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A Study to Compare the Grades of Algebra I Students that Participated in Tutoring Sessions with the Grades of Students Who Did Not Receive Tutoring

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A STUDY TO COMPARE THE GRADES OF ALGEBRA I STUDENTS THAT
PARTICIPATED IN TUTORING SESSIONS WITH THE GRADES OF
STUDENTS WHO DID NOT RECEIVE TUTORING

IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE DEGREE
MASTER OF SCIENCE IN OCCUPATIONAL & TECHNICAL STUDIES
OLD DOMINION UNIVERSITY

BY

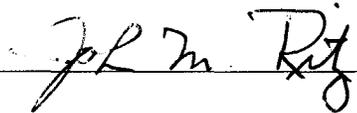
JAMES W. WILKERSON

JULY, 2000

SIGNATURE PAGE

James W. Wilkerson prepared this research project under the direction of Dr. John M. Ritz in OTED 635/636, Research Methods in Occupational and Technical Studies and Problems in Occupational and Technical Studies. It was submitted to Dr. John M. Ritz, Research Advisor and Graduate Program Director, as partial fulfillment of the requirements for the Master of Science in Occupational and Technical Studies degree.

APPROVED BY:



A handwritten signature in cursive script, appearing to read "John M. Ritz", is written over a horizontal line.

Dr. John M. Ritz

Research Advisor and Graduate Program Director

Occupational and Technical Studies

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Date

7-12-00

ACKNOWLEDGEMENTS

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Finally, my deepest gratitude goes to my wonderful wife, Angie, for all of her support and understanding during this research. Thanks for being there for me.

James W. Wilkerson

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CHAPTER I

INTRODUCTION

Algebra I can be a challenging subject for a lot of community college students. Individuals that take algebra I try a variety of options and techniques to pass, but many are not successful on their own. Tutoring is one option that can provide an enormous amount of support and guidance for students taking this course.

A large number of Dabney S. Lancaster Community College (DSLCC) students have to take developmental math classes such as basic arithmetic, algebra I, algebra II, and geometry to prepare them for college level mathematics. It is very important for students to develop a strong knowledge base of algebra I since it is the foundation for other math classes. It is important for students to realize that attending tutoring sessions on a regular basis will help them to complete algebra I.

STATEMENT OF THE PROBLEM

The problem of this study was to compare the grades of Algebra I students at Dabney S. Lancaster Community College that participated in tutoring sessions with the grades of students who did not receive tutoring.

RESEARCH GOALS

The hypothesis of this study was:

H₁: Tutoring students for an Algebra I class at Dabney S. Lancaster Community College will improve students' abilities to successfully complete the class.

BACKGROUND AND SIGNIFICANCE

Dabney S. Lancaster Community College (DSLCC) has a tutoring program for students through the Achievement Center, a Student Support Services federally funded grant program. The program operates under Title IV and is administered by the U.S. Department of Education. The program provides the following services:

- Tutoring (group or individual) in over 25 subjects.
- Computer usage with a variety of word processing programs for papers and resumes and skill-building programs in reading, writing, and math.
- Study skills instruction in note-taking, time management, test-taking, and stress management.
- Peer mentoring for students struggling with academic or personal issues who may benefit from a role model in a one-on-one relationship.
- Counseling in personal or family matters and referrals to DSLCC or community professionals.
- Transfer assistance in choosing a school, completing admissions and financial aid applications, and free trips to visit nearby four-year colleges.
- Cultural activities outside the classroom, such as free or greatly reduced tickets to concerts or plays.
- Special accommodations for students with documented disabilities.

From this list of services, tutoring is by far the most supported and utilized service. The majority of the tutoring provided is to help developmental math students.

It is important for administrators, faculty, and students to realize the importance of students developing a strong mathematical foundation in algebra I. No matter what direction students choose after completing their developmental math classes, they will need that prior mathematical knowledge to continue their course of studies. Two-year degree seeking students will need some type of college level math such as technical mathematics or liberal arts math. Transfer students will need strong mathematical backgrounds to continue on to pre-calculus and calculus.

The focus of this study was to show the effects that algebra I tutoring has on students successfully completing an algebra I course. Students' success will show the importance of the tutoring that is provided by the Achievement Center.

LIMITATIONS

The limitations of this study were as follows:

1. The results of this study were confined to an algebra I class at Dabney S. Lancaster Community College in Clifton Forge, Virginia.
2. The study was not able to closely supervise students and document any help that they received outside of class and tutoring.
3. The period of this study was for the fall semester of the 1999-2000 school year.

4. The study required the use of different tutors.

ASSUMPTIONS

In this study, there were several factors that were believed to be true.

They were as follows:

1. Tutors provided similar help to all students.
2. Students in the class were in need of remediation.
3. Tutoring would develop skill in students to enable them to successfully complete credited mathematics courses.

PROCEDURES

One algebra I class at Dabney S. Lancaster Community College in Clifton Forge, Virginia, was used to conduct this study. All students were made aware of the free tutoring that was offered by the Achievement Center staff. The students that voluntarily signed up for tutoring were monitored by their attendance to tutoring sessions and their grade in the class. The grades of the students that did not receive tutoring were collected at the end of the semester. The classes were compared to determine if there was a significant difference in grades from those receiving tutoring as compared to those who did not seek this assistance.

DEFINITION OF TERMS

The following contains a list of terms and their meanings that is relevant for this study.

1. Remediation – the teaching and correcting of skills in which one has a deficiency.

2. Developmental class – a class that prepares a student for a college level course.
3. Tutoring – the teaching of skills, strategies, and knowledge of a course to a student in a one-on-one or small group setting.
4. Algebra I – a fundamental course on the concepts of algebra using variables and equations to prepare students for college level math courses.

OVERVIEW OF CHAPTERS

This chapter provided the components that are involved in the study. It emphasized the importance of having a strong foundation in algebra I. Tutoring was described as a component to help students acquire the necessary skills and knowledge to successfully complete algebra I. The problem of this study was to compare the grades of Algebra I students at Dabney S. Lancaster Community College that participated in tutoring sessions with the grades of students who did not receive tutoring.

Chapter II, Review of Literature, will provide in-depth information on other findings about tutoring and algebra I. Chapter III, Methods and Procedures, will explain how the study was conducted. Chapter IV, Findings, provides and explains the results of the study. Chapter V, Summary, Conclusions, and Recommendations, concludes the study and offers suggestions to improve it.

CHAPTER II

REVIEW OF LITERATURE

Mathematics can be a very challenging subject for many students. This review covers the concepts of algebra I, math grades, tutoring, and tutoring programs in mathematics.

ALGEBRA I

Algebra I contains the basic building blocks for all other math. Students need to have a strong understanding of these algebra concepts to be successful in higher math classes. Algebra I is a tremendous change from basic arithmetic for most students. This change is generally what causes problems for students. Students have to learn new skills that seem very strange and unusual because they require students to think and visualize math differently. Algebra concepts cause students to use more thinking skills, more reasoning skills, and more abstract skills.

Learning algebra requires practice, practice, and more practice. Learning math is very different from learning other subjects. To learn math students need to solve numerous problems so that they are not only able to learn the process, but so that they are able to make connections between various concepts. Making these connections between concepts is very crucial because math continues to build from one concept to the next. If these connections are not made, then the student either is unable to continue, or continues and is continuously lost playing catch-up.

MATHEMATICS GRADES

Mathematics grades in the United States compared to other countries are considerably low. There have been many ideas and suggestions on how to improve our country's grades in mathematics. They have considered teaching styles, students' attitudes, and math content. Researchers have not been able to identify what exactly is causing low math scores in the United States (Schmidt & McKnight, 1998, p. 1830). Low math scores in the United States seem to be caused by many different variables.

One approach to grades has been to focus on teaching students how to understand and interpret their grades. Many students have a fear of making mistakes and having other students do better than them. These types of students measure their success by outperforming other students. This causes students to focus too much on their grades. When students become focused on their grades they lose the real meaning behind learning and obtaining knowledge. Students are studying to make good grades, and not studying to learn and become more knowledgeable in the subject matter. Other learners are just the opposite. They are not concerned with their grades and making mistakes. They view mistakes as a learning opportunity. Their main concern is to master the content (Svinicki, 1998, p. 101).

Researchers state that it is better for teachers to help students develop a healthy attitude towards grades by focusing more on students' progress and not comparing students with one another. Teachers should help students learn strategies that will give them more personal control when they make mistakes.

Students need to be showed that they can recover from errors. This will make students less obsessed with their grades and avoiding making errors. When students begin to learn from mistakes they also are developing a better attitude toward failure. Teachers also benefit because, “when students see grades as a means to an end rather than as an end in themselves, we [teachers] are less frequently placed in the position of having to defend grading, and we can spend more time working with the students to understand content” (Svinicki, 1998, p. 102). This emphasizes the idea that students need to adapt a mastery approach to learning.

The following is a list of key concepts that should be used when developing a grading system:

1. Grading systems should be based on performance benchmarks.
2. Grading systems should be valid and recognizable.
3. Grading systems should be reliable and consistent.
4. Grading systems should be logical and based on real differences in performance (Svinicki, 1998, p. 104).

Most importantly when developing a grading system is to make sure that you understand the system.

TUTORING

Tutoring is a method that can help students learn material better. Tutors provide students with individual help. Tutors are able to work closer with students than teachers, and are more able to find students’ weak areas. This

allows tutors to help students by focusing on these weak areas and making them better students.

There are two types of tutoring models. One model is called instructional tutoring, and the other model is called assignment-assistance tutoring. The instructional tutoring model contains the following elements in which tutors:

1. Analyze the assignment in terms of learner skills needed to complete the assignment.
2. Analyze the student's current level of skill and strategy knowledge.
3. Instruct the student through explanation, modeling, and guided practice in relevant skills, strategies, and content knowledge that the student can use to complete similar tasks in the future.
4. Provide sustained corrective feedback.
5. Provide immediate support for current assignments to keep the student academically afloat while the student develops proficiency as an independent learner.

The assignment-assistance tutoring model contains the following elements in which tutors:

1. Provide small-group or one-to-one homework assistance.
2. React to the demands of the general curriculum and review content with the student.
3. Provide brief feedback on student performance.
4. Make little or no systematic attempt to teach skills and learning strategies relevant to the homework assignment at hand and

generalizable to similar assignments in the future (Hock, Deshler, & Schumaker, 1999, pp. 102-103).

These two views on defining tutoring is what makes it difficult to understand whether a tutoring program is successful or not. It depends on what the desired outcome the program wants for their students. Programs that use the instructional tutoring model generally provide more skills and techniques that develop independent learners. Programs that use the assignment-assistance tutoring model focus more on the tasks at hand and short term help with homework and assignments.

Studies have been conducted on the instructional tutoring model and the assignment-assistance tutoring model. These studies showed that the instructional and the assignment-assistance tutoring models benefit the students. The difference is in the way the tutoring is conducted. Studies have not proven one model to be better than the other.

TUTORING PROGRAMS IN MATHEMATICS

Tutoring mathematics requires a good understanding of the math concepts being tutored, because students will always ask why. Math tutors cannot just be familiar with formulas and concepts; they need to know how they work and how they relate to other mathematical concepts. Math tutors not only need this deep knowledge of math, but they also need to have the skills to explain and relate the math to the students. These skills are just as important as knowing math, because if the tutor cannot explain the concepts then the tutor will have difficulty being an effective tutor.

Many math programs use peer tutors to help students gain a better understanding of mathematics. This type of tutoring is able to benefit the students and the tutors. The students learn skills and techniques from the tutors, and the tutors gain a better understanding of the math through explaining the material to the students. Peer tutoring requires a lot of tutor training and preparation for the tutor to be successful. This training can be done through role-playing by having tutors take turns tutoring one another. This allows the tutors to evaluate each other and learn new strategies and techniques to explain various math procedures, because with math there is generally more than one way to solve a problem (Barone & Taylor, 1996, pp. 8-9).

When the tutoring begins the tutor should keep a journal of some type to keep track of when, and what material was covered during a tutoring session. The journal should also contain the progress of the student. This is not only beneficial to the tutor, but also beneficial to the student to see how much has been learned. This will help give the student confidence.

SUMMARY

The review of literature presented an overview of algebra I, tutoring, and math tutoring programs. Tutoring programs have been developed to teach students. The controversy of what tutoring model should be used is still discussed today. Math tutoring programs require tutors to not only have knowledge of math, but also the skills to teach the knowledge to others. While tutoring programs have been around for years, there is still no set model.

The following chapter, Chapter III, will outline the Methods and Procedures the researcher used to conduct this study. Chapter III will define the population, the research variables, the methods of data collection, and the statistical analysis.

CHAPTER III

METHODS AND PROCEDURES

This chapter outlines the methods and procedures that were used to conduct this study. This study was experimental in nature. The following sections are included: population, research variables, procedures, methods of data collection, statistical analysis, and summary.

POPULATION

The population of this study consisted of 21 algebra I students enrolled at Dabney S. Lancaster Community College in Clifton Forge, Virginia. This class of 21 contained traditional and nontraditional students. The group of students that did not seek out tutoring consisted of 18 students (Group A), and the remaining 3 students received tutoring (Group B).

RESEARCH VARIABLES

Group A, students not receiving tutoring, only received instructional help from the instructor. Group B, students receiving tutoring, received extra instructional help from tutors in the Achievement Center.

PROCEDURES

This study was conducted in an algebra I class at Dabney S. Lancaster Community College in Clifton Forge, Virginia, during the fall semester of 1999. The entire class of 21 students was given the opportunity throughout the fall semester to sign-up for tutoring in the Achievement Center. Students that did not receive tutoring, Group A, were identified as passing or failing the class at the end

of the fall semester when grades were posted. Students that received tutoring, Group B, were monitored by their tutors throughout the entire semester.

The tutors kept records on the amount of time and the number of sessions that the students (Group B) attended during the semester. The tutors used a combination of instructional tutoring and assignment-assistance tutoring with more emphasis on the instructional tutoring model. The tutors taught the students math study skills and explained math concepts to the students. Most tutoring was conducted one-on-one with the students when possible. In some cases small groups of two or three were used when necessary.

METHODS OF DATA COLLECTION

The data was collected at the end of the semester when the grades were posted. The grades were identified as either passing or failing.

STATISTICAL ANALYSIS

The grades from the two groups, Group A and Group B, were collected and then analyzed using a chi-square test. This was done to determine if there was a correlation between the grades of students receiving tutoring and those not seeking this assistance.

SUMMARY

Chapter III outlined the methods and procedures used to conduct this study. The topics outlined included the population, research variables, procedures, methods of data collection, and statistical analysis. Chapter IV, Findings, will explain the results of the study.

CHAPTER IV

FINDINGS

The problem of this study was to compare the grades of Algebra I students at Dabney S. Lancaster Community College that participated in tutoring sessions with the grades of students who did not receive tutoring. This chapter contains the results of the data that was collected. The data was used to determine if there was a significant difference in the grades of Algebra I students that participated in tutoring sessions as compared to the grades of students who did not receive tutoring.

EXPLANATION OF TABLES

Data was collected at the end of the semester when grades were posted. Group A, represents the students that did not receive tutoring from the Achievement Center. Group B, represents the students that received tutoring on a regular basis from the Achievement Center. A chi-square test was used to compare the results of the data collected (See Table I).

There were a total of twenty-one students used in this research. Only three of these students received tutoring through the Achievement Center. The data showed that fifteen out of the eighteen students that did not receive tutoring, group A, failed the class. All three of the students that received tutoring, group B, passed the class. A chi-square test was calculated to determine if there was a significant difference in the grades of students that participated in tutoring sessions compared with the grades of students who did not receive tutoring.

Using one degree of freedom the calculated Chi-square value indicated a level of significance to the .01 level.

SUMMARY

Chapter IV showed the data that was collected on both groups. The majority of students in group A failed while all of the students in group B passed. A chi-square test was used to determine if there was a significant difference in the grades of the students in group A compared with the grades of the students in group B. Chapter V will provide the Summary, Conclusions, and Recommendations for this study.

TABLE I
Chi-square Test

	Passed	Failed	Total
Group A	3	15	18
Group B	3	0	3
Total	6	15	21

Degrees of freedom: 1

$$\chi^2 = \frac{N(AD-BC)^2}{(A+B)(C+D)(A+C)B+D}$$

$$\chi^2 = \frac{21(45-0)}{(18)(3)(15)(6)}$$

$$\chi^2 = 8.75$$

CHAPTER V
SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

SUMMARY

The problem of this study was to compare the grades of Algebra I students at Dabney S. Lancaster Community College that participated in tutoring sessions with the grades of students who did not receive tutoring. The hypothesis of this study was that tutoring students for an Algebra I class at Dabney S. Lancaster Community College would improve students' abilities to successfully complete the class.

All students were given the chance to sign up for free tutoring in the Achievement Center. The students that signed up for tutoring received mainly instructional tutoring along with some assignment-assistance tutoring. The tutors monitored the students that signed up for tutoring by keeping a log sheet for each student. The students grades were recorded when they were posted at the end of the semester.

The data from both groups was recorded and a chi-square test was calculated. A chi-square test was used to determine if there was a significant difference in the students' grades between group A, students that did not receive tutoring and group B, students that received tutoring.

CONCLUSIONS

The findings of this study indicated that there was a significant difference in students' grades between group A and group B. The researcher's hypothesis was that tutoring students for an Algebra I class at Dabney S. Lancaster

Community College would improve students' abilities to successfully complete the class. The results of the chi-square test equaled 8.75 and had one degree of freedom. This chi-square value is greater than 6.640 making it significant at the .01 level.

Based on final grades, group B did better than group A. Therefore, the researcher was able to accept the hypothesis that tutoring students for an Algebra I class will improve students' abilities to successfully complete the class.

RECOMMENDATIONS

As with all studies, this study is not complete until others are able to bring different ideas and views to the study through further investigation. Therefore, the researcher suggests the following recommendations:

1. That additional research and study needs to be done on how much and how often tutoring should take place.
2. That additional research should be done on different types of tutoring to find out which method is best for different situations.
3. That further research should be done at other community colleges on the effects of tutoring their students.
4. That further research should be done on a larger scale to obtain more accurate results.

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