would be significantly higher. A second purpose was to compare the grades of the remedial attendees to those of the non-remedial students in first college-level math course. It was expected that both groups would have equivalent pass/fail ratios. The first hypothesis was rejected. The null hypothesis, which stated that no difference would be found between the two groups, was retained. The second hypothesis, however, was accepted. It stated that the two groups (remedial attendees and non-remedials) would have equivalent pass/fail ratios or rates.

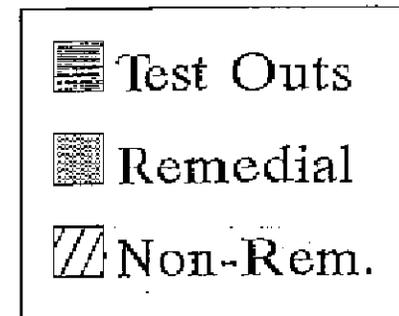
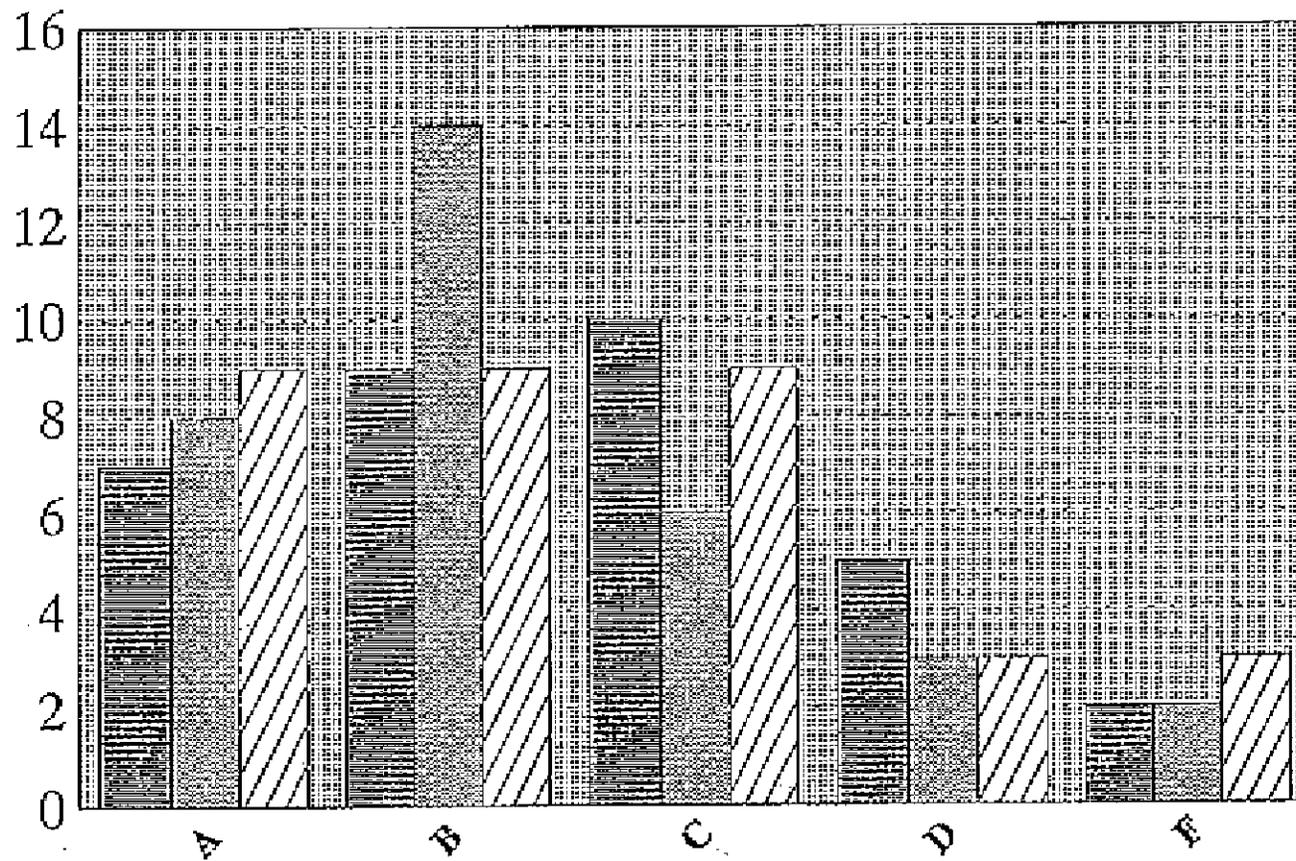
### **Summary**

Grades achieved in first college-level math course were expected to be significantly higher for remedial attendees than for the remedial test-outs. An analysis of the data, utilizing a chi-square analysis did not support this expectation. It was also expected that the pass/fail rates in the first college-level math course would be equivalent for the

remedial attendees and the non-remedial students. This expectation was supported through an analysis of the data. In summation, for the first hypothesis, the decision was to retain the null hypothesis, and for the second hypothesis, to reject the null and accept the alternate hypothesis.

# Grades-First College Level Math

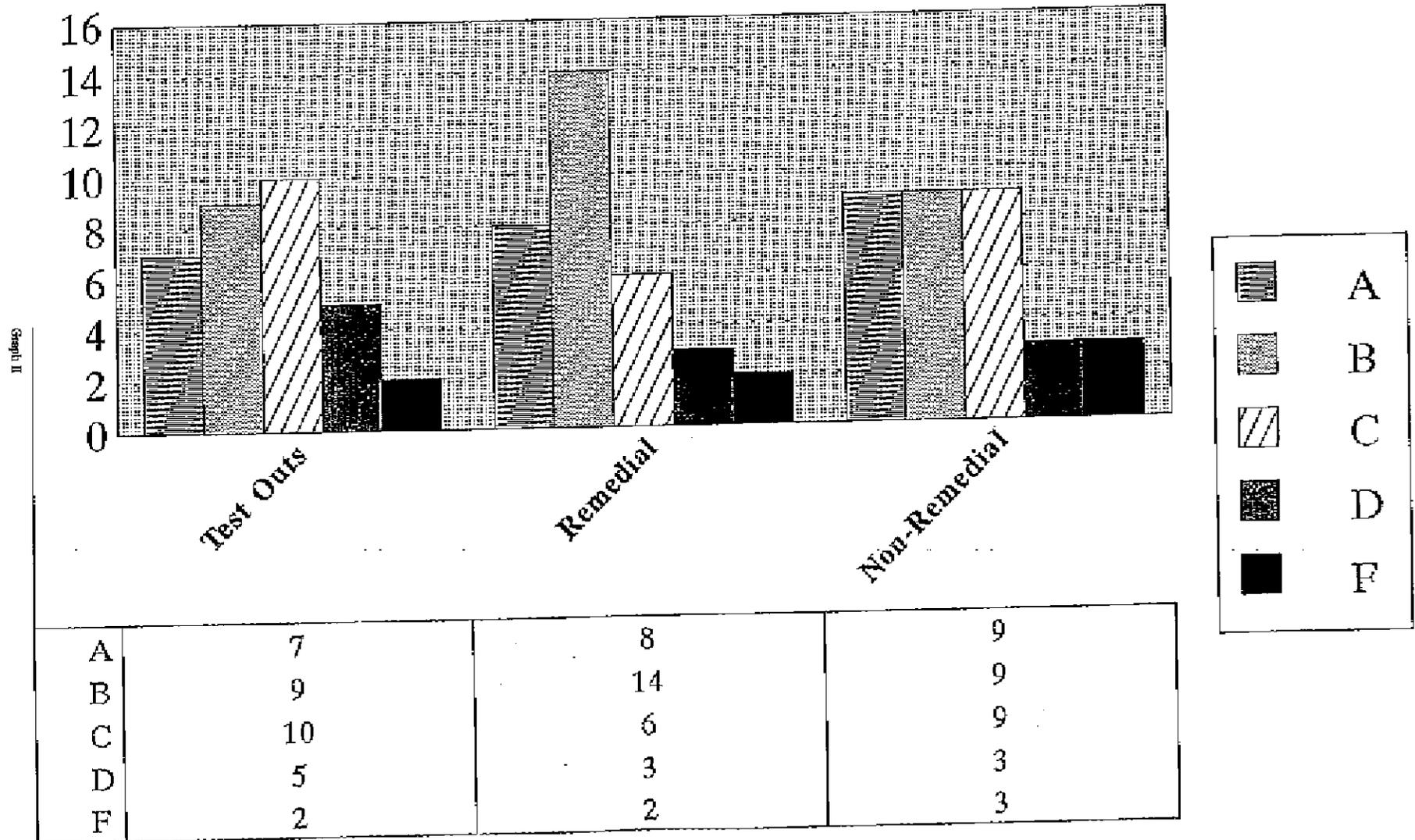
## Fall 1991 and 1992 Cohorts



Test Outs	7	9	10	5	2
Remedial	8	14	6	3	2
Non-Rem.	9	9	9	3	3

# Grades-First College Level Math

## Fall 1991 and 1992 Cohorts



## CHAPTER FIVE

### Summary and Conclusions

#### Summary

The purpose of this study was to examine the relationship between successful completion of a basic skills algebra course offered at Rowan College, Basic Algebra, and subsequent performance or success in college-level mathematics courses. Grades earned by students in first college-level math course served as the measure of performance. To achieve the purpose of the study, grades earned by three different groups of students were compared. These groups were remedial attendees, remedial test-outs, and non-remedial students. Remedial attendees are students who were identified as in need of remediation and successfully completed the remedial or basic skills course. Remedial test-outs are those students who were originally identified as in need of remediation but obtained a passing score on a challenge or retest, thus, exempting them from having to take the course.

The non-remedial students are those who were never originally identified as in need of remediation and, therefore, did not take the remedial course. A total of 99 subjects were utilized in the study, with 33 comprising each of the three groups. All of the subjects entered Rowan College of New Jersey, as entering freshmen, in the fall semesters of 1991 and 1992.

It was expected that remedial attendees would achieve higher grades in their first college-level math course than their remedial test-out peers. Although the mean grade for

attendees was higher than that of test-outs, a chi-square analysis found no significant difference between the two groups. It was also expected that remedial attendees would perform comparably to their non-remedial counterpart, with both groups having the same pass/fail rates. This was confirmed through a chi-square analysis, which indicated no significant difference between the two groups. Interestingly, though, the remedial attendees did have a mean grade that was higher than that of their non-remedial counterparts.

### **Conclusions**

Thus, the findings of the study were as follows:

1. Remedial students did not earn significantly higher grades than their remedial test-out counterparts.
2. Neither the grades nor the pass/fail rate of remedial attendees differed significantly from their non-remedial counterparts.
3. The grades earned did not differ significantly among the three groups.

### **Discussion**

Although an analysis of the data found no significant difference between the three groups, the remedial attendees did have the highest mean college-level math grade of 2.66, even higher than the non-remedial group, with a mean of 2.55. The remedial test-outs had a mean grade of 2.37, the lowest of all three groups. In this respect, the results support the results of several studies, including some of those mentioned in the review of the

literature. The study conducted by Napoli and his associates, for instance, found that remedial attendees had a GPA of 2.49, compared with 2.43 for non-remedial students, and 2.17 for test-outs. Like that study, the current study found the remedial attendee group to attain the highest mean grade. Thus, insofar as the means for each group in the current study are concerned, the attendees performed the best. In addition, the information presented on Graphs I and II illustrates some important features. It is easy to recognize, for instance, that the remedial attendees had the greatest number of As and Bs combined, in their first college-level math course, while test-outs had the greatest number of Cs and Ds combined. Regardless, due to the lack of statistical significance, the final decision was to retain the null for the first hypothesis, which stated that there would be no significant difference between the remedial attendee group and the remedial test-out group. Thus, in another respect, the lack of a significant difference between these two groups is in contrast to the findings of the study by Napoli and his associates as well as many other of the previously cited studies.

Perhaps one main reason for the lack of significant findings is the relatively small sample sized utilized in the study, with each of the three groups comprised of only 33 subjects. Other possible extraneous variables could include the use of outside help or tutors by any of the students, differences in the course material, difficulty level, instructor teaching style, and different criteria for achieving certain grades in the various math courses. In addition, as with any other study encompassing the use of secondary records, there is selective deposit and selective retention of information and records. This type of

study can only obtain and use information from those records which are available. Also, it must be assumed that the records that have been utilized for the study are accurate.

### **Implications For Future Research**

Perhaps a better designed study, which utilizes a larger sample size and controls for as many extraneous variables as possible, would yield significant findings. A study comparing remedial attendees, test-outs, and non-remedial students who have all taken the same course as their first college-level math and perhaps even with the same instructor, may prove to be a more reliable study and might also turn up significant results.

It is clear, however, that much more research needs to be conducted on determining the effects and/or benefits of post-secondary remedial instruction. This is particularly true, given the number of entering college freshmen identified as having skill deficiencies in one or more of the three basic areas of reading, writing, and math. The results and subsequent effects of remedial instruction at the college level needs to be continuously studied to ensure these courses are adequately meeting the needs of the students, and so they can be regularly improved, when needed, in order to achieve the goals of the remedial program.

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