Investigating the Efficacy of Support Programs for Eighth Grade Algebra I Students in the San Dieguito Union High School District

A Thesis Presented to
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We offer our gratitude to
the San Dieguito Union High School District,
our families,
Jennifer Jeffries,
and Rene Townsend.
The purpose of this study was to evaluate the effectiveness of two different eighth-grade algebra support programs. Algebra Topics is a year-long elective math course in which students enroll in addition to their eighth grade algebra course. The Algebra Academy is a second semester support program, serving recommended students with low first semester Algebra 1 grades. We hypothesized that both the Algebra Topics course and Algebra Academy would improve the performance of eighth grade students simultaneously enrolled in Algebra I. The effect of the Algebra Topics course on the 20 students enrolled was assessed by reviewing their first semester grades and SAT-9 scores. These scores were compared to the grades and test scores of 21 students who did not enroll in Algebra Topics. The second semester grades and SAT-9 scores of the 9 students enrolled in the Algebra Academy were also compared to the grades and test scores of the 9 students not enrolled. Both teachers administering the two support programs were also interviewed.

The findings suggest that students enrolled in the Algebra Topics performed better on semester grades and SAT-9 tests than students not enrolled. The data revealed that students enrolled in Algebra Academy had lower semester grades and comparable SAT-9 scores. Although both programs offered a “double dose” of Algebra, the two programs differed in accountability, time, structure, and student perception. Recommendations for eighth grade algebra support programs are included.
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CHAPTER 1 - INTRODUCTION

Background to the Problem

In 1989, the National Education Summit in Charlottesville, West Virginia, was convened by President George Bush and attended by the governors of all 50 states. Headed by then Governor Bill Clinton, the summit established eight primary goals, the most notable of which stated “U.S. students will be first in the world in math and science” (U.S. Department of Education. National Center for Education Statistics [NCES], 2000) by the year 2000. The gauntlet for the improvement of math and science education was thrown.

As a means of monitoring U.S. progress towards the goal of leading the world in math and science education, the NCES commissioned the Third International Mathematics and Science Study (TIMSS) in 1995. The study was comprehensive analysis of mathematics and science instruction and performance around the globe. TIMSS involved 42 countries and tested students at three grade levels. It included the testing of students, video and case study analysis of instructional methods, and an investigation of various curricula from every participating country (NCES, 2000).

At first glance, the results were not positive for the mathematics education community of the United States. Eighth graders in the U.S. scored better than only 4 of 25 nations, the same as 6 of 25 nations, and worse than 14 of 25 nations (NCES, 2000). That the United States could only outscore nations such as Lithuania, Cyprus, and Iran, fared no better than Iceland and Latvia, and did significantly worse than the
likes of Ireland and the Slovak Republic was a call to arms for educational reformists throughout the country.

However, not all educational professionals and analysts accepted the results of TIMSS as undeniable fact (Thomas B. Fordham Foundation, 1998). Many questions about the quality and reliability of the information were raised. The core of the argument questioning the TIMSS data was its failure to consider that almost every nation other than the U.S. in the study filters students into various educational paths based on ability testing, frequently as early as sixth grade. Meanwhile the U.S. continues to educate all of its children through twelfth grade. Therefore, any comparison of student populations between the U.S. and other countries is flawed because the profile of students is not the same.

Despite the questions about the TIMSS data, California, with its large number of high-tech and high-skill jobs, was a hotbed of political and educational debate over what to do to improve student performance. In 1997, the Standards Commission was established to create California’s first K-12 mathematics standards. After much behind-the-scenes political wrangling, the Mathematics Content Standards for California Public Schools were established and adopted in December of 1997 (Becker and Jacob, 2000). For middle schools, the most significant aspect of the new standards was the acceleration of Algebra I from the ninth grade to the eighth grade, a move mirrored by many other states.

As a result of the adoption of the new standards, a fiery debate over the appropriateness of teaching algebra in the eighth grade was ignited. Highly respected
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education professionals argued for either side. U.S. Education Secretary Richard W. Riley agreed with the improvement of the middle school math curriculum, stating that “we [have] set low expectations for all our students… too many [have been] taking dead-end general math courses” (Chmelynski, 1999). Without an acceleration of algebra to eighth grade, too few students have the opportunity to take high level courses such as calculus before leaving high school.

Those arguing against the move were split into two groups. First were those who believed students are not developmentally ready at 13-14 years old to tackle the abstract thinking required for success in algebra. Lee Jacks Professor of Child Education at Stanford University Nel Noddings (2000) argued that forcing algebra upon all eighth graders assumes all students are on a college track. According to Noddings, many students at that age do not yet have the interest nor the intellectual capability to be successful in algebra, therefore assuring their failure and a loss of motivation to earn so much as a high school diploma. Others argued that the immediate transfer of algebra to eighth grade was foolish because students have not been taught the skills necessary to be successful. Glenda Lappan, then president of the National Council of Teachers of Mathematics (NCTM) warned “You cannot simply mandate algebra at a particular grade level without first preparing students in prior grades to be ready” (Chmelynski, 1999).

In spite of the ongoing debate about the wisdom of moving Algebra I to eighth grade, several significant legislative initiatives in 1999 were based on the new standards (Becker and Jacob, 2000). First, a $1 billion textbook adoption was
approved with the new texts adhering to the standards. A $43 million professional
development program to train teachers to teach the new standards was also passed.
But the most visible and arguably most influential piece of legislation passed was a
new testing program known as STAR (Standardized Testing and Reporting). Its
mission was to track school and student progress through the new standards and
promised to reward or punish schools based on their performance on an augmented
version of the Stanford Achievement Test 9 (SAT-9). The message to California
teachers and students was clear: algebra in eighth grade is here to stay and failure is
not an option.

To this end, many schools have created support programs designed to assist
students enrolled in algebra courses as eighth graders. The support programs are not
intended to be a penalty of extra work (Carlin & Jaffee, 2001), but rather to provide
help to students who may not be optimally prepared to take such a course. These
support programs have taken on a variety of structures and styles. Some are outside
the traditional school day or school year. After school math labs and homework help
centers are frequently found in California schools. They are often staffed by teachers
or volunteer parents. Some schools even hold such classes at night to work around
busy family schedules. Summer school courses are offered to help incoming eighth
graders brush up on their skills before enrolling in Algebra I in the fall. Other
programs are within the school day. Students enroll themselves in a second math
course instead of electives such as art, drama, or foreign languages to support their
work in a traditional algebra class. Peers tutor each other during lunches and study
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hall hours. Technology based tutorials applying computers or graphing calculators to algebraic work are commonplace. Whatever the program’s details, the mission is always the same: help eighth grade students successfully complete a true Algebra I course.

Statement of the Problem

To provide eighth grade students with the best chance of completing Algebra I successfully, the San Dieguito Union High School District has created several different algebra support programs. The purpose of this thesis is to review the efficacy of two of the algebra support programs as they relate to eighth grade students enrolled in the 2000-2001 school year – Algebra Topics and the Algebra Academy. Algebra Topics is an elective math course designed for students who were promoted to Algebra I from Pre-Algebra, but did so with a grade lower than a B- and/or low SAT-9 scores. They are invited to enroll in the Algebra Topics course at the beginning of the eighth grade school year. This course is a year-long elective course – attendance is mandatory and students receive a grade at the end of both semesters.

In the Algebra Academy, students meet with an algebra teacher during SSR (Silent Sustained Reading) two times per week for 20 minutes per session. Students receive extra instruction and homework help to supplement their standard algebra course. Students enroll in the Algebra Academy program voluntarily, attendance is not mandatory, and students do not receive a grade for the program. Although the instructor is a credentialed math teacher, she is not employed by the SDUHSD at this time. She teaches the Algebra Academy on a volunteer basis.
To assess the efficacy of the two programs, we focused our study on two essential questions:

- Did students enrolled in the Algebra Topics course perform satisfactorily or better in their Algebra I course than students of a similar academic profile that did not enroll in the Algebra Topics course?
- Did students enrolled in the Algebra Academy perform satisfactorily or better in their Algebra I course than students of a similar academic profile that did not enroll in the Algebra Academy?

The effectiveness of the programs will be measured through the use of quantitative grades and SAT-9 data. From the results we will make recommendations for improving the two programs. Recommendations for improving the quality of the two programs will be based upon teacher input, current research, and other methods currently being employed in districts throughout the county and state.

**Statement of the Hypotheses**

The study focuses on the following two hypotheses:

- The Algebra Topics course does improve the performance of eighth grade students simultaneously enrolled in Algebra I.
- The Algebra Academy does improve the performance of eighth grade students simultaneously enrolled in Algebra I.

**Importance of the Study**

The math programs in California’s middle schools have come face to face with a series of daunting challenges in recent years. First, middle schools were
suddenly required to have nearly all eighth grade students successfully complete a rigorous first year algebra course in eighth grade without time to improve student skills in time for the change as dictated by the Mathematics Content Standards for California Public Schools. Then the STAR program increased the stakes for schools by offering monetary rewards and punishments for high and low performing schools. Furthermore, upon Governor Gray Davis’ recommendation, the legislature mandated that all students seeking a diploma pass the High School Exit Exam (HSEE). The math portion of the test includes questions based on the content standards for Algebra I taught at the middle school level.

In response to these various pressures, California’s school districts have developed a wide variety of math support programs. The question that remains to be answered is which of these programs are effective and which are not. Much research has been done about instructional techniques and the effectiveness of after school and summer school programs. However, very little study has been done pertaining to eighth grade algebra in the new climate.

Delimitations/Limitations of the Study

Due to the small scope of this thesis, the reader must be aware of the following delimitations and limitations:

- The study uses data from students enrolled in two middle schools within the San Dieguito Union High School District. Data that would be collected from school districts with different demographics should not be expected to replicate the results collected in this study.
• Only eighth grade students who are enrolled in Algebra I are featured in this study. Comparisons are made between students of similar academic profiles enrolled in Algebra I and one of two support programs, Algebra Topics and the Algebra Academy. Findings may be different for students with different academic profiles and for students in different course levels.

• Data were collected on 41 students in Algebra Topics and on 18 students in the Algebra Academy. This sample size may not necessarily reflect a larger population.

• Data from only the 2000-2001 school year were used. Data and results may vary from year to year.

• Semester grade data were collected from numerous teachers. Semester grade data may be based on varying criteria between teachers.

Despite the importance of considering the limitations listed above, the results of this study do give guidance to the San Dieguito Union High School District for how to improve the support programs offered to eighth grade Algebra I students. In addition, other schools and school districts may be able to use the findings of this study to improve their own math support programs.

Definition of Terms

The following terms have specific meaning with regards to this topic. The terminology defined below will be used throughout our thesis.

Algebra 1 Course – A non-arithmetic course in which students learn to use variables and functions to represent unknown quantities, numerical patterns, and relationships.
Algebra Topics - Algebra Topics is a year-long elective math course in which students enroll in addition to their eighth grade algebra course. Meeting four times a week for a total of 275 minutes, this course is designed for students who received a low grade and/or low SAT-9 scores in seventh grade pre-algebra.

The Algebra Academy - The Algebra Academy is a second semester support program, serving recommended students with low first semester Algebra 1 grades. Students meet with a credentialed teacher two times a week for a total of 40 minutes. Students receive extra instruction and homework help to increase their chances for success in the second semester of their eighth grade algebra course.

Pre-Algebra Course – A transitional course from arithmetic to algebra. Students continue to explore concrete situations while learning the language and symbols of algebra and elementary algebraic concepts.

Quantitative Grade – Letter grade based on performance in an academic course.

SAT-9 or Stanford 9 - State achievement test required by the state of California to assess growth of students and schools.

STAR (Standardized Testing and Reporting) – A new testing program whose mission is to track school and student progress through the new standards and promise to reward or punish schools based on their performance on an augmented version of the Stanford Achievement Test 9 (SAT-9).
Organization of the Study

"Investigating the Efficacy of Support Programs for Eighth Grade Algebra I Students in the San Dieguito Union High School District" is presented in five chapters. The content of the chapters is as follows:

Chapter One begins with a description of the background to the study, the problem and hypothesis, and the importance of the topic in education today. Delimitations and limitations are then outlined. Chapter One also includes the definition of terms and a description of the organization of the study.

Chapter Two presents a review of the literature relevant to the study. The review highlights key research on the topics of cognitive development, predicting future success, "algebrafying" the curriculum, scheduling, remediation, tutoring, Advancement via Individual Determination (AVID), and computer assistance.

Chapter Three covers the methodology of the study. It includes a description of the subjects and materials used in the study as well as the specific procedures used to gather the necessary data.

Chapter Four is the results and findings. This chapter includes tables and a review and analysis of the data.

Chapter five includes the summary and conclusions. The chapter ends with recommendations for the San Dieguito School District as well as any district which has implemented algebra in the eighth grade. The recommendations are based on our findings and those presented in the review of the literature.
The review of existing literature and studies relate to algebra success and failure. Included is literature on cognitive development, algebra as the “gateway” course, curriculum changes, scheduling options, remediation, tutoring, Advancement Via Individual Determination (AVID), and computer assistance.

Cognitive Development

Should algebra be taught in eighth grade? If so, do students possess the cognitive development in order to succeed? Chicago math professor Zalman argues that “learning the language of algebra” is the “keystone subject in all of secondary mathematics” (1987). Researchers reveal contradicting evidence concerning the cognitive ability of middle school students to understand and generalize algebraic concepts.

Are middle school students cognitively ready to learn algebra? Davis examines three seventh grade algebra classes, observing “cognitive development, constructivism and algebra as a subject matter” (1998). The study includes twelve hours of observation, with all three teachers interviewed, and students and instruction recorded. In each class, instruction begins with a review activity, allowing students to connect new material to previous concepts. Teachers were facilitators in the classroom, often questioning students to promote cognitive development.

Although metacognitive approaches, collaborative learning, current technology and the National Council of Teachers of Mathematics (NCTM) guidelines
were evident, these middle school students were very limited in their ability to generalize concepts (p.19). The majority of middle school students are in the transition from “concrete to formal operational cognitive functioning” (p.3). Students need more time and practice to develop the appropriate cognitive skills to understand algebra. To enrich the learning process, teachers should provide time for reflection, force students to explain their thought process orally and in written form, and offer peer collaboration time in the classroom (p.19).

Observing an eighth grade mathematics class, Smith and Phillips provide evidence that students do possess the skills to succeed in algebra. They evaluate students’ work from The Connected Mathematics Project (CMP). In CMP, the curriculum is very “problem centered,” where Algebra is taught as “a set of tools for analyzing and understanding relationships between covarying quantities” (2000). In their study, Smith and Phillips require students to solve interview problems covering linear functions, graphing calculators and exponential and quadratic relationships. Solutions and methods are discussed, as students work in pairs and individually.

Through discussion and evaluation, Smith and Phillips determine that middle school students have the ability to develop algebraic skills. By providing a rigorous sequenced curriculum, such as CMP, students are immersed in a problem-centered approach to algebra. Students are encouraged to express their ideas and insights, as educators listen and foster student thinking.

For algebra to succeed in eighth grade, how should concepts be presented to promote cognitive development? Fouche, an assistant professor at the University of
West Florida, believes schools need to move from traditional algebra content and focus on a curriculum based on “construction of concepts and the development of algebraic ways” (1997). Conducting a research project involving eighth grade algebra and pre algebra students, Fouche presents eight different math problems, as students are asked to solve them using any method or strategy possible. Students solve these problems individually and as a group, and strategies are compared.

Having not learned advanced equations or formula development, the pre-algebra students are more “flexible and creative” in solving the eight math problems (p.227). Pre-algebra students are not restricted by a set of rules and grow more easily in their solving methods. In the algebra group, intuition is replaced with learned procedures and equations. With creativity suppressed by rules, algebra students search for formulas and are reluctant to utilize different strategies. By allowing students to solve simple math problems and grow to more general ones, students learn algebraic concepts instead of memorizing rules. They become stronger students. Without this “constructive experience,” students will be confined to a “poorly stocked problem solving toolbox” (p.228). If provided the appropriate learning environment and instruction, Fouche believes that middle school students can understand algebraic concepts.

As a consultant in mathematics education, Prevost conducts a study examining mathematics, science and computer education in grades 7 to 12 in New Hampshire schools. It was found that only half of eighth grade algebra students continued studying math through high school, and those that failed to continue
dropped out of math after tenth grade. Although fifty-four percent of the students were female, only forty-four percent of them continued math through high school. By pushing algebra to eighth grade, Provost argues that students are accelerated out of mathematics (1985).

In most other countries, algebra is taught in seventh and eighth grade. Japanese students are learning and mastering topics almost two years ahead of the U.S (Zalman, 1987). In our country, math courses are repetitive, and Zalman questions the amount of time spent reviewing material in class. It is “counterproductive” and “effectively decelerates our best students one year and our average students about two years” (p.433). By taking algebra in eighth grade, students are less pressured in high school. They have the freedom to take additional courses, opening the door to higher-level math courses. However, Zalman acknowledges that classroom time is lost in eighth grade. Compared to ninth grade algebra, only eighty percent of the curriculum can really be taught in middle school. Eighth graders lose instruction time to field trips, and assemblies, and are not accustomed to the amount of homework (p.431).

Described as a “foreign language,” algebra, like any other language, is easier to learn when you are younger (Zalman, 1987). But are middle school students cognitively ready? Debate and controversy continue. U.S. Secretary of Education Richard W. Riley believes, “The key to understanding mathematics is taking algebra or courses covering algebraic concepts by the end of eighth grade.” In the 2000 National Assessment of Education Progress, eighth grade Algebra students scored
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higher than those enrolled in regular math or pre-algebra classes. A simple solution to eighth grade algebra does not exist, for “learning Algebra is a complex, multiyear process that involves many intellectual challenges” (Smith & Phillips, 2000).

Predicting Future Success

Eighth grade algebra has often been classified a “gatekeeper” course because the successful completion of algebra is a prerequisite to further rigorous mathematics study and later, college and career opportunities. Students who have strong mathematics skills, beginning with algebra in eighth grade, will do better in college and in the labor force. Eighty-three percent of students who took Algebra I and Geometry go to college compared to 36 percent of students who did not take Algebra I and Geometry (U.S. Department of Education [USDE], 1997). But does taking algebra in eighth grade really give students any advantage in coursework or achievement by the end of high school?

Students’ choice of courses is a powerful indicator of mathematics achievement. “This occurs partially because students who are more proficient tend to take more mathematics classes and, at the eighth grade, the better students are tracked into more advanced courses” (Shakrani, 1996). Eighth graders who take algebra have consistently higher proficiency scores than students taking other eighth grade mathematics courses. Shakrani concludes that students need the foundation of algebra in eighth grade to prepare them for the higher mathematical concepts covered in high school. The U.S. Department of Education found that approximately 60 percent of students who took calculus in high school had taken algebra in the eighth grade.
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(1997). At many schools, students who do not complete prerequisite courses early are unable to take more challenging mathematics and science courses at the end of high school.

Xin Ma posed a challenge to widespread beliefs concerning the relationship between course work and math achievement (1994). He examined the effects of pre-algebra, geometry, and calculus courses to see which played a larger role in subsequent achievement in and attitude towards mathematics. Contrary to widespread beliefs, he found that most mathematics course work did not play a large role in mathematics achievement. He challenged the “myth” that advanced mathematics courses improve mathematics achievement more than lower level courses. His results also showed students do not seem to develop a negative attitude towards mathematics because they took certain math courses.

Barbara K. Flexer found eighth grade algebra to be the stumbling block for many intelligent students who had previously been high-achieving in mathematics (1984). To avoid this “trauma of failure,” Flexer wondered if there was any way to predict eighth grade algebra achievement before students entered the course. After analyzing IQ scores, math achievement test scores, prognosis test scores, algebra grades, and algebra achievement test scores, she found the algebra prognosis test to be the best overall predictor of success in an eighth grade algebra course. When combined with students’ previous year’s mathematics course grade, the best predictor for success was found. Nevertheless, Flexer questioned the setting of an arbitrary cutoff point for test scores and previous grades when selecting students to enroll in
eighth grade algebra, "since a criterion stringent enough to prevent most of the
potential failures is also likely to exclude a number of students who would succeed"

The U.S. Department of Education’s report, entitled “Mathematics Equals
Opportunity,” described many programs which have increased the number of students
taking algebra (1997). Equity 2000 “dramatically increased” the percentage of
students enrolled in Algebra I by eighth grade while maintaining the percentage of
students passing the course. Phasing out lower level math classes in exchange for
algebra, increasing parental involvement, and teacher training are important
components of the program. Texas developed an Advanced Placement Incentives
program which financially rewards teachers, schools, and students when students take
Advanced Placement (AP) exams. Growth in AP participation, especially in inner city
schools, has been remarkable. South Carolina funded training AP teachers and helped
defray AP exam costs for students. They saw a large increase in the number of math
and science AP exams. The Quantitative Understanding: Amplifying Student
Achievement and Reasoning (QUASAR) Project has raised low levels of students
participation and performance in mathematics in urban schools. Mathematics
teachers, administrators, and university mathematics educators collaborate to
“develop, implement, and refine mathematics instruction” (USDE, 1997). All
QUASAR school sites stress professional development and teacher support.

Julia B. Smith found early access to algebra has an effect beyond simply the
acquisition of algebra skills (1996). She found that students who enter high school
having already taken algebra take more advanced math courses and have higher mathematics performance by the end of high school. She partially attributes this to both students’ and educators’ expectations about how long students will stay in the “mathematics pipeline” if they take algebra early. Students who enter the “pipeline” early stay there relatively easily, even if grades or test scores slip. In contrast, students who want to enter the “pipeline” as ninth or tenth graders must meet strict grade and test score requirements.

Inequities in access exist in this country. The percentage of students taking algebra is much lower in urban schools and schools in poor communities. Similarly, substantially larger proportions of Caucasian and Asian students take algebra then African-America and Hispanic students (Shakrani, 1996). Some recent National Assessment of Education Progress (NAEP) data indicate that less than half the students in urban schools take any mathematics beyond one year of algebra, and one in five do not study algebra at all (Silver, 1997). Robert Moses, a civil rights activist and math teacher, has called the inequity in access to algebra “a crucial issue for a new civil rights movement for minorities in this country” (Silver, 1997). Moses wants black parents and their communities to demand equal access to algebra and an understanding of “symbolic representation,” knowledge he believes is essential to getting a good job in the information age (Borsuk, 2001). The U.S. Department of Education (USDE) reports that workers who have strong mathematics and science backgrounds will be more likely to be employed as technology becomes more prevalent (1997). Some major American companies require job applicants to pass
standardized mathematics and reading tests. Unemployment rates among high school graduates who scored in the top quartile of the Armed Services Vocational Aptitude Battery mathematics test was only 4.4 percent, compared to 10.3 percent for those who scored in the lowest quartile (USDE, 1997).

Taking rigorous mathematics and science courses in high school appears to be especially important for low-income students (U.S. Department of Education, 1997). Seventy-one percent of low-income students who took algebra I and geometry went to college compared to ninety-four percent of high-income and 84 percent of middle-income families. Low-income students who took Algebra I and Geometry were almost three times as likely to attend college as those who did not. Unfortunately, despite this importance, low-income students are only half as likely as high-income students to take Algebra I and Geometry. Other educators disagree that algebra is a gateway course, stating the push for algebra has alienated minority and poor students (Borsuk, 2001).

The kind of substantial support many students need to pass algebra does not exist in most schools. An integrated honors/group study approach used successfully at University of California, Berkeley was adapted to a California high school to address racial imbalance in algebra. Between 1983 and 1987, black students’ failure rates decreased by 50 percent (Marlowe, 1987).

Even though most American students who complete high school take two years of algebra, many have not mastered the fundamentals of algebraic ideas (Silver, 1997). As a result, many students take remedial mathematics courses in college.
“AlgebraFying” the Curriculum

How do schools make “algebra for all” a reality? Many states have begun mandating algebra in high school and even middle school, believing all students need to be exposed to algebraic ideas. Other view algebra not just as a course, but a way of thinking and reasoning which can be developed over time. They want to “algebrafy” the elementary school curriculum to ease students’ transitions from arithmetic to algebra.

Mandating algebra in eighth grade, some believe, better serves students than additional arithmetic review courses. Mandating algebra in middle school has its proponents and opponents, but no one can deny the larger numbers of inadequately prepared students failing algebra as a result. Although mandated algebra courses ensure all eighth graders are exposed to algebra, students’ attitude toward mathematics and their belief in their own academic abilities can plummet (Silver, 1997).

Many others believe the key to algebra reform is to “algebrafy” the curriculum. By integrating algebraic reasoning across all grade levels, students will be ready for algebra in either eighth or ninth grade. “Just as algebra has acted as a constricted gateway to significant mathematics…algebra reform is the gateway to K-12 mathematics reform for the next century” (Kaput, 2000).

If educators want students to gain strong algebraic reasoning and problem solving skills, the current algebra curriculum must be updated, condensed, and made meaningful. “Those who believe that all students can learn algebra …do not visualize
the traditional algebra content or techniques....Instead, they see a curriculum based on the construction of concepts and the development of algebraic ways of thinking” (Fouche, 1997). Although we now expect all students to take algebra, instead of only a small minority, the curriculum has not changed much in the last century. We need to increase not only the numbers of students taking algebra, but the quality of courses they take. Basic algebra ideas must be integrated into K-12 mathematics in a way that helps students make the transition from arithmetic to algebraic thinking. Algebraic concepts can be planted in students’ minds in elementary school. In the California Math Standards, these roots of algebraic reasoning begin with patterns and sorting in kindergarten, demonstrating understanding and use of a beginning concept of a variable in fourth grade, and writing and evaluating algebraic expressions using up to three variables by sixth grade. Teacher training must be a part of such reform if we are to succeed in the algebrafication of school mathematics.

Scheduling

With algebra labeled as the gateway to higher-level math courses, school districts search for options to support students. In California, schools offer a number of support programs. In the Vista Unified School District, summer school and tutorials are in place to support eighth grade students (Spielvogel, 2000). Out of the fifteen districts in Orange County, eleven offer extended Algebra I classes (Sacchetti, 2001). Researchers suggest and studies prove that scheduling may be the solution to our failing algebra rates. To achieve success, we need more time. As Rettig and
Canady explain, “Schedules must be devised in which time becomes the variable, not achievement” (1998).

From 1993 to 1996, focusing on students enrolled at a Central Texas high school, Skrobarcek, Chang, Thompson, Atteberry, Westbrook, and Manus investigate and compare student attitudes, teacher perceptions, failure and absentee rates between traditionally taught Algebra I classes and those taught using a 120 minute class block. Although the study concludes that higher failure rates exist in the block classes, Skrobarcek et al. reveal that lower achieving math students were initially enrolled in the Algebra I block. For the majority of students failing math, these students were also failing their other academic courses. Skrobarcek et al. describe the block as a “slower version” of the traditional class, and discover higher absentee rates in the Algebra I block (1997). Interestingly, Skrobarcek et al. discover contradicting evidence. One student, enrolled in the block period for first semester and transferred to the traditional class during second semester, failed second semester algebra with an average of 59% and nine absences, and passed first semester with an average of 95% and eight absences.

Student and teacher perceptions favor the Algebra I block. Students find it easier to concentrate and are less stressed during the block. The longer periods of time support “teacher innovation and creativity” and more “effective student evaluation” as teachers are able to provide more individual attention (p.108). As Skrobarcek et al. state, “the Algebra I block schedule allows for the maximum use of time, a precious commodity” (p.110).
As a variation of the block schedule, Rettig and Canady present the Variable Learning Time schedule (VLT), a schedule based on time rather than tracking. Focusing on Algebra I students, Rettig and Canady recommend dividing the Algebra I curriculum into four parts, each section taught during a two-period block of time. After each quarter, students are assessed and then regrouped, allowing additional time to master Part I of the curriculum or advancing to Part II. Students receive “honors” if they complete Algebra I within one year with an average grade of B or higher. The Variable Learning Time schedule allows “large numbers of students to complete this course successfully, but in different amounts of time.” Students learn at their own pace (1998).

If a student requires extended learning time for Part I, Rettig and Canady suggest giving the student a grade of “Incomplete” or “Work in Progress,” where teachers prepare an “Algebra Learning Plan” to assess the student’s areas of weakness (p.58). Computer software and labs are available to address these weaknesses. Under the Variable Learning Time schedule, students may take two years to successfully complete Algebra I.

Rettig and Canady propose a schedule where math teachers are teamed, remediation is assessed early, and honors is “based on performance, not based on a prediction of performance” (p.64). However, concerns and issues exist. In order to administer this schedule effectively, staff development time is necessary and schools must accommodate a new grading system. Parents may be unwilling to accept the
lack of “honors” classes, and class sizes may fluctuate as students learn and graduate at different rates.

As an alternative to block scheduling, Louise Peele, assistant principal of Granby High School in Norfolk, Va, suggests “double dose” as a very “worthy and viable strategy to enhance student academic success” (1998). Although after school tutoring, peer tutoring and math pull out programs may provide guidance, these options lack immediate reinforcement. By enrolling in two periods of math, students have the opportunity to master concepts, ask questions, and review material all in the same day.

Does “double dose” work? In 1986, Timilty Middle School in Roxbury, Mass., was ranked last on standardized test scores. Five years later, after enrolling all students in a “daily double” of math and reading, Timilty Middle school accelerated to first place (Schulz, 1991, 26). Students were given support, immediate reinforcement, and extra time to learn in the classroom.

From 1995 to 1996, in Norfolk, Virginia at Lake Taylor High School, five ninth grade algebra classes were studied. In four of the classes, students attended one algebra section each day, and in the other class, students attended algebra twice a day. Student success was measured by final exam grades, passing rates, and course grade distribution. Although there was no significant difference in student achievement, the “double dose” group revealed higher outcomes for first semester. With only 83 students in the control group, and 19 in the “double dose” group, the study was
Efficacy of Math Support Programs

undoubtedly affected by this small sampling size. Peele supports “double dosing,”
and argues further investigation (p. 114).

If time is the obstacle, should classes be “looped?” (Rossi, 2000). Rossi
examines this “looping” strategy at Norward Park, a small public school in Chicago.
By enrolling students with the same teacher in seventh and eighth grade, schools can
add almost a month to the academic year, giving students the necessary time to learn
algebra by eighth grade. The 2000 Illinois Standards Achievement Tests report
Norward Park with the fifth highest eighth grade math scores in Chicago. “Looping”
is claimed to be one of the reasons for this high placement (2000).

As another solution, certain school districts are extending algebra over two
years, but concern and issues are evident. As Sacchetti states, algebra taught over two
years would provide students the necessary time to master the curriculum, but
questions if this two year option prevents students from taking higher level math
courses in high school. Math professors claim no real evidence supports a two-year
course, and criticism continues (2001). At the University of Texas, Math professor
Uri Treisman states, “We saw that two-year algebra was a burial ground for students
that no one took seriously.” In the Irvine, Fullerton, Brea-Olinda and Laguna Beach
school districts, students may only enroll in a one-year algebra course (p.A3). In the
Poway Unified District, two-year algebra courses are offered, and students have the
opportunity to enroll in “extra help” electives (Spielvogel, 2000). Different schools
have different philosophies towards two-year algebra courses.
To graduate from high school, California students are required to pass algebra and the high school exit exam. With this pressure and the push of standardizing algebra to eighth grade, educators seek support options for students. Districts may implement a block schedule, provide support electives or extend algebra over two years. Several solutions exist. As Skrobarcek et al. proclaim, “the key to liberating learning lies in unlocking time” (1997).

**Remediation**

According to the Third International Mathematics and Science Study (TIMSS), middle school students score below average in math. Our curriculum is “a mile wide and an inch deep,” covering far too many topics and not enough depth (Silver, 1998). Students are struggling, as many resort to remediation to graduate. Although summer school supports student achievement, researchers reveal contradicting evidence. Is this program an effective solution for students?

In his review, Johnston reports summer school promotion rates from New York City, Chicago and New Orleans. Out of 200,000 New York City students enrolled in summer school, sixty-three percent were successfully promoted to the next grade level. In Chicago, seventy-one percent of eighth graders remediated in summer school and moved on to ninth grade. However, New Orleans produced disappointing results, as summer school “failed to help hundreds of students pass a retest of the state exams” (Johnston, 2000). Although most failed, seventy-five percent of New Orleans students did improve their overall test scores by attending summer school (2000).

Examining summer school for disadvantaged students, Ascher describes
several ailments that afflict the program. Summer school is unorganized, with low expectations and low teacher attendance rates. Time is spent on establishing teacher-student relationships, as the curriculum is less rigorous compared to that taught in the regular school year. Although summer school does provide more learning time in the classroom, Ascher argues that more time does not “necessarily increase learning” (1988). Research shows no “significant educational benefit from providing summer schools” (1988). Ascher recommends further exploration to appropriately evaluate student learning.

How does Algebra I taught during summer school compare to the regular school year? Baenan and Lloyd review the results of a dissertation conducted by Marcia Alford, former director of summer school programs in the Wake County Public School System in Raleigh, North Carolina. Alford studies students who failed Algebra I in the regular 1994-1995 school year, and chose to retake the course during summer school or the following year. Student success was compared and measured by course passing rates, “End-of-Course” (or EOC) test scores, and final grades (2000).

In her dissertation, Alford illustrates existing differences between Algebra I during summer school and Algebra I during the normal school year. Although both complete the required curriculum, class sizes are smaller during summer school. Instead of meeting one hour a day, summer school students meet for five hours each day over a shorter period of time, receiving a more concentrated focus of the curriculum. With this longer block of time, Alford discovers that summer school
teachers were "less likely to use straight lecture" when teaching the curriculum (Baenan & Lloyd, 2000). Class composition also varied. During summer school, only students who failed Algebra I are enrolled, making these classes more homogenous than those offered during the regular school year. Although no significant difference in "EOC" test scores was found, Alford concludes that a "significantly higher percentage of students passed Algebra I and made higher grades" during summer school (Baenan & Lloyd, 2000). Alford argues summer school as an effective option for remediation.

Comparing summer school to the regular school year, there exists differences in style, structure and approach. Is it an effective program? Studies provide conflicting documentation. As summer school becomes an integral part of school remediation, researchers reveal concern and believe improvements should be made.

Tutoring

Research is mixed concerning the ability of after-school tutoring programs to turn academic failure into academic success. Tutoring seems effective sometimes and under certain conditions (Cohen, Kulik, & Kulik, 1982; Lepper, Drake, & O’Donnell-Johnson, 1997; McArthur, Lewis, & Bishay, 1996; Merrill, Reiser, Merrill, & Landers, 1995). There are many variables which affect the result: What kind of training do tutors receive? Where is the tutoring done? How are students selected to receive tutoring? How long does the tutoring last? What is the tutor to tutee ratio? Do students receive homework help or additional instruction? What
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follow-up is done to ensure success in the long run? All of these factors work together to determine if a tutoring program is successful or ineffective.

Some forms of tutoring may hinder learning when students become dependent on their tutors for success (Ceprano, 1995; Keim, McWhirter, & Bernstein, 1996). Other studies show tutoring to have an insignificant or even negative effect on student achievement. For a nonprofit agency operating an after-school tutoring program in cooperation with a city school system, academic gains were almost nonexistent (Zuelke & Nelson, 2001). Tutors worked with students, grades 3-12, twice a week for an hour each time. Although the goal was to improve classroom performance, reading and mathematics grade point averages did not improve (and actually often declined) in the first three years as a result of after-school tutoring. Directors blamed the lack of improvement on the absence of coordination between tutors and students’ classroom teachers, the high tutor-tutee ratio because of difficulty securing enough tutors, absence of leadership, and an uneasy relationship with school personnel. It was only after directors made adjustments and scaled down the program to two schools in its final fourth year that a still discouraging 1.5 percent gain was reported. This tutoring program has been discontinued, and the nonprofit agency is considering concentrating tutoring services at their offices instead of at schools.

Some after-school programs are able to improve the educational outcomes for students who are at-risk for academic failure. Studies have found one-to-one tutoring to be an extremely effective intervention (Bloom, 1984; Graesser, Bowers, & Hacker, 1997; Slavin, 1990).
In two different studies, Hock, Pulvers, Deshler, and Schumaker (2001) found strategic tutoring was effective in improving the quiz and test performance of at-risk students enrolled in a junior high Algebra I class. Trained university tutors individually assisted students in completing homework assignments two or three times a week for 30 minutes per session. A strategic tutoring model was used in which tutors taught a strategy that helped students complete class assignments successfully which could then be used independently whenever students encountered similar assignments. Results indicated strategic tutoring was effective in improving the quiz and test performance of students enrolled in a junior high Algebra 1 course. The ultimate goal of strategic tutoring was to develop independent and proficient learners, but these two studies showed mixed results in later passing levels.

Classwide Peer Tutoring (CWPT) is another option for heterogeneous instruction. CWPT does not require outside tutors to work with students; instead, students within the same classroom tutor each other. The class is divided into two teams, with each team composed of heterogeneous tutoring pairs. Each pair teaches each other the skill, practice the skill, and monitor each other’s learning. Students take quizzes every week to assess their progress. Studies have shown that students are able to learn more in less time when working with peers instead of in traditional, teacher-led instruction situations (Greenwood & Delquadri, 1995).

David Allsopp found that CWPT was as effective as independent practice in teaching higher order thinking skills in mathematics in middle school (1997). Greenwood & Delquadri found that CWPT students continued to exceed the
achievement test levels of the control group for middle and high school (1995).

However, the time and training needed to develop such complex CWPT procedures for middle school may prevent many teachers from implementing this program in their classroom.

**Advancement Via Individual Determination (AVID)**

Encouraging and empowering students, the Advancement Via Individual Determination program (AVID), forces "students to take responsibility for their own learning" (Swanson, Marcus and Elliot, 2000). Based on collaboration, inquiry and writing, AVID provides academic support for "students in the middle" (2000). With teachers, parents and community tutors working together, the program targets college enrollment for all students. AVID's goal is "to increase college participation among African American, Alaskan/Native American, Latino, and low-income students who are most underrepresented in postsecondary education" (Swanson, 1993). The program is an elective course taught during the regular school day. As research suggests, students who fail the first time, rarely succeed when given another chance (Swanson et al., 2000). Does AVID have the ability to alter this pattern?

As San Diego educator Swanson describes, AVID has proven successful over the past twenty years. In 1980, starting with one class of thirty at Clairemont High School, the AVID program produced graduating students with an average GPA of 3.2, with a number of them taking honors classes. All thirty students enrolled in college, receiving over $50,000 in loans and scholarships. "By 1984 (the first year AVID students graduated), Clairemont’s scores on the Comprehensive Test of Basic
Skills had improved...35% higher in total mathematics” (Swanson, 1993). From 1990 to 1992, compared to the national average, AVID promoted a larger number of Latino and African American students to college. For those participating in AVID, 43% of Latino students and 54% of African American students attended college (1993). From 1990 to 1997, 92.8 percent of AVID graduates enrolled in universities. Compared to other California high schools, AVID schools have lower drop-out rates and higher percentage of college bound students (Swanson et al., 2000). Researchers prove AVID to be an effective support program.

Currently, AVID serves "more than 40,000 middle and high school students in more than 600 schools in California" (Swanson et al., 2000). Success is based on the AVID essentials: commitment, voluntary student participation, rigorous curriculum, monetary support, collaboration and tutorials (Swanson et al., 2000).

Computer Assistance

Students fail algebra for a variety of reasons – lack of basic skills, lack of motivation, and poor study habits. Unfortunately, evaluating exactly what students can and cannot do and then providing extra assistance in these areas is beyond the scope of most high school math courses. The advent of advanced computer software has given schools another option to help at-risk students. Computer assisted tutoring, and the controversy over its effectiveness, is not a new idea. A study dating back to 1980 found the use of computer-enhanced resources in an algebra II course had no significant effect on algebra achievement or attitudes (Saunders & Bell, 1980). Furthermore, Cathleen Stasz found that students’ backgrounds and attitudes about
computers and computer-based instruction complicate studies, leaving educators little data on the instructional effectiveness of computer tutoring systems (1988).

Educators at Capistrano Valley High School have looked to computer software to provide the kind of individualized instruction that can help struggling students succeed in algebra (Unknown, 1994). Educators, with the help of Scantron Corp., developed a pilot program for students who had previously failed upper-level math courses. With the evaluative portion of ScanTrack software, math teacher Sharon Stratton found “some students could not add a positive and negative number correctly; some had no idea of order of operations… I never would have known to look for these kinds of basic mistakes.” The software program then generated individualized instruction, worksheets, and tests. Results of the first semester of use were promising - every student enrolled in the Advanced Algebra Lab course earned a passing grade.

Educators are also turning to computerized help in algebra in South Cobb County, Georgia (MacDonald, 2001). A computer-assisted tutoring program was introduced at four high schools and one middle school, all with disappointing results on the Algebra I final exams. The software allows students to move at their own pace and includes spreadsheets, graphs, and other applications.
Subjects

The participants of this study were eighth grade students enrolled in Algebra I courses at Diegueño Middle School and Carmel Valley Middle School in the San Dieguito Union High School District located in San Diego County, California. Diegueño Middle School, with an enrollment of approximately 1100 students, is located in Encinitas, California. There are approximately 563 eighth graders at Diegueño Middle School. Carmel Valley Middle School, with an enrollment of approximately 900 students, is located in San Diego, California. There are approximately 468 eighth graders at Carmel Valley Middle School. The student ethnic demographics for all schools in the San Dieguito Union High School District are similar: 81% Caucasian, 14% Hispanic, 3% Asian, and 2% other.

Data from 59 eighth-grade students were collected. Of the 41 students identified at Diegueño Middle School, 21 students were only enrolled in an Algebra I course and 20 students were enrolled in both an Algebra I course and the Algebra Topics course. Of the 18 students identified at Carmel Valley Middle School, 9 students were only enrolled in an algebra course, and 9 students were enrolled in an Algebra 1 course and also participated in the Algebra Academy program.

Data from these algebra students will be collected from the 2000-2001 SAT-9 and first and second semester course grades.
Materials

Permission to access the records of all students of the San Dieguito District was granted by the Assistant Superintendent of Instruction.

Coordinating teachers for both the Algebra Topics and Algebra Academy programs provided student rosters for both courses. Using these rosters, SAT-9 scores and semester grades were gathered by looking at student records at Diegueño Middle School and Carmel Valley Middle School. Once the data were collected, they were organized using spreadsheets created in Microsoft Excel 2002.

Questionnaires were created to assess coordinating teachers’ perceptions of the two algebra support programs. Questions were created to determine what changes had been made to the programs in their second year, and what changes were planned for the third year. Questions also were created to better understand the inner workings of the programs and coordinating teachers’ responses to our results and findings. Questions included in the questionnaire included:

1) When designing your activities, instruction, etc. do you get support and ideas from other teachers, or do you do this alone? How do you feel about this arrangement? Do you feel you are helping students succeed in algebra?
2) What have you done differently this year than you did last year?
3) How will you alter the class even further next year?
4) Analyzing student grades, we found that (students enrolled in Algebra Topics had lower drop rates and higher grades than students who did not enroll) or
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(students enrolled in the Algebra Academy had similar grades to those of students who did not enroll). How do you feel about these results?

5) Analyzing student SAT-9 scores, we found that (students enrolled in Algebra Topics maintained similar percentile rankings while students not enrolled had their percentile rankings drop) or (students enrolled in Algebra Academy maintained similar percentile rankings to students who had not enrolled.) How do you feel about these results?

6) How are the grades looking for this year? How do you think the changes you have made in the second year of the program have affected students’ grades?

7) If you could start this whole program again under the same constraints of funds, time, manpower, etc. how would you do things differently?

8) If you had unlimited funds, time, manpower, etc. how would you do things differently?

Procedures

Coordinating teachers for both the Algebra Topics and Algebra Academy programs provided student rosters for both courses. Using these rosters, SAT-9 scores and semester grades were gathered by looking at student records at Diegueño Middle School and Carmel Valley Middle School.

Once the data were collected, they were organized using spreadsheets created in Microsoft Excel 2002. Because of the varying purpose of the two programs, the test and control populations were separate for Algebra Topics and the Algebra Academy.
The criterion for enrollment in Algebra Topics was students who received below a B- grade in one or both semesters of seventh-grade Pre-Algebra. Of the 45 students who qualified for the profile, 22 enrolled in Algebra Topics. The remaining 23 students did not enroll in Algebra Topics. This group of 45 students composed our population for the Algebra Topics study. Because of missing grade or test score data, 4 qualifying students were dropped from the study. This left an Algebra Topics population of 20 students and a Non-Algebra Topics population of 21 students.

Twenty students were recommended to enroll in the Algebra Academy. Of these 20 students, 10 elected to participate in the support program and 10 did not. This group of 20 students composed our population for the Algebra Academy study. This left an Algebra Academy population of 9 students and a Non-Algebra Academy population of 9 students. After identifying these students, all student names and identification numbers were removed.

Questionnaires were e-mailed to the two coordinating teachers. Both teachers completed the questionnaires and returned them by e-mail. In addition, the two coordinating teachers sent us the parent permission slips they use for their courses.
CHAPTER IV – RESULTS AND FINDINGS

The purpose of this study was to determine the efficacy of two math support programs offered in the San Dieguito Union High School District: Algebra Topics at Diegúeño Middle School and Algebra Academy at Carmel Valley Middle School. Our hypothesis stated that students enrolled in Algebra and one of these support programs would outperform students enrolled in Algebra without one of the support programs.

Because of the varying purpose of the two programs, the test and control populations were separate for Algebra Topics and the Algebra Academy. The purpose of Algebra Topics was to provide immediate support to students identified as likely to struggle in Algebra, particularly in the first semester. Students were invited to the course in advance of their enrollment in Algebra. The criterion for enrollment in Algebra Topics was students who received below a B- grade in one or both semesters of seventh-grade Pre-Algebra. Of the 45 students who qualified for the profile, 22 enrolled in Algebra Topics. The remaining 23 students did not enroll in Algebra Topics. This group of 45 students composed our population for the Algebra Topics study. Because of missing grade or test score data, 4 qualifying students were dropped from the study. This left an Algebra Topics population of 20 students and a Non-Algebra Topics population of 21 students.

The purpose of the Algebra Academy was to support students who were identified by their teacher as struggling during the first semester of algebra. Twenty
students were recommended to enroll in the Algebra Academy. Of these 20 students, 10 elected to participate in the support program and 10 did not. This group of 20 students composed our population for the Algebra Academy study. Because of missing test score data, 2 qualifying students were dropped from the study. This left an Algebra Academy population of 9 students and a Non-Algebra Academy population of 9 students.

Results: Algebra Topics vs. Non-Algebra Topics - Grades

Of the 20 students who enrolled in Algebra Topics, 2 students out of 20 (10%) dropped down a level of mathematics from Algebra to Pre-Algebra before the end of the first semester of eighth grade. Of the 21 students who did not enroll in Algebra Topics, 8 students out of 21 (38%) dropped down a level of mathematics from Algebra back to Pre-Algebra before the end of the first semester of eighth grade.

Of the Algebra Topics students, 2 students earned a grade of A in the first semester of Algebra (10%), 11 students earned a grade of B (55%), and 5 earned a grade of C (25%), 0 earned a grade of D (0%), and 0 earned a grade of F (0%). Of the Non-Algebra Topics students, 0 students earned a grade of A in the first semester of Algebra (0%), 3 students earned a grade of B (14%), 4 earned a grade of C (19%), 5 earned a grade of D (24%), and 1 earned a grade of F (5%).
Table 1: First Semester Grades of Algebra Topics and Non-Algebra Topics Students

<table>
<thead>
<tr>
<th>Letter Grade</th>
<th>Algebra Topics (n = 20)</th>
<th>% of Algebra Topics Population</th>
<th>Non-Algebra Topics (n = 21)</th>
<th>% of Non-Algebra Topics Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>2</td>
<td>10%</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>B</td>
<td>11</td>
<td>55%</td>
<td>3</td>
<td>14%</td>
</tr>
<tr>
<td>C</td>
<td>5</td>
<td>25%</td>
<td>4</td>
<td>19%</td>
</tr>
<tr>
<td>D</td>
<td>0</td>
<td>0%</td>
<td>5</td>
<td>24%</td>
</tr>
<tr>
<td>F</td>
<td>0</td>
<td>0%</td>
<td>1</td>
<td>5%</td>
</tr>
<tr>
<td>Dropped Algebra</td>
<td>2</td>
<td>10%</td>
<td>8</td>
<td>38%</td>
</tr>
</tbody>
</table>

Students who enrolled in Algebra Topics and remained in Algebra through the end of the first semester (n = 18) earned an average of 2.0 grade points in the second semester of Pre-Algebra with a standard deviation of 0.5 grade points. This corresponded with a letter grade of C. This group earned an average of 2.8 grade points in the first semester of Algebra with a standard deviation of 0.6 grade points. This corresponded with a letter grade of B-.

Students who did not enroll in Algebra Topics and remained in Algebra (n = 13) earned an average of 2.1 grade points in the second semester of Pre-Algebra with a standard deviation of 0.3 grade points. This corresponded with a letter grade of C. This group earned an average of 1.7 grade points in the first semester of Algebra with a standard deviation of 0.9 grade points. This corresponded with a letter grade of C-. 

Table 2: Letter Grades and Grade Point Equivalents

<table>
<thead>
<tr>
<th>Letter Grade</th>
<th>Grade Point Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>4 points</td>
</tr>
<tr>
<td>B</td>
<td>3</td>
</tr>
<tr>
<td>C</td>
<td>2</td>
</tr>
<tr>
<td>D</td>
<td>1</td>
</tr>
<tr>
<td>F</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 3: Grade Point Averages of Algebra Topics and Non-Algebra Topics Students

<table>
<thead>
<tr>
<th>Student Population</th>
<th>GPA 2&lt;sup&gt;nd&lt;/sup&gt; Semester Pre-Algebra</th>
<th>Standard Deviation</th>
<th>GPA 1&lt;sup&gt;st&lt;/sup&gt; Semester Algebra</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Algebra Topics Students (n = 18)</td>
<td></td>
<td>2.0</td>
<td>0.5</td>
<td>2.8</td>
</tr>
<tr>
<td>Non-Algebra Topics Students (n = 13)</td>
<td></td>
<td>2.1</td>
<td>0.3</td>
<td>1.7</td>
</tr>
</tbody>
</table>

Results: Algebra Topics vs. Non-Algebra Topics – SAT-9

The 20 students who enrolled in Algebra Topics had an average percentile rank of 75.4 for Total Math on the seventh grade SAT-9 with a standard deviation of 12.6. The average score of this group for Total Math on the eighth grade SAT-9 was a 75.2 with a standard deviation of 10.6.

The 21 students who did not enroll in Algebra Topics had an average percentile rank of 86.2 for Total Math on the seventh grade SAT-9 with a standard deviation of...
deviation of 7.3. The average score of this group for Total Math on the eighth grade SAT-9 was a 78.8 with a standard deviation of 14.0.

Table 4: SAT-9 Total Math Percentile Ranks for Algebra Topics and Non-Algebra Topics Students

<table>
<thead>
<tr>
<th>Student Population</th>
<th>SAT-9 Total Math 7th Grade</th>
<th>Standard Deviation</th>
<th>SAT-9 Total Math 8th Grade</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Algebra Topics Students (n = 20)</td>
<td>75.4</td>
<td>12.6</td>
<td>75.2</td>
<td>10.6</td>
</tr>
<tr>
<td>Non-Algebra Topics Students (n = 21)</td>
<td>86.2</td>
<td>7.3</td>
<td>78.8</td>
<td>14.0</td>
</tr>
</tbody>
</table>

Results: Algebra Academy vs. Non-Algebra Academy – Grades

Of the Algebra Academy students, 0 students earned a grade of A in the second semester of Algebra (0%), 1 students earned a grade of B (11%), and 4 earned a grade of C (44%), 3 earned a grade of D (33%), and 1 earned a grade of F (11%).

Of the Non-Algebra Academy students, 0 students earned a grade of A in the second semester (0%), 3 students earned a grade of B (33%), 4 earned a grade of C (44%), 2 earned a grade of D (22%), and 0 earned a grade of F (0%).
Table 5: Second Semester Grades of Algebra Academy and Non-Algebra Academy Topics Students

<table>
<thead>
<tr>
<th>Letter Grade</th>
<th>Algebra Academy</th>
<th>% of Algebra Academy Population (n = 9)</th>
<th>Non-Algebra Academy</th>
<th>% of Non-Algebra Academy Population (n = 9)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0</td>
<td>0%</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>B</td>
<td>1</td>
<td>11%</td>
<td>3</td>
<td>33%</td>
</tr>
<tr>
<td>C</td>
<td>4</td>
<td>44%</td>
<td>4</td>
<td>44%</td>
</tr>
<tr>
<td>D</td>
<td>3</td>
<td>33%</td>
<td>2</td>
<td>22%</td>
</tr>
<tr>
<td>F</td>
<td>1</td>
<td>11%</td>
<td>0</td>
<td>0%</td>
</tr>
</tbody>
</table>

Students who enrolled in the Algebra Academy (n = 9) earned an average of 1.6 grade points in the first semester of algebra with a standard deviation of 0.7 grade points. This corresponded with a letter grade between a C- and a D+. This group earned an average of 1.6 grade points in the second semester of Algebra with a standard deviation of 0.9 grade points. This corresponded with a letter grade between a C and a D. Students who did not enroll in the Algebra Academy (n = 9) earned an average of 1.8 grade points in the first semester of algebra with a standard deviation of 0.4 grade points. This corresponded with a letter grade of C-. This group earned an average of 2.1 grade points in the second semester of Algebra with a standard deviation of 0.8 grade points. This corresponded with a letter grade of C.
Table 6: Grade Point Averages of Algebra Academy and Non-Algebra Academy Students

<table>
<thead>
<tr>
<th>Student Population</th>
<th>GPA 1st Semester Algebra</th>
<th>Standard Deviation</th>
<th>GPA 2nd Semester Algebra</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Algebra Academy Students (n = 9)</td>
<td>1.6</td>
<td>0.7</td>
<td>1.6</td>
<td>0.9</td>
</tr>
<tr>
<td>Non-Algebra Academy Students (n = 9)</td>
<td>1.8</td>
<td>0.4</td>
<td>2.1</td>
<td>0.8</td>
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</tbody>
</table>

Results: Algebra Academy vs. Non-Algebra Academy – SAT-9

The 9 students who enrolled in the Algebra Academy had an average percentile rank of 75.8 for Total Math on the seventh grade SAT-9 with a standard deviation of 18.8. The average score of this group for Total Math on the eighth grade SAT-9 was a 76.7 with a standard deviation of 13.0.

The 9 students who did not enroll in Algebra Topics had an average percentile rank of 71.4 for Total Math on the seventh grade SAT-9 with a standard deviation of 26.3. The average score of this group for Total Math on the eighth grade SAT-9 was a 74.3 with a standard deviation of 26.4.
Efficacy of Math Support Programs

Table 7: SAT-9 Total Math Percentile Ranks for Algebra Academy and Non-Algebra Academy Students

<table>
<thead>
<tr>
<th>Student Population</th>
<th>SAT-9 Total Math 7&lt;sup&gt;th&lt;/sup&gt; Grade</th>
<th>Standard Deviation</th>
<th>SAT-9 Total Math 8&lt;sup&gt;th&lt;/sup&gt; Grade</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Algebra Academy Students</td>
<td>75.8</td>
<td>18.8</td>
<td>76.7</td>
<td>13.0</td>
</tr>
<tr>
<td>(n = 9)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Algebra Academy Students</td>
<td>71.4</td>
<td>26.3</td>
<td>74.3</td>
<td>26.4</td>
</tr>
<tr>
<td>(n = 9)</td>
<td></td>
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CHAPTER V – SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

As California legislation advances algebra standards to eighth grade, researchers, educators and students desperately seek successful support programs. Despite disagreement, U.S. Secretary of Education Richard W. Riley states, “The key to understanding mathematics is taking algebra or courses covering algebraic concepts by the end of eighth grade” (Smith & Phillips, 2000). In order to satisfy this demand, students require appropriate cognitive ability, classroom time, multiple teaching strategies, and support programs to achieve success. As research in the Review of the Literature describes, several support programs currently exist. Block scheduling, computer programs, elective options and tutoring provide multiple methods of student support. With the shift to eighth grade algebra, the San Dieguito District implemented two algebra support programs to increase instructional time in the classroom: Algebra Topics and Algebra Academy.

This study hypothesized that students enrolled in Algebra Topics or Algebra Academy would be more successful in algebra than those students not enrolled in one of these support programs. Students’ seventh and eighth grade SAT-9 scores and first and second Algebra semester course grades were analyzed to assess performance. For the Algebra Topics study, 41 students were sampled, with 20 students enrolled in the program and 21 students not enrolled. Algebra Topics was offered as an elective course taught during the regular school day. Students worked with an Algebra teacher
five hours each week, receiving homework help and lesson review that paralleled their algebra class. For Algebra Topics students, 65% earned first semester Algebra grades of B or higher, with no students receiving D’s or F’s. For those students not enrolled, only 33% earned grades of B or higher, with 29% earning grades of D or below. For the non-Algebra Topics students, eight dropped out of algebra during first semester. However, for those students enrolled in the support program, only two decided to drop out of algebra. In comparing SAT-9 scores, Algebra Topics students scored an average percentile rank of 75.4 in seventh grade and an average of 75.2 in eighth grade, proving no significant decrease. For the 21 non-Algebra Topics students, the seventh grade average percentile rank was 86.2 compared to the eighth grade average rank of 78.8. For the non-Algebra Topics students, the average SAT-9 score decreased from seventh grade to eighth grade. Analysis of Algebra grades and SAT-9 scores reveals Algebra Topics as an effective support program for eighth grade students.

For the Algebra Academy study, 18 students were examined, with nine students enrolled in the program, and nine students not enrolled. The Algebra Academy students worked with a volunteer teacher twice a week for 20 minutes each meeting. After comparing SAT-9 scores from seventh to eighth grade, both populations showed an improvement. For the Algebra Academy students, SAT-9 percentile ranks averaged 75.8 in seventh grade and 76.7 in eighth grade. For the non-Academy students, percentile ranks averaged 71.4 in seventh grade and 74.3 in eighth grade. Overall, the non-Academy students showed a greater improvement in SAT-9
scores than those students enrolled in the support program. When analyzing first
semester and second semester algebra grades, the non-Algebra Academy students
improved from an average of C- to a C. Grades for the Algebra Academy students
remained the same from first semester to second, showing no improvement. Out of
the nine students enrolled in the support program, only 55% scored a C or B for
second semester, with one student earning an F grade. For those students not enrolled,
77% earned a C or B, with no student earning an F grade. When comparing second
semester algebra grades, the Algebra Academy students averaged lower than non-
Academy students. Analysis of algebra grades and SAT-9 scores reveals the Algebra
Academy as an ineffective support program for eighth grade students.

Conclusions

By completing algebra in eighth grade, students gain the freedom to take
additional math courses in high school. In fact, the U.S. Department of Education
found that approximately 60 percent of students who took calculus in high school had
taken algebra in eighth grade. But in our attempt to advance algebra to eighth grade
and encourage students to take as many math courses as possible, is student
understanding being compromised? Are California state goals being met at the
expense of student learning? Our curriculum today has often been described as “a
mile wide and an inch deep,” covering far too many topics and not enough depth
(Silver, 1998). Algebra is no exception. Once a traditional ninth grade course, algebra
has moved on to eighth grade, with no changes in student expectation or curriculum.
Students are one year younger, and class sizes are often much larger. Can eighth
graders succeed in Algebra I?

As Skrobarceck et al. proclaim, “The key to liberating learning lies in unlocking time” (1997). Does more instructional time equal success? This paper examined the benefits of two different algebra support programs that exposed students to more algebra time in the classroom. Each program provided students the opportunity to review class material, ask additional questions, and receive homework assistance. The fundamental questions we focused on to analyze these two programs were:

- Did students enrolled in the Algebra Topics course perform satisfactorily or better in their Algebra I course than students of a similar academic profile that did not enroll in the Algebra Topics course?

The data collected revealed that students enrolled in Algebra Topics performed better than those students not enrolled. With concepts and lessons immediately reinforced, Algebra Topics provided additional instructional time and encouragement for students to succeed. Fewer students dropped Algebra I, and more students passed the course with A’s and B’s. Scheduled as an elective during the school day, Algebra Topics was taught as a class section by a credentialed teacher from the school. The teacher had knowledge of the algebra curriculum, and the opportunity to share ideas and concerns with others. Students who enrolled in the course willingly sacrificed their only elective option. In Algebra Topics, attendance was taken and students received a grade based on class participation and homework completion.
• Did students enrolled in the Algebra Academy perform satisfactorily or better in their Algebra I course than students of a similar academic profile that did not enroll in the Algebra Academy?

The data collected revealed that students enrolled in the Algebra Academy performed worse than those students not enrolled. Semester grades dropped, and SAT-9 scores showed no improvement. Taught by a credentialed teacher from outside the school, the Algebra Academy was organized as a volunteer position. The teacher was accessible part-time, two days a week. Students were invited to enroll in the Algebra Academy during second semester, where attendance was taken, but no academic grades were given.

Why was Algebra Topics an effective support program and the Algebra Academy a failure? Although both programs provided a "double dose" of algebra, the programs differed in accountability, time, structure and student perception. In Algebra Topics, students met with a teacher five hours each week, where attendance was taken, and students received letter grades for their performance. In the Algebra Academy, consequences for missing a class were not as detrimental. Students only met with a teacher twice a week for 20 minutes, attendance was not taken, and no grades were given for performance. Without assessment, are middle school students motivated to learn? Because the Algebra Academy was structured during the school's twenty-five minute tutorial time, class meetings were often sacrificed for school fire drills and assemblies. Compared to the Algebra Topics course, consistency and structure were weak in the Algebra Academy.
Efficacy of Math Support Programs

As a full time teacher on campus, the Algebra Topics teacher was accessible and visible, making communication easier between staff. Having previously taught eighth grade algebra, this teacher had insight to students' challenges and weaknesses. With this understanding, the Algebra Topics teacher may have better served students' needs. Having never taught at a middle school, the Algebra Academy teacher did not have this experience to draw upon. This teacher was only on campus part-time, making communication more difficult. When comparing the two courses, accessibility and content knowledge differed between the two teachers.

If students passed Pre-Algebra but had a B- or below in one or both semesters, they were invited to enroll in the Algebra Topics course at the beginning of eighth grade. With struggling students targeted early, reinforcement started immediately, providing algebra support throughout the year. In the Algebra Academy, students were selected much later. Students who struggled in first semester of Algebra I were invited to enroll in the Algebra Academy for the second semester. By waiting this long, was student motivation and self-esteem damaged? Was student perception already negatively affected? Although the program's goals were student support and encouragement, this support may have arrived too late. With additional time and an earlier start, the Algebra Academy could be improved.

In the 2001-2002 school year, twelve students enrolled in the Algebra Academy for second semester. Comparing first semester grades to third quarter grades, less than 50% showed improvement. On average, first semester grades dropped from a C- to a D+ for the third quarter. Will student scores continue to drop
by the end of the semester? Unfortunately, this is the program’s second year of existence, and its second year with no positive results. Comparing this year to last, were any changes made to the program? After questioning the Algebra Academy teacher, we learn that instruction and discipline practices were altered. The teacher is now using more collaboration, less direct instruction, giving more review worksheets before tests and quizzes, and is enforcing stricter rules and expectations. However, the amount of instruction time has remained the same. Frustrated by this lack of time, the teacher suggests longer sessions, mandatory attendance and an incentive program to improve student motivation.

How does the Algebra Academy teacher feel about the program’s poor performance? Recognizing that the program is far from perfect, the teacher is not discouraged by the results, and suggests that multiple factors contribute to student success in algebra. She believes the Algebra Academy to be an important and valuable program, but only one piece to the puzzle. If students are willing to take full advantage of the program, establish strong study habits, complete homework and seek additional tutoring when needed, eighth graders can succeed in algebra. It is important that students take responsibility for their own learning. Although the Algebra Academy students showed no improvement in SAT-9 scores, the teacher was not disheartened and questions the validity of the test. Does one test score accurately evaluate a support program? Without a doubt, eighth grade Algebra is a complicated dilemma. As described by Smith and Phillips, “learning algebra is a complex, multiyear process that involves many intellectual challenges” (2000).
Why is Algebra Topics a successful program? With consistent structure and continual assessment, the program devotes sufficient time for student learning. After questioning the Algebra Topics teacher, we learn that students develop a positive self-image and are excited to come to class. Demonstrating a strong understanding of the algebra curriculum, the teacher communicates daily with the mathematics staff and utilizes study guide materials from the district’s algebra textbook. Because the course is scheduled after students’ regular algebra classes, the teacher can immediately reinforce concepts and easily adjust to serve students’ needs. The teacher greatly appreciates this arrangement and believes it to be an integral part of student success.

How does the Algebra Topics teacher feel about the program’s positive performance? She is proud of her students and extremely supportive of the program. She trains them to become active learners. For those students who attended Algebra Topics since the beginning of the school year, algebra grades have improved. For those students who began Algebra Topics second semester, grades showed no improvement. The teacher is not discouraged by these results and admits that success relies on student character. For those that started late in the year, they lacked the commitment and motivation to succeed in the program. For next year, the Algebra Topics teacher plans to implement additional pre-algebra review to strengthen basic skills and utilize more logic problems and math games for motivation. If funding were unlimited, she suggests a class size of 20, where high school and college students help facilitate collaborative learning groups, and classroom computers are on hand to provide student review and practice. In the future, the teacher looks forward
to sharing student success rates with parents. Although Algebra Topics is a young program, it is certainly on the right path for success.

Can eighth graders find success in algebra? Students fail algebra for a variety of reasons, such as lack of basic skills, lack of motivation and poor study habits. Unfortunately, a simple solution to eighth grade algebra does not exist. Although the Algebra Topics course made a positive difference in student learning for students at Dieguezno Middle School, this course is not the solution for every student in California. What if a student is unwilling to sacrifice their only elective option to take the Algebra Topics course? How does this student receive support? Curriculum changes need to be made, where basic algebraic concepts are introduced and integrated in elementary school. Eighth grade algebra arrived without foresight and school districts are scrambling to cope and find effective support programs. For the 2002-2003 school year, the San Dieguito District will expand the Algebra Topics course to an additional middle school site.

Recommendations

Although the debate over the appropriateness of teaching algebra in eighth grade continues, California standards, textbook adoptions, professional development programs, and the STAR testing program have determined that eighth grade algebra is here to stay. All school districts must help students succeed in algebra, but many are unprepared to both fund and organize a program that will help the diverse student populations that exist in California today.
Middle schools have developed a wide variety of support programs for eighth graders taking algebra. Some are during the regular school day. Students can take a second math course instead of standard electives like art, drama, or foreign language. Peer tutors and parent volunteers assist students during breaks or study hall hours. Other programs are outside the school day. After-school math labs, homework help centers, Saturday classes, and evening classes are frequently staffed by teachers or parent volunteers. Special summer school courses help students review pre-algebra coursework to get them as ready as possible for algebra.

The results of this study suggest that the Algebra Academy may not be the most effective approach to helping students in algebra. Students who attended the two 20-minute sessions per week had similar grades and SAT-9 scores to those of students who did not enroll.

In contrast, Algebra Topics did help students maintain higher grades and lower drop rates in algebra. There are many differences which may influence the success of these programs. The Algebra Academy was taught by a parent volunteer with a math credential for 40 minutes total a week. Students were not enrolled in the course and attendance was not mandatory. In contrast, Algebra Topics was taught by a math staff member who has taught Algebra I in the past. Students spend 275 minutes a week in Algebra Topics, were given a grade for the course, and their attendance was taken at every class period.

Mandatory participation in a during-the-school-day algebra support program for students who struggled in Pre-Algebra and/or Algebra I might also increase
success rates. Lower class sizes in eighth grade algebra courses and the support program that accompanies them may also boost student performance.

By dedicating a staff member, classroom, and funding for the Algebra Topics course, the San Dieguito Union High School District has put its full support behind helping struggling algebra students. Instead of just homework help or review, Algebra Topics provides immediate reinforcement and allows students the time to master difficult concepts. This idea of “double dosing” has worked at other schools. Timilty Middle School in Roxbury, Mass. was ranked last on standardized test scores (Schulz, 1991). Five years later, after enrolling all students in a “daily double” of math and reading, Timilty Middle School jumped to first place. At Lake Taylor High School in Norfolk, Virginia, students enrolled in a double dose of algebra had higher grades and passing rates (Schulz, 1991).

More students may succeed in algebra if some of the following recommendations are implemented:

Recommendations for middle school principals:

- Analyze semester grades and SAT-9 scores to determine the effectiveness of existing algebra support programs. Re-evaluate the length and duration of existing algebra support programs.
- Determine the focus of the program – to help students throughout the whole year, or just the first or second semester.
Efficacy of Math Support Programs

- Determine the criteria for participation in the algebra support program – grades, SAT-9 test scores, etc.
- During students' seventh grade year, advertise the support program that will be offered alongside Algebra I.
- Have math teachers attend workshops focusing on implementing teaching strategies and techniques used to help students grasp algebraic concepts.
- Work with teachers to identify the most important concepts to be covered in an algebra support program. Provide teachers with opportunities to develop curriculum to meet the needs of this year's particular group of students.
- Work with teachers to determine how closely the support program will follow the Algebra I pacing.
- Help teachers assess the individual needs of each student in the algebra support program through SAT-9 analysis, special tests, or computer software evaluations.
- Analyze test data and semester grades and make adjustments and improvements to the program as needed.

Recommendations for district office policy makers:

- Analyze semester grades and SAT-9 scores to determine the effectiveness of existing algebra support programs. Re-evaluate the length and duration of existing algebra support programs.
• Dedicate time, money, and staff to an eighth grade algebra support program that occurs during the school day as an elective course.

• Lower the class size for eighth grade algebra courses or increase instructional aide support to reduce the student to teacher/aide ratio.

• Provide math departments with the financial opportunity and research data to develop a successful algebra support program that is standards and research based.

• Review the demographic data of students taking algebra. If socio-economic or race dominates, what can be done to better educate both students and parents?

• Contact other districts to find out how they are helping struggling students in algebra. Investigate both financial resources and program descriptions at the state level.

Implementing some of these recommendations would help schools develop and implement an eighth grade algebra support program that would help struggling students succeed in algebra. As the move of algebra to eighth grade is relatively new, middle schools and districts in California are independently trying to develop support programs. It is imperative that districts work together to share what is working and what is not.

Additional Recommendations

As discussed in the Review of Literature, there are many different scheduling and tutoring options which have been conceived and implemented to help students
succeed in eighth grade algebra. Due to the novelty of eighth grade algebra, there has been little time for much research to be done to determine which strategies seem the most affective. Furthermore, the small amount of research that has been done is often contradictory. It is clear that further “thinking outside of the box” is necessary to determine what best helps struggling students.

Many students and teachers favor Algebra I being taught as a 120 minute block period, allowing students and teachers to have more time and less stress. Research is mixed on the success of such block periods. Rettig and Canady present the Variable Learning Time schedule (1998). Dividing up the algebra curriculum into four parts, each section is taught during a two-period block of time. After each quarter, students are assessed then regrouped, allowing students to either spend additional time or move on. As a result, students completed Algebra I in one to two years, depending on their mastery of each section. Rettig and Canady found the Variable Learning Time schedule helped large numbers of students complete algebra successfully. The fluctuation in class size, however, can wreck havoc on the master schedule.

Some school districts are extending algebra over two years. This scheduling strategy does provide students more time to master the curriculum, but other school districts are concerned that this two-year option will prevent students from taking higher level math courses in high school. The “looping” strategy, enrolling students with the same teacher in seventh and eighth grade, is another option. This strategy can increase time on task, but there is little research to show its effectiveness.
Summer school can also provide more learning time, but can also be disorganized and have low attendance rates. Although summer school is asked to cover the same curriculum as a year-long course, class sizes are smaller and meet several hours a day, providing a concentrated focus on the curriculum. Research is mixed on the success of summer school as an effective option for remediation.

After-school tutoring programs seem effective sometimes and under certain conditions. Variables such as training, location, duration, tutor-to-tutee ratio, type of instruction, and follow-up all work together to determine if a tutoring program is successful or not. In the Algebra Topics class, the instructor noted that active learning is very important - "This year I am also trying to be more diligent about making kids work along with me - not just watch and listen - but 'DO' math." She wanted to empower students by actively involving them in doing algebra, not enabling them or just acting as a study hall. Classwide Peer Tutoring is another option in which students within the same classroom tutor each other, but the complexity of the procedure prevents many schools from implementing this program (Greenwood & Delquadri, 1995).

Schools must create a clear vision and decide upon a purpose for their support program. Is the purpose to provide immediate support to students identified as likely to struggle in algebra, particularly in the first semester? Or, is the purpose to provide support in the second semester to students who were identified by their teacher as struggling during the first semester of algebra? In addition, schools must decide if their program is proactive or just a "bandaid." Will students receive additional pre-
algebra review before entering Algebra I? Or will students receive extra instruction during just the first semester, the second semester, or the whole year of algebra? Is the algebra support program designed to combat high drop out rates, low semester grades, low SAT-9 test scores, or all three? Administrators and teachers must answer these questions and set explicit goals for student improvement. Only then will staff members be able to analyze, monitor, and adjust the program to show the results they desire.

Above all, we need teachers and administrators who are dedicated to helping students succeed. More information and study about eighth grade algebra support programs is needed. Existing data is often contradictory, making it difficult for administrators to design a support program that is “research based.” As the demographics of each school are so different, it is clear that there is not one program that will work for all schools. Each district and each school must find what works best for their own students. In regards to tutoring and support programs, there is no “one size fits all.”
Part I: The following represents data for students who did enroll in the Algebra Topics course.

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Part I: The following represents data for students who did enroll in the Algebra Academy course.

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APPENDIX B

Part II: The following represents data for students who did not enroll in the Algebra Academy course.

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<td>83</td>
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</tbody>
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APPENDIX C

Questionnaire for Algebra Topics Coordinating Teacher

When designing your activities, instruction, etc. do you get support and ideas from other teachers, or do you do this alone? How do you feel about this arrangement? Do you feel you are helping students succeed in algebra?

What have you done differently this year than you did last year?

How will you alter the class even further next year?

Analyzing student grades, we found that students enrolled in Algebra Topics had lower drop rates and higher grades than students who did not enroll. How do you feel about these results?

Analyzing student SAT-9 scores, we found that students enrolled in Algebra Topics maintained similar percentile rankings while students not enrolled had their percentile rankings drop. How do you feel about these results?

How are the grades looking for this year? How do you think the changes you have made in the second year of the program have affected students' grades?

If you could start this whole program again under the same constraints of funds, time, manpower, etc. how would you do things differently?

If you had unlimited funds, time, manpower, etc. how would you do things differently?

We would greatly appreciate any copies of handouts for parents or students describing the program. Thank you.
Questionnaire for Algebra Academy Coordinating Teacher

When designing your activities, instruction, etc. do you get support and ideas from other teachers, or do you do this alone? How do you feel about this arrangement? Do you feel you are helping students succeed in algebra?

What have you done differently this year than you did last year?

How will you alter the class even further next year?

Analyzing student grades, we found that students enrolled in the Algebra Academy had similar grades to those of students who did not enroll. How do you feel about these results?

Analyzing student SAT-9 scores, we found that students enrolled in Algebra Academy maintained similar percentile rankings to students who had not enrolled. How do you feel about these results?

How are the grades looking for this year? How do you think the changes you have made in the second year of the program have affected students’ grades?

If you could start this whole program again under the same constraints of funds, time, manpower, etc. how would you do things differently?

If you had unlimited funds, time, manpower, etc. how would you do things differently?

We would greatly appreciate any copies of handouts for parents or students describing the program. Thank you.
Dear Parent(s) of ________________________,

This semester the Diegueño Math department will offer an elective entitled Algebra Topics. This course will provide daily support for students enrolled in algebra I and will be scheduled within the regular school day. Organizational skills, remediation and homework assistance for the students in their already assigned algebra class will be the focus of the class. Regular attendance coupled with an emphasis on the use of the daily agenda and the notes taken in the algebra class will be stressed for this support course. The homework assigned by your student’s current math teacher will be worked on each day. Some additional homework might be assigned for this elective class. This Algebra Topics class would be scheduled as one the student’s electives for the first semester.

The grade earned in the Algebra Topics elective will be a reflection of the student’s effort and will not represent mastery of concepts taught or fulfill the requirements of the Algebra I course.

Your student has been recommended for this course. I strongly urge you to support this elective class to help your student successfully complete the algebra I course. Space is limited for this elective and students who opt to not take this elective will very probably not have a seat available to him/her later in the semester. If you have any additional questions please contact your child’s counselor.

Math Department
Diegueño Middle School
Dear Parents:

Congratulations! ______________________ has been selected for the 2nd semester Algebra Academy. This extra help session meets during the tutorial period on Tuesday and Thursday of each week. The Academy is designed to provide additional support and homework help in algebra. This is a wonderful opportunity to get extra help during the school day in a small group environment. The Academy will begin on February 12th. Please check one of the following choices, sign & return this sheet.

____ Yes! Please enroll my student in the Algebra Academy.

____ Thanks anyway! Please give our spot to another student.

Parent/Guardian Signature _______________________________
REFERENCES


Efficacy of Math Support Programs


Efficacy of Math Support Programs


MacDonald, Mary. (2001, August 23). South Cobb students to get help; Turnover, scores concern board. The Atlanta Constitution, p. 1JF.


Efficacy of Math Support Programs


Efficacy of Math Support Programs


