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A Correlational Study of the AVID Program with M.S. Math Achievement

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A CORRELATIONAL STUDY OF THE ADVANCEMENT VIA INDIVIDUAL DETERMINATION (AVID) PROGRAM WITH MIDDLE SCHOOL STUDENT ACHIEVEMENT IN MATHEMATICS

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ABSTRACT

Improving student achievement in mathematics in secondary schools remains a priority for public education in our country. With continued federal and state mandates to improve overall student achievement in mathematics, as well as to close the achievement gap, many school districts have sought programs, such as Advancement Via Individual Determination (AVID), to assist in improving student performance. The mission of AVID is to improve the academic achievement of students who are often in the "middle" or "average" and who are typically minorities and are economically disadvantaged. AVID seeks to support these students by providing them with the strategies that successful students often use, including honing their understanding of writing, inquiry, collaboration, and reading, and developing techniques to improve their organization and critical thinking skills, so they stand a greater chance of entrance into a four-year college or university upon graduation from high school.

The purpose of this quasi-experimental study was to examine the impact of the AVID program on seventh and eighth grade student achievement in mathematics as measured by the Colorado State Assessment Program (CSAP). This study, conducted in a middle class suburban middle school of a large school district, compared matched pairs of AVID elective students, AVID team students, and non-AVID students from their 2008 overall CSAP results in mathematics and in the sub-content areas of number sense and

geometry with their 2009 overall CSAP results in mathematics and in the sub-content areas of number sense and geometry.

The results of this study were mixed. Students who participated in the AVID elective class showed statistically significant improvement in their mathematical achievement as measured by CSAP; however, no significance was found when comparing student achievement of AVID elective students with AVID team students or non-AVID students. The AVID program, therefore, may have an overall positive impact on student achievement for those students who are able to participate in classes with AVID trained teachers.

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INTRODUCTION

Background

You hardly notice them. They are the kids who sit quietly in overcrowded classrooms, rarely misbehaving, scraping by with poor or mediocre grades, forever teetering between success and failure (Bushweller, 1998). We refer to these students as "average" or "students in the middle." These students have low expectations for themselves, and their teachers expect little of them as well. These students often drift from class to class without pushing themselves. They are taught to accept mediocrity. Yet, these students are only a few steps from excelling like their classmates who routinely maintain high grade point averages, enroll in advanced classes, and perform well on assessments.

It is difficult to pick up the newspaper without reading about the crisis in public education, especially declining test scores and increasing dropout rates. Employers are frustrated with poorly educated high school graduates. Taxpayers wonder why public schools are not doing a better job of educating society's children. Politicians scramble to offer solutions to worsening conditions.

In particular, our schools and communities struggle to produce students who enter post-secondary opportunities with a stronger foundation in mathematics. Colleges and universities continue to face challenges in admitting and supporting students who leave high school with poor skills in mathematics and science (Schmidt, McKnight, & Raizen, 1997). Tutoring college and university students in basic mathematics has become commonplace for many institutions (Schmidt, McKnight, & Raizen, 1997). Moreover, several of the leading careers in the 21st century now rely on strong skills in mathematics (Adelman, 2006). Employers desire students who are proficient in mathematics and understand how to apply their knowledge and skills in real world situations.

Students in the middle, who continue to be underserved in our schools, compared to students who either are identified as gifted and talented or as disabled learners, continue to fall behind in their classes and struggle to reach their potentials – especially in mathematics. Under the current conditions of many schools, change efforts remain ineffective and, subsequently, keep students in the middle struggling to reach their full potential.

Statement of the Problem

One may argue that more than any other subject, mathematics separates students out of programs leading to scientific and other professional careers. Mathematics not only filters students out of certain career paths, it can keep them out of school itself. This problem is compounded by the fact that there is a limited vision as to how to educate today's children in mathematics in the United States (Schmidt, McKnight, & Raizen, 1997). During the 1970's, schools stressed computational mathematics and the placement of students in developmentally appropriate levels so that they would achieve at their own paces. This method of teaching mathematics was not effective, and educators were convinced that computational facility was not useful if students did not know when to use the mathematical processes they were learning (Findell, 1996).

During the late 1980's and the early 1990's, major restructuring in mathematics was recommended by the National Council of Teachers of Mathematics (NCTM, 1997). The NCTM *Professional Standards for Teaching Mathematics* provided guidelines for teachers in hopes that it would improve their mathematics instruction. The NCTM standards asserted that being mathematically literate included having an appreciation of the value and beauty of mathematics as well as being able and inclined to appraise and use quantitative information (NCTM, 1989). However, the National Assessment of Educational Progress (NAEP) historical trends from 1973 to 2008 indicated no significant changes in mathematics achievement, despite the efforts produced by NCTM (NAEP, 2008).

Complicating the situation is the prevailing attitude of the public that innate ability is the main cause of high achievement in mathematics (Stevenson & Stigler, 1992). "American children view learning mathematics as a process of rapid insight rather than lengthy study. They believe that a mathematics problem is only solvable if it can be solved in less than ten minutes" (Stevenson & Stigler, 1992). The belief is that one either possesses this ability or one does not. Additionally, there appears to be a general acceptance with respect to not doing well in mathematics at school (Stevenson & Stigler, 1992).

Purpose of the Study

One possible intervention to address student achievement is the college preparatory program known as Advancement Via Individual Determination (AVID), which seeks to increase opportunities for minority or underachieving students to enroll in four-year universities by providing both academic and social support in rigorous courses.

The program was established in 1980 by a high school English teacher, Mary Catherine Swanson, who believed that all students had the ability to succeed if they were held accountable to high standards and expectations. Currently, the program has expanded exponentially from 32 students in San Diego, California, to over 4,500 schools in 45 states and 16 countries around the world, serving approximately 400,000 students (AVID Center, 2006). The AVID program seeks to level the playing field for all students despite socioeconomic level, ethnicity, gender, or any other obstacles they have encountered.

A review of literature suggests a lack of research conducted on the relationship between the AVID program and student achievement in mathematics at the middle school level. The results of this study will assist school administrators who are making decisions about AVID as a way to support improved student achievement in mathematics at the middle school level, prioritizing professional development needs, and expanding the AVID program within middle schools.

The purpose of this study was to investigate whether training teachers in Advancement Via Individual Determination (AVID) instructional strategies in mathematics made a statistically significant difference in their students' academic growth in mathematics as measured using the Colorado Student Assessment Program (CSAP), compared to students' academic growth in mathematics who had not been instructed by teachers trained in AVID methodologies. This study also investigated whether students who were enrolled in the AVID elective class and received their mathematics instruction from AVID trained teachers demonstrated greater academic growth in mathematics as measured using CSAP than did their peers who only received their instruction from AVID trained teachers but who were not enrolled in an AVID elective class.

Research Questions

This correlational study sought to address how the AVID program impacted mathematical student achievement at Huntington Middle School (pseudonym), a middle class suburban school within a large school district. Specifically, this study addressed the following overarching question:

1. Is there a correlation between AVID teacher training and student participation and mathematical student achievement for seventh and eighth grade students at Huntington Middle School?

This correlational study also sought to address how the AVID elective class and AVID trained teachers were valuable to impacting mathematical student achievement.

2. After participating in the AVID elective class, did middle school students from seventh and eighth grades demonstrate statistically significant academic growth in mathematics and the sub-content areas (as measured using the Colorado Student Assessment Program) when compared to a group of middle school students who were on the AVID academic team but who were not in the AVID elective class?

In addition, this correlational study sought to address how AVID trained teachers were valuable to impacting mathematical student achievement even if students did not participate in the AVID elective class.

3. After participating in the AVID elective class, did middle school students from seventh and eighth grades demonstrate statistically significant academic growth in mathematics and the sub-content areas (as measured using CSAP) when compared to a group of middle school students who were non-AVID students?

Lastly, this correlational study sought to address how AVID trained teachers were valuable to impacting mathematical student achievement even if students did not participate in the AVID elective class or on the AVID academic team.

4. After participating on the AVID academic team (but not in the AVID elective class), did middle school students from seventh and eighth grades demonstrate statistically significant academic growth in mathematics and the sub-content areas (as measured using CSAP) when compared to a group of middle school students who were non-AVID students?

Assumptions

The following theoretical and empirical assumptions grounded this study:

Theoretical

1. The teaching strategies used by mathematics teachers can influence student achievement.
2. AVID professional development in mathematics provides unique strategies for teaching that are utilized by the teacher.
3. Growth on state standards-based assessments is a good indicator of student achievement in mathematics.

Empirical

1. The target population is sufficient (approximately 600 students) to make generalizations to a larger population of seventh and eighth grade students.
2. The sample groups are sufficiently representative of a larger general population of seventh and eighth grade students.

3. Participating in the AVID Summer Institute and the follow-up workshops is a reliable method to determine that a teacher is trained adequately and uses AVID instructional strategies and methodologies in the classroom.

Definitions of Terms

Average students are those who are neither labeled gifted and talented nor learning disabled by the Mountain School District guidelines and whose grades typically fall in the middle, usually earning B's and C's.

AVID stands for Advancement Via Individual Determination. AVID comes from the Latin root avidus meaning "eager for knowledge." It is a college preparatory program for underachieving, underserved students. AVID focuses on restructuring schools from the classroom. Teachers from core content classes, along with school administrators and counselors receive training during the summer in AVID methodologies related to their subject areas.

AVID team consists of a four-person core academic (language arts, mathematics, science, and social studies) teaching team in which the teachers have been trained in AVID instructional strategies and methodologies.

AVID elective class consists of students who are on the AVID team and, in addition, receive targeted organizational strategies, questioning skills, and tutorial sessions to support high level thinking on a daily basis.

AVID instructional strategies and methodologies include writing, inquiry, collaboration, and reading (WICR) that are the key components found in all classrooms with AVID trained teachers. These strategies provide the foundation for AVID students to improve their achievement in reading, writing, and mathematics.

Colorado Student Assessment Program (CSAP) is designed to provide schools a picture of how students are doing to ensure they are progressing toward meeting the Colorado Content Model Standards and Benchmarks. All Colorado students in grades 3 – 10 complete the CSAP assessments each spring in reading, writing, mathematics, and in select grades, science.

Mathematics achievement data is kept by a district on the achievement of its students. In mathematics, most districts keep student data on standardized multiple-choice test scores and academic grades. Some districts also assess students on constructed response questions, such as writing a detailed solution to a problem. Achievement in mathematics can also be measured over time.

Middle schools are transformed junior high schools. Unlike junior high schools, which are often designed as mini-high schools that deal primarily with academics, middle schools were created to address the academic, social, emotional, and physical needs of young adolescents. Middle schools are organized in different configurations. Some of them are seventh and eighth grade only, whereas some consist of sixth, seventh, and eighth grades grouped in teams.

Tutorials consist of college level tutors coming into the AVID classroom and tutoring a small group of students at one time using the Socratic method. This allows students to learn from one another and from the tutor.

Overview of Dissertation

The statement of the problem, purpose of the study, research questions, assumptions, and definitions of terms of this study were presented in Chapter One. Chapter Two contains a review of the literature related to student achievement in mathematics with respect to middle school students. The history of AVID, how students are identified for AVID, and pertinent literature regarding the objectives of the AVID program are all discussed. The design and procedures for the research are presented in Chapter Three, and the data analysis is described in Chapter Four. In Chapter Five, general conclusions, implications, and recommendations for future research are made.

Chapter Two

REVIEW OF LITERATURE

Middle School and Mathematics

Tracking

Research by Oaks (1988), Fennema and Sherman (1977), and Wheelock (1992) clearly show that the practice of middle and high school tracking forces many students into low-level mathematics classes. In vast numbers, these students tend to be minorities and students from disadvantaged homes. This practice of tracking appears first in middle school mathematics and English classes and continues as the tracked students proceed through high school.

The problem is not a recent one. Since the mid-20th century, America has been examining its mathematics and science programs so that more students might enter fields to help our country be more competitive globally in such areas as space, engineering, and medicine. Educators tried various approaches and instructional models, including hands-on mathematics. None of these programs succeeded in making our students first in the world in mathematics and science.

Instead of looking at mathematics as a single issue that had to be fixed or providing short-term solutions to a system that was already failing, some reformers set out to change the entire education system to deal with the current realities. Research by

Treisman (1997), Darling-Hammond (1997), and Rosenholtz (1991) shows that successful schools have successful teachers who motivate their students to be successful.

The document, *Caught in the Middle* (NMSA, 1987), strongly recommends an untracked middle school where teachers address the social, emotional, and physical needs of their students. Instead of caring solely for the academic needs of students, teachers need to care about the emotional, social, and physical needs of students. Many California junior highs transformed themselves into middle schools. The vision was that the school would be divided into small teams or families in which a core of students would take the same subjects without being tracked, and teachers would get to know their students better. By knowing their students' interests, teachers would design exploratory and interdisciplinary classes that would tap into these interests and would create a desire for students to want to come to school (Lipsitz, Mixell, Jackson, & Austin, 1997).

As a result, many middle schools only superficially addressed the area of mathematics. While math classes and interdisciplinary classes were seen on master schedules, a variety of math classes of various levels were also seen at each grade. Even though students were on the same team, they were tracked into different mathematics classes based on ability. Again, it seemed that even though a structure existed for un-tracking students, the disadvantages associated with tracking still persisted. Minority students and students from disadvantaged homes were continually tracked into low and remedial mathematics classes from junior high to high school, repeating basic arithmetic computational courses (Oaks, 1995).

The claim that tracking is prevalent in the middle grades is supported by data obtained from the National Achievement of Educational Progress (NAEP) Examination

(Mullis, Dossey, Owen, & Phillips, 1991). The study indicated nationally that nearly two-thirds of the nation's schools engaged in tracking. In addition, *Caught in the Middle* (NMSA, 1987), argued that the assignment of "at risk" students, who are deficient in basic skills, to extensive blocks of remedial instruction often fails because it reinforces negative self-perceptions by emphasizing students' past failures and deprives them of cognitive stimulation. Ladson-Billings (1994) stated that placement in low tracks is likely to mean less attention and individualized instruction from the teacher. In a kind of self-fulfilling prophecy, students who have remedial instruction perform at lower levels. Their ability to rise above these levels is compromised because they get less attention. Consequently, they continue the cycle of poor school performance. Reviewing national data, Oaks (1990) and her colleagues from the Rand Corporation reported that tracking practices across schools resulted in entire schools being dominated by remedial programs. Oaks (1988) also showed that mathematics was one of the major causes for tracking minority and impoverished students into inferior, non-college preparatory programs. Many students dropped out of mathematics convinced that only geniuses could learn it.

Minorities

Providing equal access to academically rigorous mathematics courses continues to challenge educators, especially as it relates to minority students. Adelman (1999) stated in *Answers in the Toolbox* that the academic intensity and quality of a student's course of study is a far more powerful predictor of bachelor's degree attainment than class rank, grade point average or test scores. He found that this impact was far more pronounced in African-American and Latino students than for any other group. In fact, in 2006, Adelman revisited his *Answers in the Toolbox* and the critical role mathematics teachers' play was more clearly defined. In *The Toolbox Revisited: Paths to Degree Completion From High School Through College* (2006), Adelman indicated that the highest level of mathematics reached in high schools continues to be a key marker in pre-collegiate momentum, with the tipping point of momentum toward a bachelor's degree now firmly above Algebra 2. In addition to college access and success, a rigorous curriculum predicts greater skill in the workforce and greater wage-earning potential. An extensive study conducted by Educational Testing Service (2004) found that "84 percent of highly paid professionals and 61 percent of well-paid, white-collar professionals had taken Algebra 2 or higher-level mathematics courses while only 30 percent of low-to-moderately skilled and low-paid workers had done so" (American Diploma Project, 2004 p. 11). These findings make a strong case for all schools to provide all students, not just those enrolled in college preparatory courses, with a rigorous academic program that includes preparation for and access to Algebra 2 and beyond.

Standards

The standards released by The National Council of Teachers of Mathematics (NCTM) support these definitions of rigor, which promote mathematical thinking, reasoning, and understanding (NCTM, 2000). The NCTM has repeatedly extended a philosophy of students as active constructors of mathematical knowledge, and teachers are to serve as facilitators of students' learning by providing classroom experiences in which students can engage with rich mathematical tasks, develop connections between mathematical ideas and between different representations of mathematical ideas, and collaboratively construct and communicate their mathematical thinking (NCTM, 2000).

In sum, students must be given an opportunity to investigate important and worthwhile mathematics with understanding that goes beyond procedural knowledge.

Despite restructuring of middle schools to address the whole child and even though NCTM standards were widely adopted, historical trends from the National Assessment of Educational Progress (NAEP, 2008) indicate no significant changes in mathematics achievement. Furthermore, data from the Third International Mathematics and Science Study (TIMSS) reveals that mathematics achievement of middle school students remains low. In a 1995 study, American eighth graders stood 18^{th} in mathematics out of 40 countries. United States eighth graders were outperformed by Japan and Germany, countries that are our economic competitors (Schmidt, McKnight, & Raizen, 1997). In order to compete in a 21^{st} century global economy, middle school mathematics achievement must be improved.

The AVID Program

History

In recent years, attention has been drawn to systemic reform programs such as Advancement Via Individual Determination (AVID). AVID is designed to prepare middle and high school students with average abilities from groups traditionally underrepresented in postsecondary education for eligibility and success in four-year colleges and universities. It recognizes that the only way some students can get into or succeed in college is by perseverance, hard work, and as the AVID name reveals, individual determination.

AVID is a school restructuring or school change program established in 1980 by two English teachers at Clairemont High School in San Diego, California. Many disadvantaged students assigned to the school were not achieving at academic levels that would allow them entry into four-year colleges or universities. Because of concern for students' lack of entry and success at the post-high school level, Mary Catherine Swanson, one of the program's founders, promoted a belief that a team consisting of students, content area teachers, counselors, administrators, parents, college personnel, and business people was necessary to support a student's academic success. Through this team effort, the AVID program was born. The AVID program components were designed to encourage not only entry into four-year colleges and universities for students, but to help them maintain an acceptable level of excellence.

While the program was originally designed as an intervention for high school students, in the mid-1980s, when AVID began to expand beyond San Diego City Schools, and middle school students were transitioning to high school, AVID programs were addressed through a summer bridge program for students exiting eighth grade and entering ninth grade. By 1989-1990, however, an AVID middle level program had been implemented, and the summer bridge program was discontinued. Since then, the number of AVID programs in California has increased to approximately 119 (Guthrie & Guthrie, 2002).

Swanson (1996) stated that middle level AVID programs had grown dramatically as it had become increasingly clear that assistance and support for low income and underachieving students had to begin earlier than ninth grade. Swanson expressed that, although the objectives of middle level AVID were much the same as in high schools, the organization and curriculum of the middle grades, as well as the developmental level of students, required some modifications to the program. She indicated that these included, for example, a focus on college awareness rather than college applications and a focus on literacy and numeracy. Swanson emphasized that the goal of middle level AVID was to successfully transition middle school students to a high school curricular path that would lead to college.

According to Swanson, AVID, during its thirty years of existence, has grown from a single classroom in one school to more than 4,500 schools in 45 states and 16 foreign countries, enrolling more than 400,000 students. Since 1990, more than 4,000 students have graduated from AVID programs in San Diego County alone. Of these participants, 93.8% have enrolled in college, where 89% remain two years later. This is a college enrollment rate 75% higher and a retention rate 60% higher than the national average (AVID 2006). While research has shown that AVID high school students experience success in getting into college, little research has been conducted on AVID at the middle school level, especially related to mathematics.

Objectives

AVID is designed to achieve specific objectives. The program requires that students enroll in honors and advanced placement classes, and it supports students while they participate in rigorous college preparatory programs. It aids students in the development of good study habits and academic survival skills. Students, through AVID, learn appropriate writing and time management skills. Students also receive support in maintaining grade point averages that will be competitive in applying to four-year colleges and universities. AVID fosters positive attitudes toward school and higher education, helps students become knowledgeable about colleges, and assists students in developing a plan to get to college. Moreover, AVID fosters opportunities for students to apply to appropriate colleges and to utilize the financial aid process to the fullest. AVID helps create students that college presidents and admissions officers of public and private colleges and universities will solicit for enrollment (Guthrie & Guthrie, 2002).

The AVID elective class, professional development, curriculum, teaching strategies, and district and school-wide support are important factors that make the program successful (Guthrie & Guthrie, 2002). Students enrolled in the AVID elective class have access to a variety of resources; they learn organizational skills, such as time management, study skills, and critical thinking that will allow them to succeed in college. A unique element of the program relies on the use of college students as both tutors and role models. As a result, the program seeks to build their self-confidence and self-image to become leaders at school. AVID elective teachers and content area teachers at the school site receive support through attending workshops and summer institutes to reinforce curriculum-writing, inquiry, reading, and collaboration. More importantly, AVID seeks to revolutionize the perception of teachers who believe that low-income minority students cannot succeed.

In order to retain the high caliber and quality of the AVID program, the AVID Center requires that schools must receive certification from the local area agency for implementing the "AVID Program Essentials." According to Advancement Via Individual Determination (Guthrie & Guthrie, 2002), these essentials are:

1. AVID student selection focuses on students in the middle (2.0-3.5 GPA's as one indicator) with academic potential, who would benefit from AVID support to improve their academic record and begin college preparation.
2. AVID program participants, both students and staff, must choose to participate.

3. The school must be committed to the full implementation of the AVID program, with the AVID elective class available within the regular academic school day.
4. AVID students must be enrolled in a rigorous course of study that will enable them to meet requirements for university enrollment.
5. A strong, relevant writing curriculum provides the basis for instruction in the AVID elective class.
6. Inquiry is used as a basis for instruction in the AVID elective.
7. Collaboration is used as a basis for instruction in the AVID classroom.
8. A sufficient number of tutors are available in the AVID class to facilitate student access to rigorous curriculum.
9. AVID program implementation and student progress are monitored through the AVID Data System, and results are analyzed to ensure success.
10. The school or district has identified resources for program costs, has agreed to implement AVID Program Implementation Essentials and to participate in AVID Certification, and has committed to ongoing participation in AVID staff development.
11. An active interdisciplinary site team collaborates on issues of student access to and success in rigorous college preparatory classes.
12. AVID provides support for students to succeed in higher level mathematics.
13. AVID teachers participate in ongoing, high quality staff development through the regional coordinator workshops and the AVID Summer Institute.

14. The AVID site coordinator must be a seasoned, highly-respected, and dedicated senior teacher with specific knowledge and skills. The AVID coordinator must be an expert in college admissions, public relations, and other special areas.

The AVID site team, a small learning community, is composed of all the stakeholders (i.e. students, faculty, AVID elective teachers, administrators, college tutors, counselors, and parents) who meet frequently to discuss how to improve the program and is ultimately responsible for getting the school certified. A comprehensive rubric based on the program essentials (with performance levels designated as Not AVID, Meets Standard, Routine Use, or Institutionalized) is provided to each school site every year to reflect and analyze its own practices. There are seven categories of certification which include: New AVID Site, Affiliate AVID Site, Certified AVID Site, Certified and Eligible to Become AVID Demonstration School, Certified with Distinction, Inactive, and De-certified Site. Typically, most schools successfully implementing the program receive certification, and schools that exceed the minimum standards are designated as demonstration sites. Regional offices train teachers through ongoing one day workshops conducted monthly and week long summer institutes conducted yearly.

Students

Potential AVID students are identified by counselors, teachers, parents, or by students themselves. AVID's three criteria (ability, desire, and determination) and membership in an underrepresented group are vital to the program's success. AVID students possess the academic potential to succeed in college preparatory courses with tutorial support. According to Guthrie and Guthrie (2002), the typical AVID student has a grade point average (GPA) of 2.0 – 3.5 while in high school. On the middle school level, students who maintain grades with a B or C average are likely identified for the AVID program.

AVID students typically are members of an underrepresented group of students found on the campuses of four-year colleges and universities. This includes members of racial minorities, those who speak English as a second language, and those in low-income households. This socioeconomic status is determined by participation in free or reduced lunch programs. Most of the students participating in AVID will be the first generation in their families to attend college (Swanson, 1996).

The program, according to Swanson, requires hard work and perseverance and is effective only if participation is voluntary. Students in the AVID program must demonstrate a desire to attend college. Students are required to undertake demanding college preparatory courses with an expectation that they will complete at least two hours of homework each night. Students are also required to maintain a notebook binder, which incorporates all of the notes taken while in classes, and they must participate in tutorial groups regularly in an AVID elective class. Students must sign a contract agreeing to enroll in AVID for at least three years or until they complete high school. Parents of participating students also must sign an agreement to support all AVID academic requirements. Parents must agree to encourage and support their children's academic success and agree to attend all parent meetings.

Pedagogical Models of AVID

The AVID classroom consists of writing as a tool for learning, inquiry methodologies, collaboration, and reading as a device for comprehending (WICR). Writing is basic to thinking, learning, and growing. It allows students to think in complex ways by clarifying and ordering experiences. It contributes to self-knowledge and helps students to become better readers. Inquiry immediately engages students with their own thinking processes. It teaches them to think for themselves instead of chasing the right answers. Student ownership for expanded understanding of concepts is the result. The AVID philosophy and belief also espouses that students learn best when they are actively manipulating materials by making inferences and then generalizing from those inferences. Collaborative learning groups encourage this kind of thinking. Moreover, AVID incorporates strategies that help students to become more effective readers when used strategically with rich and varied curricula. In short, classroom lessons that infuse WICR elements provide students at all levels opportunities to practice literacy skills they must master in preparation for accessing rigorous course work and post-secondary education opportunities. In the AVID mathematics classroom, writing, inquiry, collaboration, and reading are equally critical to instructional strategies and practices as in any other classroom.

Writing in the AVID Mathematics Classroom

Researchers have determined that along with the mastery of basic mathematical skills, both cognitive and meta-cognitive abilities are crucial to improve problem solving abilities and overall mathematical expertise (Mayer, 1998; Schoenfeld, 1987; Silver, 1987). Subsequently, it is important to engage students in activities that support the development of these mental processes if we intend for our students to achieve mathematically.

Writing is not only an activity widely used in schools, but it can help students generate and connect their thoughts and ideas as well as consolidate their thinking. As students compare and contrast, analyze, and synthesize information, they are able to create a clear conceptual picture through written words. Writing in this manner is not merely recording information, but engaging in active construction of knowledge (Bereiter & Scardamalia, 1987). Therefore, writing under these conditions is a valuable learning activity and promotes meta-cognitive thinking which in turn, improves students' understanding of mathematical concepts.

It is critical that the mathematics curricula of the 21st century incorporate opportunities for students to become effective communicators. It will not be enough for 21st century students to master the concepts of mathematics. They will need to be equipped with the skills to successfully communicate highly technical information.

The National Council of Teachers of Mathematics (NCTM) highlights the importance of communication in its standards. Instructional programs from pre-kindergarten through grade 12 should enable all students to organize and consolidate their mathematical thinking through communication; communicate their mathematical thinking coherently and clearly to peers, teachers, and others; analyze and evaluate the mathematical thinking and strategies to others; and use the language of mathematics to express mathematical ideas precisely.

Writing to learn in mathematics, as encouraged in the AVID program, benefits students in a number of ways. The practice promotes clear thinking, helps students make connections between math and other disciplines, and it raises the students' awareness of what is known and not known when problem-solving. Writing to learn helps students raise questions about new ideas, organize their thinking, and construct meaning out of complex material.

The practice of writing to learn is also beneficial to teachers because it provides valuable insight into the students' thinking and level of understanding. Those teachers who add writing to their pedagogy often find it easier to recognize and diagnose their students' conceptual problems. The time teachers invest in helping students clearly explain their thinking is recouped in instructional time later as lessons become more prescriptive in nature.

Inquiry in the AVID Mathematics Classroom

Current mathematics research and reform movements endorse inquiry-based instruction grounded in constructivist pedagogy (Gibson & Van Strat, 2001). The National Council of Teacher of Mathematics (NCTM, 1989; 1991; 1995) also recommends using a constructivist method of teaching, in which learners develop meaning based on experience and inquiry. In essence, constructivism places greater responsibility of discovering and learning information on the students. The teacher facilitates the students' construction of meaning and understanding of content in an inquiry-based classroom. Therefore, students better understand the relevance of mathematical concepts and become more motivated and interested in their math courses, thereby improving math performance and meeting the standards (Grant, 1998).

AVID is based upon inquiry, not lecture, because it is the process of posing and answering questions that teaches students to think. Many activities, such as tutorial and Cornell note-taking, are built around asking questions and enable students to clarify, analyze, and synthesize material. Learning how to ask the right questions is a crucial skill because many students have difficulty clarifying thoughts and asking the right questions to get the information and help that they need. Tutors and teachers are trained to ask questions and move students to successively higher levels of thinking.

Inquiry engages students with their own learning methods and teaches them to value thinking over just trying to find the correct answer to a problem. The result is student ownership of the learning process and a better understanding of concepts and ideas. In essence, inquiry as an instructional method involves discussions, critical thinking activities, and even simply examining questions together.

In the math tutorial, students engage in all levels of critical thinking, from recall to evaluation. Students pursue understanding with mutual respect and civility and are mindful of each other's dignity. They are willing to be persuaded by arguments and evidence more powerful than their own and change their minds in light of fresh insights.

To begin a tutorial session, students bring questions for discussion. Guided by a teacher or college tutor, students exchange responses and collaborate in search of understanding. By returning to notes and texts, students often gain a deeper understanding of the answers to the questions raised. This collaboration rests on the belief that the group can arrive together at some understanding that would not be arrived at independently.

There are several questioning strategies teachers and college tutors can use to lead their groups. Two highly recommended methods supported by AVID are based on the work in cognitive functions by Benjamin Bloom and Arthur Costa. Using Bloom's hierarchy of cognitive skills, teachers and college tutors can ask questions that follow along a continuum to include: knowledge (recall), comprehension (interpretation), application (translation), analysis (classification), synthesis (generalization), and evaluation (judgment). Using Costa's Model of Intellectual Functioning in Three Levels, students ask three levels of questions: Level One (questions which focus on gathering and recalling information), Level Two (questions which focus on making sense of gathered information), and Level Three (questions which focus on applying and evaluating information).

In addition to levels of questioning, a method of inquiry known as Socratic Seminars, is often used in the AVID mathematics classroom. Socratic Seminars are teacher-led or student-led dialogues regarding specific texts that encourage students to think for themselves. These seminars develop habits of thoughtfulness and analysis through close and collaborative questioning of the meaning of the text, a math problem or set of data, a work of art or music, or a presentation. Participants demonstrate careful thinking and self-expression. They search for and weigh evidence and explore differing views. The teacher or the leader of the seminar does not guide participants to a specific goal or conclusion but leads them to discover their own truth or interpretation of text. The physical arrangement of the classroom is vital to the success of the Socratic Seminars. All students should be seated in desks or tables arranged in a rectangle or a circle to encourage eye contact. This also encourages equality, sharing, and face-to-face interactions with the group (AVID Center, 2006).

Collaboration in the AVID Mathematics Classroom

Several mathematics teachers have adopted cooperative group work as a daily classroom practice, along with standards-based mathematics curricula and pedagogies based upon constructivist views of learning (Antil, Jenkins, Wayne, & Vadasy, 1998). Even the National Council of Teachers of Mathematics recommends the use of cooperative learning during at least part of the teacher's instructional time (NCTM, 2000). Furthermore, proponents of cooperative learning argue that working together provides students with more opportunities to talk about mathematics, to learn from others, and to understand through teaching (Brown & Palincsar, 1989; Farivar & Webb, 1994; Nattiv, 1994; Stevens & Slavin, 1995).

The purpose of collaborative groups in the AVID mathematics classroom is to bring all students together to take responsibility for their own learning. In small groups, students ask, explore, and answer questions. They become better listeners, thinkers, readers, and writers. They discover ideas and remember them because they are actively involved. The teacher or college tutor becomes a coach, carefully guiding students in their learning. Research shows that students learn best when they are actively manipulating materials through making inferences and then generalizing from those inferences (Nattiv, 1994). Collaborative learning groups encourage this kind of thinking and typically possess the following characteristics: positive interdependence, individual accountability, heterogeneous, shared leadership, shared responsibility for one another, social skills necessary for task completion, teacher/tutor observes and intervenes, and groups process their effectiveness.

In collaborative learning groups, students experience the process of learning the 'how' and the 'what' of learning. In order to achieve this, the teacher or college tutor must carefully guide the group, thereby encouraging the members to share their ideas and explore and respect the ideas of others. The groups must constantly probe and define and redefine until the expression of ideas is clear and precise. The group task may have individual students share completed assignments or notes, as well as work together to brainstorm and problem solve. Furthermore, in collaborative learning, there is no fixed way to group students. Depending on the class and the assignment, the teacher may determine, have students self-select, or randomly select groups.

Collaborative learning groups are the cornerstone of building successful tutorial sessions. For true collaboration, it is not essential that all members of the group master the same concepts at the same time. The members of the group have strengths in a variety of different areas. Depending on the strengths of the individual group members, the collaborative group creates a positive interdependence and productiveness. The teacher or college tutor serves as a facilitator and coach. Subsequently, it is important that all members of the tutorial group understand their role as an active participant of the collaborative tutorial process. The teacher or college tutor's role in the collaborative process includes encouraging group members to respect the ideas and thinking of others, modeling the use of inquiry to allow group members the opportunity to gain a deeper understanding, facilitating a balance of shared participation among group members, prompting members of the group to use WICR to summarize learning, coaching members of the group to ask higher level questions of each other in order to gain a greater understanding of their rigorous content, and ensuring a safe environment where members of the group are free to ask for clarification. The student's role in the collaborative process includes formulating and writing higher level questions in preparation for the tutorial group, respecting the ideas and thinking of others in the group, using inquiry to gain a deeper understanding of the content being discussed, actively participating in the group by listening, asking questions, answering questions, and taking Cornell notes, using WICR in the collaborative process, creating an environment where group members feel comfortable and safe to ask questions and seek clarification of content, and communicate openly about the group experience.

Reading in the AVID Mathematics Classroom

Research has illustrated that reading skills and mathematics performance have been shown to be closely related. Students with difficulties in arithmetic are often associated with reading ability development (Light & DeFries, 1995). Furthermore, longitudinal studies have indicated that reading disabilities predicted students' progress in mathematics, but mathematics disabilities did not affect students' progress in reading. In fact, when demographic factors were held constant, students with only mathematical difficulties progressed at a faster rate in mathematics than students with reading difficulties (Jordan, Kaplan, & Hanich, 2002).

The AVID mathematics classroom incorporates strategies that can help students become more effective readers of mathematics. In the same way that a student needs to be taught the special skills needed to read poetry, fiction, and non-fiction, the skills needed to comprehend a math textbook must also be explicitly taught. The AVID math content teacher is often in a better position to teach the skills needed for reading a math textbook than any other teacher in the school. AVID math teachers have, by the nature of their work, developed effective skills for decoding the mathematics text and are able to teach those skills to their students. Students are taught how to read like a mathematician. Unfortunately, it has become far too common for teachers to translate the text into graphs, tables, algorithms, or verbal explanations rather than giving students the tools and the opportunity to practice using those tools to decipher their texts. Rather than making the students dependent on the teacher to construct meaning from the textbook, the teacher can equip the students to be self-reliant and in the process and provide them with powerful reading comprehension tools which they can use in furthering their understanding of mathematics.

The math text cannot be simply read. Students need to understand critical structural characteristics of the math text. Math textbooks are often written in a compact style. In essence, every word counts and if a concept is missed, there is little chance that a student will pick it up later. In fact, a well-designed explanation, derivation, or proof in mathematics is the one that uses the fewest words and uses the words in the most precise manner, making vocabulary acquisition critical to comprehension. Identifying new vocabulary and utilizing specific strategies such as concept maps, word walls, graphic organizers, picture vocabulary cards, etc., will provide students with the tools they need for constructing meaning on their own.

Since each section in a mathematics text makes the assumption of having mastered the previous sections, there is no chance of truly comprehending the material by just skimming the text. There is very little redundancy. Each word, symbol, or sentence has to be decoded prior to moving on to the next. While a student may read thirty to sixty pages of a novel in thirty minutes, in the same time the student may dwell on two or three lines in a math text. However, while every sentence in a math text is logically linked to a previous section and those sections that follow, it is not a linear reading experience. AVID mathematics teachers know that math textbooks must be read in all directions, top to bottom, bottom to top, right to left, left to right, front to back, and back to front. In fact, there is usually something very wrong if an explanation, problem, or example is read only once. An AVID mathematics teacher knows that each sentence and section must be thoroughly understood before moving ahead. And, that the process of a student making sense of the text may include may iterations of scanning, rereading, cross referencing, attempting solutions, pausing and revisiting explanations, examples, illustrations, and glossaries. Moreover, AVID mathematics teachers recognize that reading instruction must be scaffolded so that students develop strategies that help them become more confident with comprehension skills.

Research on AVID

Much of the research on AVID suggests a positive impact on improving student achievement and increasing access to higher level courses to boost opportunities to enter a four-year college or university. In fact, AVID students have outperformed their peers on state mandated exams, grade point averages, and even attendance rates (Watt, Yanez, & Cossio, 2002). Greater aspirations to pursue college and significantly higher academic preparation were also found with AVID students as compared with their peers (Watt, Huerta, & Lozano, 2007). Even Advanced Placement course enrollment of underrepresented students has increased in schools that have implemented AVID (Watt, Powell, & Mendiola, 2004). Moreover, because AVID proactively seeks to raise achievement and increase college preparedness for students at risk, it explicitly teaches the behaviors most typically found among college-bound students (Martinez & Klopott, 2006). Hence, evidence suggests that AVID strategies support students “in the middle” with improved opportunities for bridging to college.

Beyond improving individual student opportunities for college readiness, AVID offers a school-wide reform effort for improving overall student achievement and teacher quality. AVID schools have enhanced their school accountability ratings, increased student enrollment in rigorous courses, and improved their graduation rates (Watt, Powell, Mendiola, & Cossio, 2006). Moreover, even after controlling for a teacher's gender, level of education, and teaching experience, participating in AVID professional development significantly predicts transformation in teacher leadership (Huerta, Watt, & Alkan, 2008). As administrators and school boards seek systemic approaches to helping all students succeed, AVID offers a viable solution based on multiple research findings.

Despite this optimistic view, most of the research studies on AVID were conducted at the high school level, not in middle schools. Although limited, research on AVID at the middle school level has shown to support improved academic opportunities for students once they enter high school. Students with two years of middle school AVID have shown to maintain significantly higher GPAs than those with only one year of AVID or no AVID experience in middle school. Furthermore, students with two years of middle school AVID are twice as likely to take three or more Advanced Placement classes in high school than their peers with only one year of AVID experience at the middle school level or no AVID experience in middle school (Guthrie & Guthrie, 2002). While these findings offer support for the AVID program, a clear research gap exists related to its effects at the middle school level. Given the resources required to implement AVID along with limited budgets that schools often face, additional research would be beneficial for administrators as they consider choosing this model for supporting students.

Summary of Literature Review

Tracking students who are often minority and underserved in schools into remedial mathematics courses significantly hinders their abilities to gain access into higher level high school classes in mathematics and, subsequently, further limits their options to enter into four-year colleges and universities. Unfortunately, reform efforts to remove tracking, such as at the middle school level, have continued to demonstrate little to no impact on academic opportunities for these students. However, research on effective teaching practices related to mathematics provides a strong case to consider the AVID program as a means to support student achievement, especially in mathematics at the middle school level.

In its inception, AVID was not meant to serve as a school or district-wide reform model; however, it has evolved from one classroom serving a small group of students to a building-level program designed to change teaching and learning within an entire campus or even an entire district. AVID has shown to impact schools and districts on several levels, including increasing expectations and improving outcomes for students and creating a positive influence on the school culture for learning and college readiness.

Chapter Three

METHODOLOGY

Purpose of Study

The purpose of this study was to investigate whether students who participated in the Advancement Via Individual Determination (AVID) program and received instruction in their core classes from AVID trained teachers made statistically significant gains in their academic growth in mathematics as measured by the Colorado Student Assessment Program (CSAP). This study also investigated whether students who were enrolled in the AVID elective class and received their mathematics instruction from AVID trained teachers demonstrated greater academic growth in mathematics as measured using CSAP than did their peers who only received their instruction from AVID trained teachers but who were not enrolled in an AVID elective class or from their peers who did not receive their instruction from AVID trained teachers nor were enrolled in an AVID elective class.

Research Hypotheses

While Chapter One listed the four guiding research questions, noted below are the corresponding null hypotheses which were tested.

1. Is there a correlation between AVID teacher training and student participation and mathematical student achievement for seventh and eighth grade students at Huntington Middle School?

    a. Null Hypothesis: There is no statistically significant impact on student achievement for seventh and eighth grade students at Huntington Middle School due to AVID.

2. After participating in the AVID elective class, did middle school students from seventh and eighth grades demonstrate statistically significant academic growth in mathematics and the sub-content areas (as measured using the Colorado Student Assessment Program) when compared to a group of middle school students who were on the AVID academic team but who were not in the AVID elective class?
    a. Null Hypothesis: After participating in the AVID elective class, there is no statistically significant academic growth in mathematics and the sub-content areas (as measured using the Colorado Student Assessment Program) when compared to a group of middle school students who are on the AVID academic team but are not in the AVID elective class.
3. After participating in the AVID elective class, did middle school students from seventh and eighth grades demonstrate statistically significant academic growth in mathematics and the sub-content areas (as measured using CSAP) when compared to a group of middle school students who were non-AVID students?
    a. Null Hypothesis: After participating in the AVID elective class, there is no statistically significant academic growth in mathematics and the sub-content areas (as measured using the Colorado Student Assessment Program) when compared to a group of middle school students who are non-AVID students.

4. After participating on the AVID academic team (but not in the AVID elective class), did middle school students from seventh and eighth grades demonstrate statistically significant academic growth in mathematics and the sub-content areas (as measured using CSAP) when compared to a group of middle school students who were non-AVID students?
    a. Null Hypothesis: After participating on the AVID academic team (but not in the AVID elective class), there is no statistically significant academic growth in mathematics and the sub-content areas (as measured using the Colorado Student Assessment Program) when compared to a group of middle school students who are non-AVID students

Design

Using a quasi-experimental design, the researcher analyzed the academic growth using the Colorado Student Assessment Program (CSAP) in mathematics. Specifically, the researcher analyzed the academic growth of seventh and eighth grade students in the AVID elective class or taught by AVID trained teachers with the academic growth of seventh and eighth grade students who were not in the AVID program to determine whether or not there was a significant difference in academic growth. In addition, the researcher analyzed the sub-content areas of CSAP mathematics tests for seventh and eighth grade AVID students and non-AVID students to further determine whether or not there was a significant difference in academic growth.

Study Site and Sample

The population of interest was middle school students and their teachers whose school was implementing an AVID program. The study sample was drawn from seventh and eighth grade students whose teachers were trained in AVID methodologies in mathematics. These teachers participated in a week of AVID training at the AVID Summer Institute in San Diego, California, and attended one follow-up training session in mathematics during the regular school year. The teachers who participated in AVID training did so based on their interest in the program, not because of any predetermined criteria such as years of teaching experience, advanced degrees in higher education, or special certifications or licenses. The criterion variables for this study were student assessment data, and analysis was conducted at the teacher level.

Huntington Middle School in Mountain School District (pseudonyms) offered a sample for which the AVID program had been implemented for the past two years, and for which several seventh and eighth grade teachers had been trained in the AVID methodologies. In addition, the deputy superintendent of Mountain School District and the principal and AVID coordinator of Huntington Middle School desired to gain research-based data related to the academic growth of their AVID students in mathematics.

As what might be described as a typical, suburban middle school of a larger school district in Colorado, Huntington Middle School provided a variety of academic and extra-curricular programs to approximately 1,000 sixth, seventh, and eighth grade students. This neighborhood school was comprised of approximately 80% Caucasian, 10% Hispanic, 5% African-American, 1% Asian, and 1% Native American according to the Colorado Department of Education (2008). Specifically (see Table 1 below), demographic information for both sixth and seventh grade Huntington Middle School students remained relatively constant between 2006 (prior to the implementation of the AVID program) and 2008. However, during that time period, Mountain School District had identified secondary mathematic achievement as an area of need among middle school and high school students within the district. Intentional efforts were made to realign K-12 mathematics curriculum between feeder elementary, middle, and high schools, additional resources were utilized for targeted professional development and math coaches were assigned to several of the secondary schools to provide further assistance with teacher competencies in mathematics instruction.

Table 1

2006 and 2008 Demographic Data for 6th and 7th Grade Huntington Middle School Students Tested in CSAP in Mathematics

	6th Grade		7th Grade	
	2006	*2008*	*2006*	*2008*
Total # of Students	304	295	344	348
American Indian	*	*	*	*
Asian American	*	*	5%	*
African American	6%	5%	*	*
Hispanic/Latino	9%	8%	8%	11%
Caucasian	82%	82%	83%	80%
IEP (Special Education)	6%	8%	6%	8%
F/R (Free & Reduced Lunch)	10%	8%	8%	9%

Note. * Indicates *n*<16 (not reported); less than 1%

To identify the teacher sample, a consent form from the deputy superintendent and principal was obtained to study the middle school AVID program at Huntington Middle School. A list of AVID trained teachers in the school was obtained from the principal. With permission from the principal and the district assessment director, the researcher obtained the roster of AVID elective students, AVID team students, and non-AVID students. To establish baseline data prior to implementation of the AVID program, results from the 2006 CSAP assessment for mathematics for all seventh and eighth grade students at Huntington Middle School were obtained. Also, the 2008 and 2009 CSAP results for mathematics for all seventh and eighth grade students at Huntington Middle School were collected to compare student scores pre-AVID and post-AVID. In addition, the mathematics classes of the identified teachers from AVID elective students, AVID team students, and non-AVID students were determined by the researcher from the master schedule. Each teacher that was studied taught four sections of mathematics classes.

The study looked at the academic growth of seventh and eighth grade students in mathematics who were identified as AVID elective students, AVID team students (students who were instructed by the AVID team but who were not identified for the AVID elective class), and non-AVID students (see Table 2 below). Non-AVID students were students who typically performed at a higher academic level than students identified to participate in the AVID elective. Approximately 600 seventh and eighth grade students from Huntington Middle School were included in the target population. The academic growth for the 2008 and 2009 CSAP assessments in mathematics for these students were analyzed and compared using matched pairs of students from those who were identified as AVID elective students, AVID team students, and non-AVID students.

Table 2

Sample Groups and n-Sizes per Group for the 2008-2009 School Year

Sample Groups	*n*-Size
7th Grade Students	7th Grade Students
AVID elective	24 students
AVID team	75 students
Non-AVID	220 students
8th Grade Students	8th Grade Students
AVID elective	24 students
AVID team	75 students
Non-AVID	220 students

This study not only examined student achievement as measured by CSAP in mathematics to determine whether or not AVID elective students, AVID team students, and non-AVID students made significant improvement from 2008 to 2009, it also compared 2009 CSAP results in mathematics between the three groups (see Figure 1).

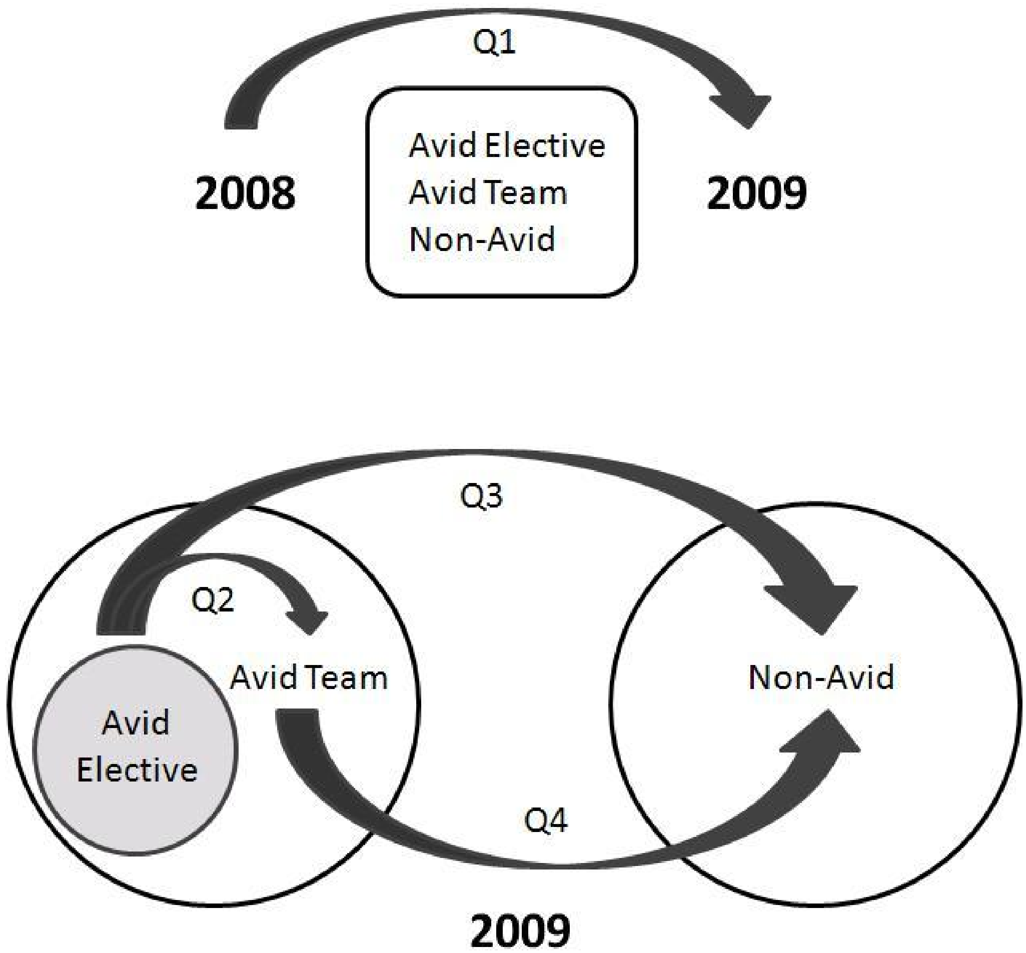

Figure 1. Overview of analysis plans comparing the AVID elective students, AVID team students, and Non-AVID students from their 2008 CSAP results in mathematics to their 2009 CSAP results in 2009 (Q1); comparing the AVID elective students' 2009 CSAP results in mathematics with the AVID team students' 2009 CSAP results (Q2); comparing the AVID elective students 2009 CSAP results in mathematics with the Non-AVID students' 2009 CSAP results (Q3); and comparing the AVID team students' 2009 CSAP results in mathematics with the Non-AVID students' CSAP results (Q4).

Data Collection

The Mountain School District Assessment Office and Huntington Middle School provided data from the 2008 and 2009 CSAP assessments in mathematics for AVID and non-AVID seventh and eighth grade students from Huntington Middle School. Upon the completion of the 2009 spring CSAP assessments in mathematics, student academic growth data were collected through a double-blind study in which the researcher was unaware of the specific individual student names. This was important to ensure student confidentiality and because the researcher was an employee within the same school district at the time of the study.

Variables

The Colorado Student Assessment Program (CSAP) represents the state's accountability measure for student, school, and district performance related to the Colorado Model Content Standards in reading, writing, mathematics, and science. This criterion-referenced assessment, administered in grades 3-10, is utilized for determining if schools and districts in Colorado achieve "adequate yearly progress" (AYP) in student attainment toward the No Child Left Behind (NCLB) goal of proficiency for all students by 2014 (Colorado Revised Statute 22-7-102, cited by the Colorado Department of Education, 2006). Each section of the assessment contains objective items as well as constructed response items which require the student to answer in complete sentences. In mathematics, for example, students must explain the process they used to solve each of the mathematics problems on the test.

The dependent variable for this study was CSAP scale scores designed to examine the amount of growth compared from the 2008 CSAP scale scores to the 2009 CSAP scale scores in mathematics for both seventh and eighth grade, including each of the sub-content areas. The independent variable was student teams which included seventh and eighth grade AVID elective students, AVID team students, and non-AVID students. CSAP scale scores were used because the continuity of the test results between years within the same grade and between grades (i.e. vertically scaled) are maintained using an anchoring of items within tests and shared items between grades (CSAP, July). Subsequently, scale scores, as a continuous variable, are appropriate for *t*-tests. In addition, since scale scores are vertically scaled, a direct comparison from one grade level to the next is appropriate in this study.

Data Analysis

Matched pairs are sometimes called dependent paired samples because the two observations are not statistically independent of each other (Utts & Heckard, 2007). Dependent *t*-tests for paired samples are often used to determine significance with a given intervention, in this case, AVID, by measuring students' CSAP scale scores prior to their participation in the AVID program and again after their participation in the AVID program.

Using paired sets of student data, the 2008 and 2009 CSAP results for mathematics (including sub-content areas) were analyzed to determine the academic growth for all AVID and non-AVID seventh and eighth grade students at Huntington Middle School. These results were compared to identify whether or not the academic growth of AVID students was significantly different from the academic growth of non-AVID students in mathematics.

The sub-content areas for the sixth grade CSAP mathematics test included: number and operation sense, patterns, and geometry. For number and operation sense, the student demonstrated an understanding of relationships among benchmark fractions, decimals, and percents and justified the reasoning used. The student added and subtracted fractions and decimals in problem solving situations. For patterns, the student represented, described, and analyzed geometric and numeric patterns using tables, words, concrete objects, and pictures in problem solving situations. For geometry, the student reasoned informally about the properties of two-dimensional figures and solved problems involving area and perimeter.

The sub-content areas for the seventh grade CSAP mathematics test included: number sense, area and perimeter relationships. For number sense, the student demonstrated understanding of the concept of equivalency as related to fractions, decimals, and percents. For area and perimeter relationships, the student demonstrated understanding of perimeter, circumference, and area, and recognized the relationships between them.

The sub-content areas for the eighth grade CSAP mathematics test included: proportional thinking, linear patterns representation, and geometry. For proportional thinking, the student applied the concepts of ratio, proportion, scale factor, and similarity, including using the relationships among fractions, decimals, and percents in problem solving situations. For linear patterns representation, the student represented, described, and analyzed linear patterns utilizing tables, graphs, verbal rules, and standard algebraic notation and solved simple linear equations in problem solving situations using a variety of methods. For geometry, the student described, analyzed and reasoned informally about properties of two and three-dimensional figures to solve problems (Colorado Department of Education, 2008, 2009). These sub-content areas in mathematics were also examined within the study to determine whether or not there was significance among the results of the AVID elective students, AVID team students, and non-AVID students.

Based upon the descriptors for each grade level's sub-content areas for CSAP, the seventh grade AVID and non-AVID students were compared to measure their academic growth: sixth grade *number and operation sense* (for 2008 CSAP for mathematics) with seventh grade *number sense* (for 2009 CSAP for mathematics) and sixth grade *geometry* (for the 2008 CSAP for mathematics) with seventh grade *area and perimeter relationships* (for 2009 CSAP for mathematics). The sixth grade results for *patterns* (from the 2008 CSAP for mathematics) were not considered for the study (see Table 2) because this sub-content area does not have a directly corresponding sub-content area in the seventh grade exam.

Again, based upon the descriptors for each grade level's sub-content areas for CSAP, the eighth grade AVID and non-AVID students were compared to measure their academic growth: seventh grade *number sense* (for 2008 CSAP for mathematics) and eighth grade *proportional thinking* (for 2009 CSAP for mathematics) and seventh grade *area and perimeter relationships* (for 2008 CSAP for mathematics) and eighth grade *geometry* (for 2009 CSAP for mathematics). The eighth grade results for *linear pattern representation* (from the 2009 CSAP for mathematics) were not considered for the study (see Table 3).

Table 3

CSAP Sub-Content Areas for Mathematics by Grade Level (2006-2009)

Grade 6	Grade 7	Grade 8
Number & Operation Sense	Number Sense	Proportional Thinking
Patterns		Linear Patterns Representation
Geometry	Area and Perimeter Relationships	Geometry

The researcher used Huntington Middle School students' sixth and seventh grade 2006 CSAP results for mathematics (including sub-content area scores) as the baseline of mathematics achievement for students prior to the implementation of the AVID program at Huntington Middle School in which the 2006 CSAP results were compared to the 2008 CSAP scores (see Figure 2).

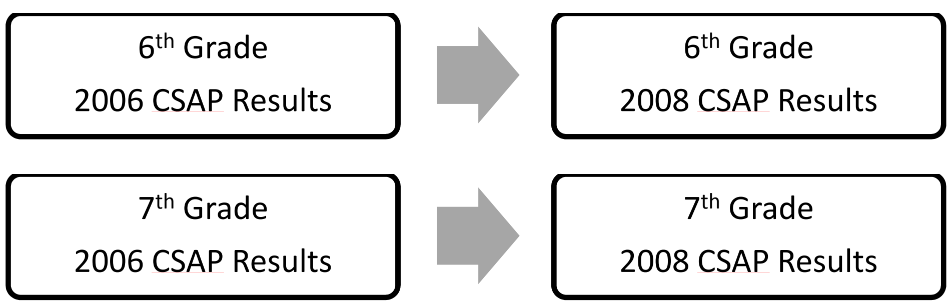

Figure 2. Baseline data were collected from 2006 and 2008 CSAP mathematics results prior to implementation of the AVID Program (pre-AVID).

The researcher identified Huntington Middle School students who were seventh grade AVID elective students for the 2008-2009 school year. These same students' sixth grade 2008 CSAP results for mathematics (including sub-content area scores) were paired with their 2009 CSAP scores. Then, the researcher identified Huntington Middle School students who were seventh grade AVID team students for the 2008-2009 school year. These same students' sixth grade 2008 CSAP results for mathematics (including sub-content area scores) were paired with their 2009 CSAP scores. Finally, the researcher identified Huntington Middle School students who were seventh grade non-AVID students for the 2008-2009 school year. Again, these same students' sixth grade 2008 CSAP results for mathematics (including sub-content area scores) were paired with their 2009 CSAP scores.

The researcher repeated this process to identify Huntington Middle School students who were the eighth grade AVID elective students for the 2008-2009 school year. These same students' seventh grade 2008 CSAP results for mathematics (including sub-content area scores) were paired with their 2009 CSAP scores. Then, the researcher identified Huntington Middle School students who were eighth grade AVID team students for the 2008-2009 school year. These same students' seventh grade 2008 CSAP results for mathematics (including sub-content area scores) were paired with their 2009 CSAP scores. Finally, the researcher identified Huntington Middle School students who were eighth grade non-AVID students for the 2008-2009 school year. Again, theses same students' seventh grade 2009 CSAP results for mathematics (including sub-content areas) were paired with their 2009 CSAP scores.

Then, the researcher analyzed the academic growth of each of the matched pairs of the seventh grade AVID elective students, the seventh grade AVID team students, and the seventh grade non-AVID students by conducting *t*-tests comparing their previous year's (2008) CSAP results for mathematics (including the sub-content areas) with their current year's (2009) CSAP results for mathematics (including the sub-content areas) to determine the statistical significance, if any, and to support or reject the null hypothesis.

Again, the researcher repeated this process and analyzed the academic growth of each of the matched pairs of the eighth grade AVID elective students, the eighth grade AVID team students, and the eighth grade non-AVID students by conducting t-tests comparing their previous year's (2008) CSAP results for mathematics (including the sub-content areas) with their current year's (2009) CSAP results for mathematics (including the sub-content areas) to determine the statistical significance, if any, and to support or reject the null hypothesis (see Figure 3).

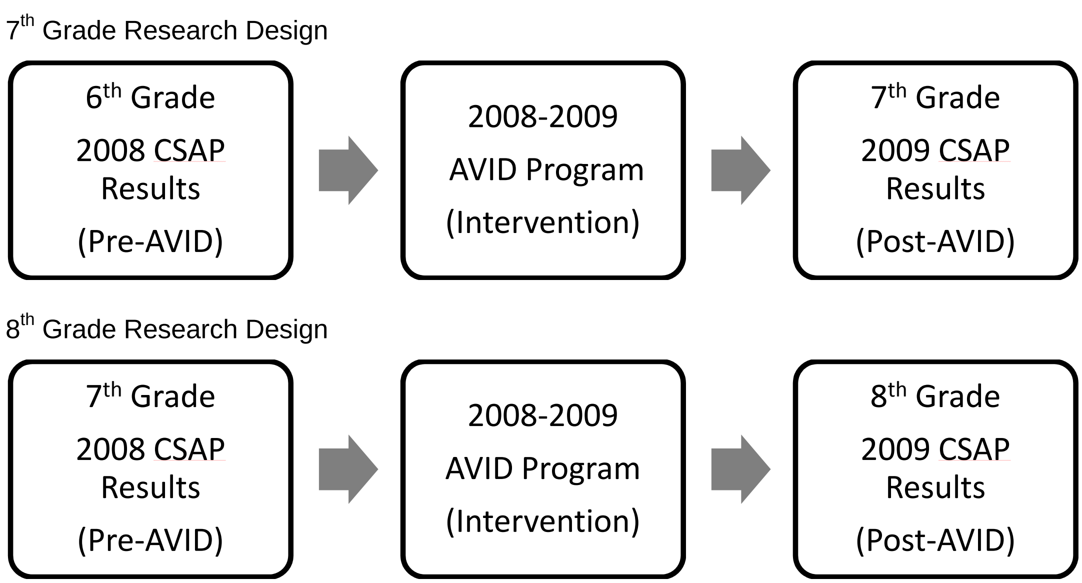

Figure 3. 7th and 8th Grade Research Design: Illustrates the comparison of pre-AVID CSAP mathematics results (2008) to post-AVID CSAP mathematics results (2009) for both seventh and eighth grades.

The researcher identified Huntington Middle School students who were seventh grade AVID elective students for the 2008-2009 school year and seventh grade AVID team students for the 2008-2009 school year. The mean scores for each of these student groups were compared using their 2009 CSAP results for mathematics (including sub-content area scores). The researcher repeated this process to identify Huntington Middle School students who were the eighth grade AVID elective students for the 2008-2009 school year and eighth grade AVID team students for the 2008-2009 school year. Again, the mean scores for each of these student groups were compared using their 2009 CSAP results for mathematics (including sub-content area scores) (see Figure 4).

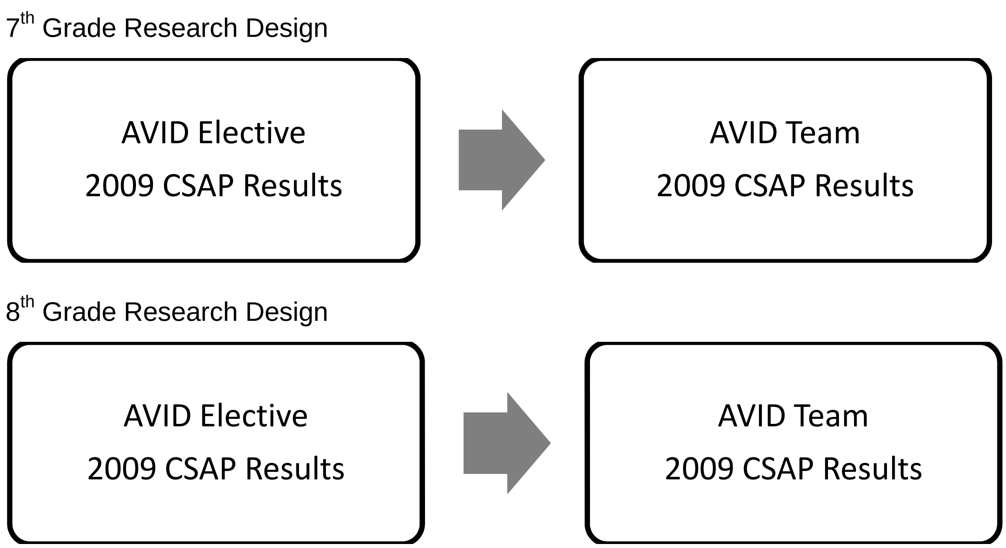

Figure 4. 7th and 8th Grade Research Design: Illustrates the comparison of AVID Elective CSAP mathematics results (2009) to AVID Team CSAP mathematics results (2009) for both seventh and eighth grades.

Then, the researcher identified Huntington Middle School students who were seventh grade AVID elective students for the 2008-2009 school year and seventh grade non-AVID students for the 2008-2009 school year. The mean scores for each of these student groups were compared using their 2009 CSAP results for mathematics (including sub-content area scores). The researcher repeated this process to identify Huntington Middle School students who were the eighth grade AVID elective students for the 2008-

2009 school year and eighth grade non-AVID students for the 2008-2009 school year. Again, the mean scores for each of these student groups were compared using their 2009 CSAP results for mathematics (including sub-content area scores) (see Figure 5).

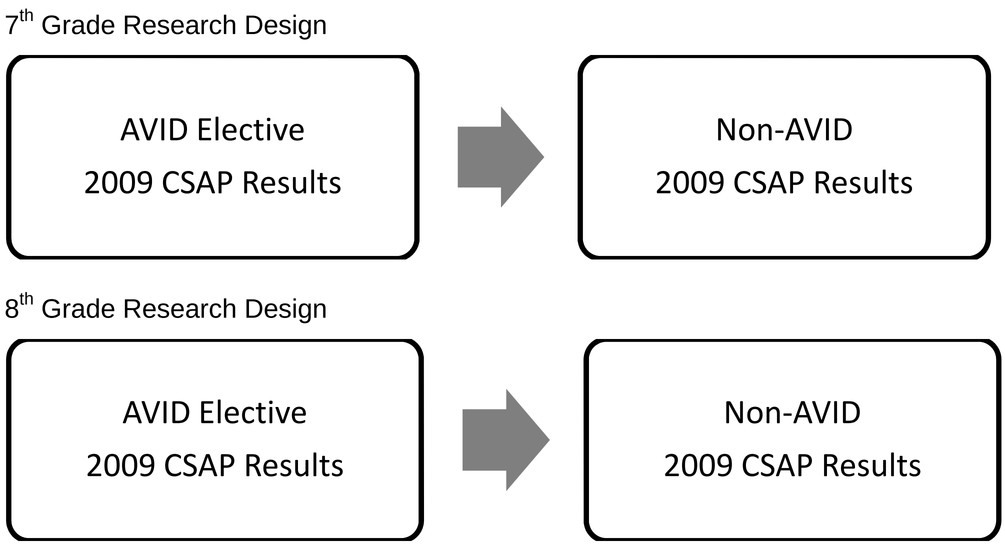

Figure 5. 7th and 8th Grade Research Design: Illustrates the comparison of AVID Elective CSAP mathematics results (2009) to Non-AVID CSAP mathematics results (2009) for both seventh and eighth grades.

Finally, the researcher identified Huntington Middle School students who were seventh grade AVID team students for the 2008-2009 school year and seventh grade non-AVID students for the 2008-2009 school year. The mean scores for each of these student groups were compared using their 2009 CSAP results for mathematics (including sub-content area scores). The researcher repeated this process to identify Huntington Middle School students who were the eighth grade AVID team students for the 2008-2009 school year and eighth grade non-AVID students for the 2008-2009 school year. Again, the mean scores for each of these student groups were compared using their 2009 CSAP results for mathematics (including sub-content area scores) (see Figure 6).

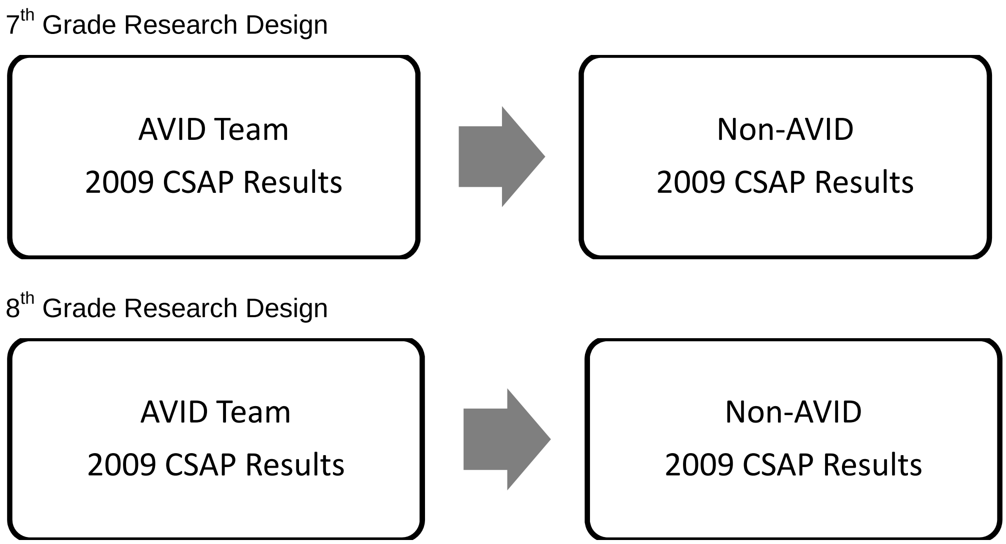

Figure 6. 7th and 8th Grade Research Design: Illustrates the comparison of AVID Team CSAP mathematics results (2009) to Non-AVID CSAP mathematics results (2009) for both seventh and eighth grades.

Chapter Four

RESULTS

This chapter presents the results of the data analyses that examined the impact of the AVID program on student achievement in mathematics at the middle school level. The four questions addressed student achievement as measured by the Colorado Student Assessment Program (CSAP) in overall mathematics and in the sub-content areas of number sense and geometry. The data utilized for the study came from seventh and eighth grade 2008 and 2009 CSAP scores from Huntington Middle School in Mountain School District (pseudonyms). In addition, data from seventh and eighth grade 2006 CSAP scores were used as a baseline prior to the start of the AVID program at Huntington Middle School. All data were received from the district in Excel spreadsheets and converted to SPSS software for analysis, including data for AVID elective students, AVID team students, and non-AVID students in both seventh and eighth grades.

A total of 24 seventh grade AVID elective students and 24 eighth grade AVID elective students were identified and then compared with seventh and eighth grade AVID team students and seventh and eighth grade non-AVID students. The scale scores from the 2008 CSAP in mathematics and in the sub-content areas of number sense and geometry and the achievement results from the 2009 CSAP in mathematics and in the sub-content areas of number sense and geometry for the AVID elective students, AVID team students, and non-AVID students were compared to determine if significant differences in scores occurred.

Baseline Comparison

An independent *t*-test was used to compare the means of CSAP data from 2006 (see Tables 4 and 5 below), which was prior to implementation of the AVID program in the school (pre-AVID), with the CSAP data from 2008. When comparing the mean 2006 sixth grade math scale scores ($\mu=548.1$, $sd=69.4157$) with the mean 2008 sixth grade scale scores ($\mu=570.06$, $sd=60.715$), there was a significant difference between these two groups in the Overall Math Scale Scores ($t(548)=3.882$, $p<.01$). As the data indicate, the means of the sixth grade students in 2008 were significantly higher than the means of those in 2006. When the mean of the 2006 seventh grade scale scores ($\mu=577.27$, $sd=59.110$) were compared with the mean of the 2008 seventh grade scale scores ($\mu=572.73$, $sd=61.145$), there was no significant difference between these two groups in Overall Math Scale Scores ($t(601)=-.925$, $p=.355$).

These data also were analyzed by the two sub-content areas. Among the sixth grade comparisons, there were significant differences between 2006 and 2008 for both number sense ($t(552)=2.492$, $p<.05$) and geometry ($t(552)=3.755$, $p<.01$). Once again, the mean for number sense in 2008 ($\mu=574.11$, $sd=93.354$) as compared to 2006 ($\mu=543.82$, $sd=95.322$) was higher in 2008 as well as for geometry in 2008 ($\mu=577.26$, $sd=77.473$) than in 2006 ($\mu=560.15$, $sd=82.746$). However, when the means of the seventh graders were compared between 2006 number sense ($\mu=576.89$, $sd=71.166$) and geometry ($\mu=578.83$, $sd=73.726$) and 2008 number sense ($\mu=571.38$, $sd=70.851$) and geometry (μ=574.07, *sd*=64.414), there were no significant differences between the two years among number sense ($t(609)=-.957$, $p=.339$) and geometry ($t(609)=-.853$, $p=.394$).

Table 4

Baseline Comparison – 6th Grade Students Testing in 2006 and 2008

	2006			2008		
	M	*sd*	*n*	*M*	*sd*	*n*
Overall Math Scale Scores**	548.10	69.416	304	570.06	60.715	295
Number Sense*	543.82	95.322	304	574.11	93.354	295
Geometry**	560.15	82.746	304	577.26	77.473	295

Note. $*p<.05$; $**p<.01$

Table 5

Baseline Comparison – 7th Grade Students Testing in 2006 and 2008

	2006			2008		
	M	*sd*	*n*	*M*	*sd*	*n*
Overall Math Scale Scores	577.27	59.110	344	572.73	61.145	348
Number Sense	576.89	71.166	344	571.38	70.851	348
Geometry	578.83	73.726	344	574.07	64.414	348

Note. $*p<.05$; $**p<.01$

Once baseline data were analyzed, the researcher examined results for each of the four research questions.

Question One: Is there a correlation between AVID teacher training and student participation and mathematical student achievement for seventh and eighth grade students at Huntington Middle School?

AVID Elective Students

As indicated in Table 6 (see below), a paired samples *t*-test was run to determine if there were significant differences within each team between the testing years of 2008 (pre-AVID) and 2009 (post-AVID). The sixth to seventh grade AVID elective students demonstrated significant differences in the Overall Math Scale Scores ($t(21)=-7.238$, $p<.01$) and the sub-content area of number sense ($t(22)=-4.008$, $p<.01$). As shown in Table 3, the mean scores were higher in 2009 than for 2008. However, although there was a higher mean score in 2009 for the sub-content area of geometry, the data indicated that a significant difference did not exist between the scores for 2008 and 2009 ($t(22)=-.820$, $p=.421$).

Table 6

6^{th} to 7^{th} Grade AVID Elective Students Testing in 2008 and 2009

	2008		2009		
	M	*sd*	*M*	*sd*	*n*
Overall Math Scale Scores**	552.00	30.695	578.45	35.551	22
Number Sense**	552.65	38.507	579.83	34.581	23
Geometry	553.87	41.426	560.87	49.192	23

Note. $*p<.05$; $**p<.01$

As indicated in Table 7 (see below), the seventh to eighth grade AVID elective students demonstrated significant differences in the Overall Math Scale Scores ($t(25)=-5.610$, $p<.01$), the sub-content area of number sense ($t(25)=-4.110$, $p<.01$), and the sub-content area of geometry ($t(25)=-3.205$, $p<.01$). As shown, the mean scores were higher in 2009 for this group in all categories.

Table 7

7th to 8th Grade AVID Elective Students Testing in 2008 and 2009

	2008		2009		
	M	*sd*	*M*	*sd*	*n*
Overall Math Scale Scores**	571.38	42.924	596.38	34.792	25
Number Sense**	575.31	46.711	604.54	38.993	25
Geometry**	567.92	63.584	597.50	31.890	25

Note. *$p<.05$; **$p<.01$

AVID Team Students

Among the students who were a part of the AVID team in 2009 but not the sub-group of AVID elective in seventh grade (see Table 8 below), the paired *t*-test indicated a significant difference in the paired mean scores between 2008 and 2009 in the Overall Math Scale Scores ($t(64)=-4.702$, $p<.01$). The mean overall math score was higher in 2009. However, although the 2009 means appear slightly higher, there were no significant differences for either sub-content areas of number sense ($t(63)=-1.762$, $p=.083$) and geometry ($t(63)=-.187$, $p=.852$).

Table 8

6th to 7th Grade AVID Team Students Testing in 2008 and 2009

	2008		2009		
	M	*sd*	*M*	*sd*	*n*
Overall Math Scale Scores**	588.03	68.471	607.82	62.490	65
Number Sense	597.36	111.978	617.67	77.070	64
Geometry	599.94	79.722	601.19	61.796	64

Note. *$p<.05$; **$p<.01$

Among the students who were part of the AVID team in 2009 but not the sub-group of AVID elective in eighth grade (see Table 9 below), the paired *t*-test indicated a significant difference in paired mean scores between 2008 and 2009 in the Overall Math Scale Scores ($t(81)=-11.074$, $p<.01$) and in the sub-content areas of number sense ($t(82)=-6.268$, $p<.01$) and geometry ($t(82)=-6.654$, $p<.01$). Moreover, as shown, the mean scales scores were higher in 2009 among all categories.

Table 9

7th to 8th Grade AVID Team Students Testing in 2008 and 2009

	2008		2009		
	M	*sd*	*M*	*sd*	*n*
Overall Math Scale Scores**	569.63	54.169	600.11	44.924	82
Number Sense**	568.88	61.761	600.83	62.955	83
Geometry**	570.51	61.050	603.24	45.361	83

Note. *$p<.05$; **$p<.01$

Non-AVID Students

Among the students who were part of the non-AVID team in 2009 in seventh grade (see Table 10 below), the paired *t*-test indicated a significant difference in paired mean scores between 2008 and 2009 in the Overall Math Scale Scores ($t(156)=-12.459$, $p<.01$), the sub-content areas of number sense ($t(160)=-5.080$, $p<.01$) and the sub-content area of geometry ($t(160)=-.4.352$, $p<.01$). Moreover, as shown, all mean scores were higher in 2009 than 2008.

Table 10

6th to 7th Grade Non-AVID Students Testing in 2008 and 2009

	2008		2009		
	M	*sd*	*M*	*sd*	*n*
Overall Math Scale Scores**	565.16	59.052	593.10	55.152	157
Number Sense**	568.24	89.637	595.42	60.935	161
Geometry**	571.44	79.011	590.80	67.214	161

Note. *$p<.05$; **$p<.01$

Among the students who were part of the non-AVID team in 2009 in eighth grade (see Table 11 below), the paired *t*-test indicated a significant difference in paired mean scores between 2008 and 2009 in the Overall Math Scale Scores ($t(202)=-14.375$, $p<.01$), the sub-content areas of number sense ($t(206)=-8.877$, $p<.01$) and the sub-content area of geometry ($t(206)=-8.633$, $p<.01$). Moreover, as shown, all mean scores were higher in 2009 than 2008.

Table 11

7th to 8th Grade Non-AVID Students Testing in 2008 and 2009

	2008		2009		
	M	*sd*	*M*	*sd*	*n*
Overall Math Scale Scores**	574.15	65.778	601.68	57.874	203
Number Sense**	571.54	76.940	605.22	69.604	207
Geometry**	575.98	66.260	599.50	57.768	207

Note. **p*<.05; ***p*<.01

Question Two: After participating in the AVID elective class, do middle school students (in seventh and eighth grades) demonstrate a statistically significant academic growth in mathematics and the sub-content areas (as measured using the Colorado Student Assessment Program) than a group of middle school students who were on the AVID academic team but were not in the AVID elective class?

Among the sixth to seventh grade students who tested in 2008 and then in 2009, an independent samples *t*-test was run to determine if there was a significant difference for Overall CSAP Math Scale Scores, the sub-content area of number sense, and the sub-content area of geometry between the AVID elective group and students who participated on the AVID team.

The results for 2008 pre-AVID testing indicated that there was a statistical difference in Overall Math Scale Scores ($t(78.36)=-3.361$, $p=.001$) with the mean of the AVID team (μ=588.03, *sd*=68.471) being higher than the mean for the AVID elective group (μ=552.00, *sd*=30.695). Likewise, for the sub-content area of number sense, there was a significant difference between the means of the AVID elective group (μ=552.65, *sd*=38.507) and the AVID team (μ=596.25, *sd*=111.461) with a higher mean score among the AVID team. The data for the sub-content area of geometry indicated a significantly higher mean for the AVID team (μ=599.95, *sd*=79.097) than for the AVID elective group (μ=553.587, *sd*=41.426) ($t(73.38)$=-3.526, p=.001).

When analyzing the 2009 math scale scores post-AVID (see Table 12 below), there was no significant difference in Overall Math Scale Scores between AVID elective and AVID team ($t(88.42)$=-1.513, p=.134). However, there were significant differences between the two groups in the sub-content area of number sense ($t(80.9)$=-3.131, p<.01) and the sub-content area of geometry ($t(87)$=-2.822, p<.01). However, as indicated, the mean scores for both number sense and geometry where higher for the AVID team than for the AVID elective group.

Table 12

7th Grade AVID Elective and AVID Team Students Testing in 2009

	AVID Elective			AVID Team		
	M	*sd*	*n*	*M*	*sd*	*n*
Overall Math Scale Scores	577.72	34.903	23	598.47	95.777	68
Number Sense**	579.83	34.581	23	616.83	76.078	66
Geometry**	560.87	49.192	23	600.67	60.992	66

Note. *p<.05; **p<.01

Among the seventh to eighth grade students for the same testing years, an independent samples *t*-test was run to determine significance for the same three math areas between the AVID elective group and AVID team. Although the mean scores appear higher for the AVID elective group than the AVID team, the data indicate that these differences were non-significant for Overall Math Scale Scores (Elective: μ=571.38, *sd*=42.924; Team: μ=569.63, *sd*=54.169), the sub-content area of number sense (Elective: μ=573.67, *sd*=46.591; Team: μ=570.28, *sd*=61.736), and for the sub-content area of geometry (Elective: μ=567.59, *sd*=62.373; Team: μ=571.46, *sd*=60.888). The results for the 2008 pre-AVID testing indicated no significant mean scale scores between the AVID elective group and the AVID team (Overall: $t(106)=.150$, $p=.881$; Number Sense: $t(110)=.262$, $p=.794$; Geometry: $t(110)=-.286$, $p=.776$). Moreover, there were no significant differences between the two groups when analyzing the 2009 post-AVID data (see Table 13 below), Overall Math Scale Scores ($t(111)=-.567$, $p=.572$), the sub-content area of number sense ($t(108)=.271$, $p=.787$), or the sub-content area of geometry (t (108) =-.575, $p=.567$).

Table 13

8th Grade AVID Elective and AVID Team Students Testing in 2009

	AVID Elective			AVID Team		
	M	*sd*	*n*	*M*	*sd*	*n*
Overall Math Scale Scores	595.41	34.492	27	600.77	45.118	86
Number Sense	604.54	38.993	26	601.01	62.596	84
Geometry	597.50	31.890	26	602.98	45.152	84

Note. $^{*}p<.05$; $^{**}p<.01$

Question Three: After participating in the AVID elective class, do middle school students (in seventh and eighth grades) demonstrate a statistically significant academic growth in mathematics and the sub-content areas (as measured using the Colorado Student Assessment Program) than a group of middle school students who were non-AVID students?

Among the sixth to seventh grade students who tested in 2008 and then in 2009, an independent samples *t*-test was run to determine if there was a significant difference for Overall CSAP Math Scale Scores, the sub-content area of number sense, and the sub-content area of geometry between students who participated in the AVID elective group and the non-AVID team.

The results for pre-AVID 2008 testing indicated that there was no statistical differences between the two groups in Overall Math Scale Scores ($t(46.74)=-1.632$, $p=.109$), for the sub-content area of number sense ($t(63.97)=-1.458$, $p=.150$) and for the sub-content area of geometry ($t(48.99)=-1.650$, $p=.105$) between the two groups. Overall, the findings showed a higher mean score for the non-AVID team than for the AVID elective group for the Overall Math Scale Scores (Elective: $\mu=552.00$, $sd=30.695$; non-AVID: $\mu=565.16$, $sd=59.052$), the sub-content area of number sense (Elective: $\mu=552.65$, $sd=38.507$; non-AVID: $\mu=568.24$, $sd=89.637$), and for the sub-content area of geometry (Elective: $\mu=553.87$, $sd=41.426$; non-AVID: $\mu=571.44$, $sd=79.011$).

When analyzing the 2009 math scale scores, post-AVID (see Table 14 below), there was no significant difference in overall math scale scores between AVID elective and the non-AVID team ($t(192)=-1.148$, $p=.252$) or in the sub-content area of number sense ($t(42.40)=-1.725$, $p=.092$). However, there was a significant difference between the two groups in the sub-content area of geometry ($t(192)=-2.081$, $p<.05$) although the mean score was higher for the non-AVID team than for the AVID elective group.

Table 14

7th Grade AVID Elective and Non-AVID Students Testing in 2009

	AVID Elective			Non-AVID		
	M	*sd*	*n*	*M*	*sd*	*n*
Overall Math Scale Scores	577.74	34.903	23	591.44	55.693	171
Number Sense	579.83	34.581	23	594.56	59.842	171
Geometry*	560.87	49.192	23	590.88	66.717	171

Note. **p*<.05; ***p*<.01

Among the seventh to eighth grade students for the same testing years, an independent samples t-test was run to determine significance for the same three math areas between the AVID elective group and the non-AVID team. The results for the pre-AVID 2008 testing indicated no significant mean scale scores between AVID elective and non-AVID students for Overall Math Scale Scores (*t(41.83)*=-.288, *p*=.775; Elective: µ=571.38, *sd*=42.924; non-AVID: µ=574.15, *sd*=65.778), number sense (*t(47.03)*=.204, *p*=.839; Elective: µ=573.67, *sd*=46.591; non-AVID: µ=571.54, *sd*=76.94), and geometry (*t(232)*=.-.623, *p*=.534; Elective: µ=567.59, *sd*=62.373; non-AVID: µ=575.98, *sd*=66.260). Moreover, there were no significant differences between the two groups when analyzing the post-AVID 2009 Overall Math Scale Scores (*t(238)*=-.514, *p*=.608) (see Table 15), the sub-content area of number sense (*t(237)*=-.056, *p*=.956), or the sub-content area of geometry (*t* (237) =-.166, *p*=.868).

Table 15

8th Grade AVID Elective and Non-AVID Students Testing in 2009

	AVID Elective			Non-AVID		
	M	*sd*	*n*	*M*	*sd*	*n*
Overall Math Scale Scores	595.41	34.492	27	601.20	57.180	213
Number Sense	604.54	38.993	26	605.31	69.079	213
Geometry	597.50	31.890	26	599.41	57.350	213

Note. *$p<.05$; **$p<.01$

Question Four: After participating on the AVID academic team (but not in the AVID elective class), do middle school students (in seventh and eighth grades) demonstrate a statistically significant academic growth in mathematics and the sub-content areas (as measured using the Colorado Student Assessment Program) than a group of middle school students who were non-AVID students?

Among the sixth to seventh grade students who tested in 2008 and then in 2009, an independent samples *t*-test was run to determine if there was a significant difference for Overall Math Scale Scores, the sub-content area of number sense, and the sub-content area of geometry between students who participated on an AVID team and the non-AVID team. The results for pre-AVID 2008 testing indicated that there were statistical differences between the two teams in Overall Math Scale Scores ($t(220)=2.504$, $p<.05$), for the sub-content area of number sense ($t(224)=1.977$, $p<.05$), and for the sub-content area of geometry ($t(224)=2.455$, $p<.05$) between the two teams. When comparing the mean scores for the overall math scores, the AVID team had higher mean scores than the non-AVID team (μ=588.03, *sd*=68.471; μ=565.16, *sd*=59.052 respectively). Likewise, the AVID team also had higher scores in the sub-content area of number sense (μ=596.25, *sd*=111.461; μ=568.24,*sd*= 89.637 respectively) and geometry (μ=599.95, *sd*=79.097; μ=571.44, *sd*=79.011 respectively).

When analyzing the post-AVID 2009 math scale scores (see Table 16 below), there was no significant difference in Overall Math Scale Scores between AVID team and the non-AVID team ($t(85.61)=.568$, $p=.571$) or in the sub-content area of geometry ($t(235)=1.036$, $p=.301$). However, there was a significant difference between the two teams in the sub-content area of number sense ($t(97.62)=2.137$, $p<.05$), in which the AVID team had higher mean scores than the non-AVID team.

Table 16

7th Grade AVID Team and Non-AVID Students Testing in 2009

	AVID Team			Non-AVID		
	M	*sd*	*n*	*M*	*sd*	*n*
Overall Math Scale Scores	598.47	95.777	68	591.44	55.693	171
Number Sense*	616.83	76.078	66	594.56	59.842	171
Geometry	600.67	60.992	66	590.88	66.717	171

Note. $*p<.05$; $**p<.01$

Among the seventh to eighth grade students for the same testing years, an independent samples t-test was run to determine significance for the same three math areas between the AVID team and the non-AVID team. The results for the pre-AVID 2008 testing indicated no significant mean scale scores between the AVID team and the non-AVID team for the Overall Math Scale Scores (*t(180.54)*=-.598, *p*=.551), the sub-content area of number sense (*t(193.26)*=-.146, *p*=.884) and for Geometry (*t(290)*=-.542, *p*=.588). Although non-significant, the mean scores for the non-AVID team were consistently higher than the AVID team for Overall Math Scale Scores (µ=574.15, *sd*=65.778; µ=569.63, *sd*=54.169 respectively), number sense (µ=571.54, *sd*=76.940; µ=570.28, *sd*=61.736 respectively), and for geometry (µ=575.98, *sd*=66.260; µ=571.46, *sd*=60.888 respectively). Moreover, there were no significant differences between the two teams when analyzing the post–AVID Overall Math Scale Scores (*t(297)*=-.062, *p*=.950) (see Table 17 below), the sub-content area of number sense (*t(295)*=-.496, *p*=.621), or the sub-content area of geometry (*t* (295) =.511, *p*=.610).

Table 17

8th Grade AVID Team and Non-AVID Students Testing in 2009

	AVID Team			Non-AVID		
	M	*sd*	*n*	*M*	*sd*	*n*
Overall Math Scale Scores	600.77	45.118	86	601.20	57.180	213
Number Sense	601.01	62.596	84	605.31	69.079	213
Geometry	602.98	45.152	84	599.41	57.350	213

Note. **p*<.05; ***p*<.01

Summary of Findings

Question One: Is there a correlation between AVID teacher training and student participation and mathematical student achievement for seventh and eighth grade students at Huntington Middle School?

The baseline data of overall 2006 CSAP mathematics results and the results of the sub-content areas of number sense and geometry for sixth and seventh grade students (prior to the introduction of the AVID program at Huntington Middle School) were used to compare to the overall 2008 CSAP mathematics results and the results of the sub-content areas of number sense and geometry for sixth and seventh grade students to determine significance, if any. Using an independent *t*-test to compare the means of the 2006 CSAP data (scale scores) and the 2008 CSAP data, there was statistical significance between the sixth grade in overall mathematics results and the results for both number sense and geometry. The 2008 sixth graders had higher mean scale scores in all three areas. However, using an independent *t*-test to compare the means of the 2006 CSAP data (scale scores) and the 2008 CSAP data, there was no significance between the seventh grade in overall mathematics results and the results for both number sense and geometry.

Using paired samples *t*-tests, the seventh grade AVID elective students demonstrated significant differences in their overall 2009 CSAP mathematics scale scores and in the sub-content area of number sense as compared to their 2008 CSAP scale scores in the same areas. However, there was no significance between the seventh grade AVID elective students' 2008 CSAP scale scores and 2009 CSAP scale scores in the sub-content area of geometry.

Again using the paired samples *t*-tests, the eighth grade AVID elective students demonstrated significant differences in their overall 2009 CSAP mathematics scale scores and in the sub-content areas of number sense and geometry as compared to their 2008 CSAP scale scores in the same areas.

Question Two: After participating in the AVID elective class, do middle school students (in seventh and eighth grades) demonstrate a statistically significant academic growth in mathematics and the sub-content areas (as measured using the Colorado Student Assessment Program) than a group of middle school students who were on the AVID academic team but were not in the AVID elective class?

An independent samples *t*-test was run and determined that there was no statistical difference between the seventh grade AVID elective students' 2009 overall CSAP scale scores in mathematics and the seventh grade AVID team students' 2009 overall CSAP scale scores in mathematics. However, there was a statistical difference between the seventh grade AVID elective students' 2009 CSAP mathematics scale scores in the sub-content areas of number sense and geometry as compared to the seventh grade AVID team students' CSAP mathematics scale scores in the sub-content areas of number sense and geometry; however, in both areas, students on the AVID team had higher mean scale scores than the AVID elective students.

Again, an independent samples *t*-test was run and determined that there was no statistical difference between the eighth grade AVID elective students' 2009 overall CSAP scale scores in mathematics and in the sub-content areas of number sense and geometry and the eighth grade AVID team students' 2009 overall CSAP scale scores in mathematics and in the sub-content areas of number sense and geometry.

Question Three: After participating in the AVID elective class, do middle school students (in seventh and eighth grades) demonstrate a statistically significant academic growth in mathematics and the sub-content areas (as measured using the Colorado Student Assessment Program) than a group of middle school students who were non-AVID students?

An independent samples *t*-test was run and determined that there was no statistical difference between the seventh grade AVID elective students' 2009 overall CSAP scale scores in mathematics and in the sub-content area of number sense and the seventh grade non-AVID students' 2009 overall CSAP scale scores in mathematics and in the sub-content area of number sense. Although, there was a significant difference between the seventh grade AVID elective students' 2009 CSAP mathematics scale scores in the sub-content area of geometry as compared to the seventh grade non-AVID students' 2009 CSAP mathematics scale scores in the sub-content area of geometry. However, the mean scale score for the sub-content area of geometry was higher for the non-AVID team.

Again, an independent samples *t*-test was run and determined that there was no statistical difference between the eighth grade AVID elective students' 2009 overall CSAP scale scores in mathematics and in the sub-content areas of number sense and geometry and the eighth grade non-AVID students' 2009 overall CSAP scale scores in mathematics and in the sub-content areas of number sense and geometry.

Question Four: After participating on the AVID academic team (but not in the AVID elective class), do middle school students (in seventh and eighth grades) demonstrate a statistically significant academic growth in mathematics and the sub-content areas (as measured using the Colorado Student Assessment Program) than a group of middle school students who were non-AVID students?

An independent samples *t*-test was run and determined that there was no statistical difference between the seventh grade AVID team students' 2009 overall CSAP scale scores in mathematics and in the sub-content area of geometry and the seventh grade non-AVID students' 2009 overall CSAP scale scores in mathematics and in the sub-content area of geometry. However, there was a significant difference between the seventh grade AVID team students' 2009 CSAP mathematics scale scores in the sub-content area of number sense as compared to the seventh grade non-AVID students' 2009 CSAP mathematics scale scores in the sub-content area of number sense. The mean scale score for the sub-content area of number sense was higher for the seventh grade AVID team students than the seventh grade non-AVID students.

Again, an independent samples *t*-test was run and determined that there was no statistical difference between the eighth grade AVID team students' 2009 overall CSAP scale scores in mathematics and in the sub-content areas of number sense and geometry and the eighth grade non-AVID students' 2009 overall CSAP scale scores in mathematics and in the sub-content areas of number sense and geometry.

The results of this study were mixed. Students who participated in the AVID elective class showed statistically significant improvement in their mathematical achievement as measured by CSAP; however, no significance was found when comparing student achievement of AVID elective students with AVID team students or non-AVID students. Furthermore, no significance in student performance was noted when comparing AVID team students with non-AVID students. However, like AVID elective students, AVID team students did make significant gains in their CSAP scores after participating on the AVID team and participating in core classes taught by AVID trained teachers. The AVID program, therefore, may have an overall positive impact on student achievement for those students who are able to participate in classes with AVID trained teachers.

Chapter Five

CONCLUSIONS

This study explored the effectiveness of the Advancement Via Individual Determination (AVID) program to improve student achievement in mathematics as measured by the Colorado State Assessment Program (CSAP) at the middle school level. The AVID program was originally designed to support high school students, yet it has grown significantly within the middle school level in recent years (Swanson, 1996). Despite the program's increasing popularity, little research has been conducted to determine whether or not this program actually makes a difference on student achievement with middle school students.

The AVID program is an in-school intervention model to assist middle-level students, underachieving students, and often members of minority groups in gaining access to college opportunities (Swanson, 2005). The mission of AVID is to ensure that all students, including those who are underrepresented will succeed in challenging curriculum, complete a challenging college preparatory path, participate in extra-curricular activities at school, increase their enrollment in four year universities, and become educated and good citizens and leaders in a democratic society (Swanson, 2000). The program specifically targets the average student who earns B's and C's yet demonstrates a motivation and determination to go onto college after high school. Generally, those who participate in AVID have both the desire and potential to succeed in challenging curriculum, are from a low socioeconomic background, and will be the first in their families to attend college.

The AVID elective class, professional development, curriculum, teaching strategies, and district and school-wide support are important factors that make the program successful (Guthrie & Guthrie, 2002). Students enrolled in the AVID elective course have access to a variety of resources; they learn organizational skills such as time management, study skills, and critical thinking skills that will allow them to succeed. A unique element of the program relies on the use of college students as both tutors and role models. As a result, the program seeks to build their self-confidence and self-image to become leaders at school. AVID elective teachers and content area teachers at the school site receive support through attending workshops and summer institutes to reinforce curriculum writing, inquiry, reading, and collaboration.

Summary of Study

By using previous CSAP scores for mathematics at Huntington Middle School in Mountain School District (pseudonyms), four questions were addressed:

1. Is there a correlation between AVID teacher training and student participation and mathematical student achievement for seventh and eighth grade students at Huntington Middle School?
2. After participating in the AVID elective class, do middle school students (in seventh and eighth grades) demonstrate a statistically significant academic growth in mathematics and the sub-content areas (as measured using the Colorado Student Assessment Program) than a group of middle school students who were on the AVID academic team but were not in the AVID elective class?

3. After participating in the AVID elective class, do middle school students (in seventh and eighth grades) demonstrate a statistically significant academic growth in mathematics and the sub-content areas (as measured using the Colorado Student Assessment Program) than a group of middle school students who were non-AVID students?
4. After participating on the AVID academic team (but not in the AVID elective class), do middle school students (in seventh and eighth grades) demonstrate a statistically significant academic growth in mathematics and the sub-content areas (as measured using the Colorado Student Assessment Program) than a group of middle school students who were non-AVID students?

Design of Study

This study utilized a quasi-experimental design in which approximately 24 AVID elective students from seventh grade at Huntington Middle School were compared to seventh grade AVID team students (who were not in the AVID elective class) and seventh grade non-AVID students by CSAP mathematics overall results and results for the CSAP mathematics sub-content areas of number sense and geometry. Also using a quasi-experimental design, approximately 24 AVID elective students from eighth grade at Huntington Middle School were compared to eighth grade AVID team students and eighth grade non-AVID students by CSAP mathematics overall results and results for the CSAP mathematics sub-content areas of number sense and geometry. In addition, using this quasi-experimental design, sixth and seventh grade CSAP mathematics overall results and results for number sense and geometry were used as a baseline prior to the AVID program being implemented into Huntington Middle School. This procedure resulted in three team comparisons per grade level to include AVID elective students with AVID team students, AVID elective students with non-AVID students, and AVID team students with non-AVID students.

After the AVID elective students were analyzed with their AVID team and non-AVID counterparts for seventh and eighth grades respectively on overall CSAP mathematics as well as the sub-content areas of number sense and geometry, students' individual 2008 and 2009 CSAP results were matched and then compared for significance. Since the AVID program did not exist prior to the 2006-2007 school year, the overall 2006 CSAP mathematics results along with the results from the sub-content areas of number sense and geometry were compared with the 2008 CSAP results to gather baseline data.

Discussion of Results

Question One: Is there a correlation between AVID teacher training and student participation and mathematical student achievement for seventh and eighth grade students at Huntington Middle School?

Because of the extensive support and additional areas of concentration in writing, inquiry, collaboration, and reading, it was anticipated that students would significantly improve their scores after participating in the AVID elective class, and the results verified this expectation. The overall results of the seventh and eighth grade AVID elective students' 2009 CSAP mathematics scores were statistically significant as compared with their previous 2008 CSAP mathematics scores (in sixth and seventh grades respectively) prior to their participation in the AVID elective classes. The mean scale scores were higher for the 2009 CSAP results for both grade levels compared to their previous 2008 CSAP results.

One explanation for these results may lie in the intentional design of the AVID elective class. Study skills are taught initially in the AVID elective class and then reinforced in the core content classrooms. Students are taught how to mimic the behaviors of successful students, including how to take ownership of their learning. Strategies such as sitting in front of the class, active listening, and asking questions help AVID elective students gain more from their classes. These students are also required to maintain a binder for each of their core classes that assists them in organizing the key ideas and questions from each class by using the Cornell format of note-taking (Swanson, 2005). In addition, AVID elective students utilize learning logs to review the content from each core class as well as generate follow-up questions for either the teacher or college tutor to gain further understanding of the specific skill or concept.

Another explanation of why AVID elective students significantly performed better on CSAP after experiencing a year of the AVID elective class may be the personal attention they receive from their AVID elective teacher and college tutors. These students, unlike most other students in a large school setting, are afforded individualized attention daily regarding each of their classes, assignments, and overall academic progress. AVID elective students are virtually immune from falling through the cracks because of the continuous connections that the AVID elective teacher and college tutors make with each student.

Furthermore, AVID elective students likely benefited from improved test scores due to the specific training the AVID elective teachers and core academic AVID teachers received from professional development and AVID summer institutes. These specialized trainings provide the AVID elective teachers and core academic AVID teachers with strategies to enhance writing, inquiry, collaboration, and reading within their content areas. AVID-trained teachers learn techniques to increase higher level questioning, promote critical thinking, and develop stronger problem-solving strategies with their students. In addition, AVID elective students are guaranteed to have AVID-trained teachers for all of their core content area classes, thus ensuring the skills and strategies that are promoted within the AVID elective class continue throughout the AVID elective student's academic day.

Question Two: After participating in the AVID elective class, do middle school students (in seventh and eighth grades) demonstrate a statistically significant academic growth in mathematics and the sub-content areas (as measured using the Colorado Student Assessment Program) than a group of middle school students who were on the AVID academic team but were not in the AVID elective class?

Because of the extensive support and additional areas of concentration in writing, inquiry, collaboration, and reading, it was anticipated that the AVID elective students would have significantly improved their scores as compared to the AVID team students, but the results did not verify this expectation. The overall results of the seventh and eighth grade AVID elective students' 2009 CSAP mathematics scores were not statistically significant as compared with the seventh and eighth grade AVID team students' 2009 CSAP mathematics scores, even after the AVID elective students' participation in the AVID elective class.

One explanation for these results may lie in the fact that the AVID team students also benefited from the AVID-trained teachers in all of their core academic classes. And, although the AVID team students did not receive an additional daily class specifically designed to offer further assistance with writing, inquiry, collaboration, and reading like the AVID elective students received, they did attend the same core classes with the same AVID-trained teachers who modeled and implemented those same basic strategies and techniques. In essence, the AVID team students, like the AVID elective students, benefited from instruction that emphasized increasing higher level questioning, promoting critical thinking, and developing stronger problem-solving strategies.

Another explanation of why the AVID elective students did not demonstrate statistically significant improvement on their CSAP scores as compared with the AVID team students may have resulted in the fact that the AVID team students did not fit the student profile to be enrolled in an AVID elective class. Basically, AVID team students already possess stronger academic skills and a track record of proven academic success than their AVID elective classmates; otherwise, those AVID team students would have been accepted into the AVID elective classes.

Question Three: After participating in the AVID elective class, do middle school students (in seventh and eighth grades) demonstrate a statistically significant academic growth in mathematics and the sub-content areas (as measured using the Colorado Student Assessment Program) than a group of middle school students who were non-AVID students?

Because of the extensive support and additional areas of concentration in writing, inquiry, collaboration, and reading, it was anticipated that the AVID elective students would have significantly improved their scores as compared to the non-AVID students, but the results did not verify this expectation. The overall results of the seventh and eighth grade AVID elective students' 2009 CSAP mathematics scores were not statistically significant as compared with the seventh and eighth grade non-AVID students' 2009 CSAP mathematics scores, even after the AVID elective students' participation in the AVID elective class.

One possible explanation of why AVID elective students did not statistically outperform non-AVID students may rest with the overall mission of the AVID program. As described by the AVID founder, Mary Catherine Swanson, and Executive Vice President for National Programs, "AVID's systematic approach supports school and district-wide achievement efforts" (Swanson & Gira, 2007). While it is not the mission of AVID for every student within a school to be enrolled in an AVID elective class, it is the mission of AVID that schools commit to the philosophy and principles of AVID throughout the school. Therefore, non-AVID students may still have been indirectly exposed to AVID instructional strategies from teachers who had gained some additional knowledge and skills from their colleagues who had been formally trained in AVID instructional strategies.

Furhermore, the non-AVID students, similar to the AVID team students, did not fit the profile to be considered AVID elective students. Therefore, many of the non-AVID students may have already possessed a stronger set of academic skills and a more successful academic track record than those students who participated in the AVID elective class. Otherwise, the non-AVID students may have gained access into an AVID elective class.

An alternative explanation may point to the fact that if the AVID students had not received the intervention of the elective class, their achievement might have further declined as compared with their non-AVID peers' achievement. Therefore, while AVID elective students did not significantly out perform their non-AVID peers in CSAP for mathematics, they did not significantly under perform as compared to their non-AVID peers. In essence, AVID elective students "kept-up" with their non-AVID peers which supports the overall goal of AVID – to provide the necessary skills for students to enroll in college preparatory classes to enter a four-year college or university that they might not otherwise achieve without the support of AVID.

Question Four: After participating on the AVID academic team (but not in the AVID elective class), do middle school students (in seventh and eighth grades) demonstrate a statistically significant academic growth in mathematics and the sub-content areas (as measured using the Colorado Student Assessment Program) than a group of middle school students who were non-AVID students?

Because of the AVID instructional strategies explicitly embedded within the core academic curriculum and additional areas of concentration in writing, inquiry, collaboration, and reading within the content areas, it was anticipated that the AVID team students would have significantly improved their scores as compared to the non-AVID students, but the results did not verify this expectation. The overall results of the seventh and eighth grade AVID team students' 2009 CSAP mathematics scores were not statistically significant as compared with the seventh and eighth grade non-AVID students' 2009 CSAP mathematics scores, even after the AVID team students' enrollment in core academic classes with AVID-trained teachers.

One explanation of why there was no statistical difference between the AVID team students and the non-AVID students may have resulted because of the mission of AVID. In essence, whether a student was enrolled in core academic classes with AVID-trained teachers or not, AVID instructional strategies may have permeated throughout the school and into other non-AVID classrooms. Therefore, non-AVID students may have had an opportunity to receive similar instructional strategies within their classes as the AVID team students.

Another explanation of the lack of statistical differences between the 2009 CSAP scores of the AVID team students and the 2009 CSAP scores of the non-AVID students may lie in the fact that neither group of students were required to meet any specific profile to enroll in an AVID elective class. Therefore, both groups of students may have similar composition of academic abilities.

To summarize, only the 2009 CSAP mathematics results of the AVID elective students as compared to their previous 2008 CSAP mathematics results showed significant differences. All of the other comparisons (AVID elective students to AVID team students, AVID elective students to non-AVID students, and AVID team students to non-AVID students) did not show significant differences in their results. In short, the AVID elective students benefited from learning how to incorporate behaviors typically found with successful students. They also gained additional support from college tutors and an AVID trained teacher who taught specific skills and strategies in writing, inquiry, collaboration, and reading. Therefore, results from this study indicate that skills promoted in the AVID elective class support students in improving achievement as measured by CSAP when compared to their academic performance before the AVID elective class.

The fact that the other AVID comparisons showed no significant differences with the CSAP results may most strongly suggest that the mission of AVID – to ultimately permeate its philosophy and strategies school-wide – may have already taken hold at Huntington Middle School. Specifically, non-AVID trained teachers may have likely embraced instructional skills and techniques from their AVID trained colleagues and found meaningful strategies to incorporate those skills into their classes.

Limitations

This quasi-experimental study researched the impact of AVID on academic performance of middle school students from the seventh and eighth grades of a large, suburban middle school. The study had the following limitations:

1. A random selection for the population of the study was not possible because students who entered into the AVID elective class did so based upon meeting the requirements of a pre-defined student profile.
2. The small sample size limited the study and may not support generalizing the results without replication of the study in other settings or replication with a larger sample size.
3. Teachers who were AVID trained in mathematics strategies professed to practice the methodologies. In reality, these teachers might have not used AVID strategies in any of their classes.

4. Since the non-AVID students were also from the same school in which the AVID program existed, the control group may have been influenced by teachers who were AVID trained, by teachers who were not AVID trained but learned some of the AVID instructional strategies, or by students who shared the strategies that they learned from attending classes with AVID trained teachers. This limitation commonly results from school environments in which a select few are adopting and implementing innovative strategies to improve instruction and student learning; however, because of the nature of schools as learning communities where educators routinely share best practices, these new innovations often ”bleed” into other classroom settings (Gredler, 1996).
5. The participation of teachers in other types of professional development in mathematics was not considered.
6. The gender, years of teaching experience, and level of education of any of the teachers involved in the study was not considered.
7. No formal process was used by the principal to select the mathematics teachers who attended the AVID Summer Institute (a week-long, intensive professional training in AVID instructional strategies and methodologies). Teachers self-selected participation in the program, possibly indicating variation in motivation.

Recommendations for Further Research

Since this study was limited to the data provided by Mountain School District and Huntington Middle School and the design of the study itself, there is opportunity for further valuable research on the AVID program at the middle level and its impact on student achievement. Suggestions for further research include the following:

1. Replication of this study using a true randomized control test as the experimental design by randomly placing students into the AVID elective class.
2. In a review of the data analysis, and even with the consideration of non-parametric statistics such as the Kriskal-Wallis Test using Chi-square and mean rank, the sample size proved too small to show a statistically significant difference when comparing AVID elective students' CSAP results in mathematics with AVID team students' and non-AVID students' CSAP results in mathematics. Therefore, the researcher would recommend replication of this study using a larger sample size to provide greater opportunity for generalizability.
3. Replication of this study using matched comparison groups (non-AVID students) from separate middle schools that do not have the AVID program would also increase validity of the results by ensuring greater confidence that the non-AVID students were not directly nor indirectly influenced by other teachers and students who possessed knowledge and expertise in the AVID instructional strategies.
4. Conducting a longitudinal study to observe the impact of the AVID program on student achievement over two or more years by analyzing the CSAP results in mathematics for students who were enrolled, for example, in the AVID elective class for at least two consecutive years or more would provide greater opportunity for the AVID principles and practices to be embraced by the students enrolled in the program and, therefore, may result in a more significant difference in CSAP results for mathematics.

5. Replication of this study with a larger sample size examining the impact of the AVID program on student achievement using CSAP results in the content areas of reading and writing could determine what, if any, significant differences occur. It may prove especially useful since the primary instructional strategies for AVID include reading and writing, along with inquiry and collaboration; therefore, one might expect a more significant difference in results in those content areas than in mathematics.

Conclusions

This study has affirmed that students who participated in the AVID program performed significantly better after participating in the AVID elective class than prior to having participated in the AVID elective class as measured by CSAP in the content area of mathematics. The AVID instructional strategies of writing, inquiry, collaboration, reading (WICR), college tutors, and overall emphasis on developing the habits and behaviors of successful students has proven to positively impact achievement of students at the middle school level. This study also confirms that the students AVID targets, those who are often identified as being underserved and in the middle, can significantly improve their academic achievement with such supports as those that make up the AVID program and AVID elective class.

The AVID program is one possible option to reform and improve student achievement within a school, especially with those students who might be least served by other intervention efforts. Moreover, when successfully implemented at the middle school level, AVID may create greater opportunities for future academic success for students as they enter high school and prepare for college and other post-secondary experiences. However, there is more research needed at the middle school level to determine whether or not the AVID program and the necessary resources to support such a program, truly have a significant impact on student achievement and are worth the expense.

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