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PROGRAMMING OPTIONS FOR GIFTED AND TALENTED MIDDLE SCHOOL STUDENTS: A COMPARISON OF THREE PROGRAMS

A Dissertation Submitted in Partial Fulfillment
of the Requirements for the Degree of
Doctor of Education

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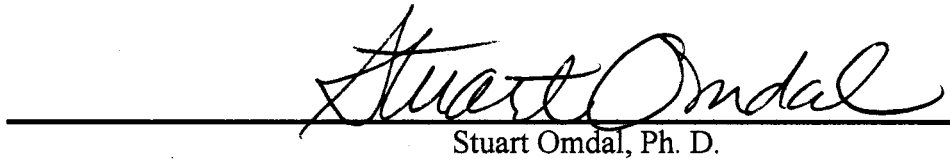

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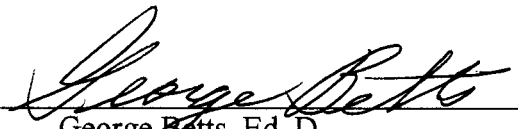
Co-Advisory Professor 
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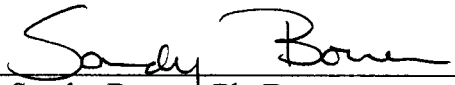
Advisory Professor 
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ABSTRACT

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This study examined the programming options available to Gifted and Talented middle school students in a large, urban, southwestern school district. Three options were available to GT students: magnet schools for gifted; magnet schools for Math and Science, Technology, Performing Arts, or other areas; and honors or Pre-Advanced Placement classes available at the students' home schools. Scale scores on the Stanford Achievement Test, 10th Edition, were compiled for the subtests of Reading, Mathematics, Science, and Social Sciences. These data were grouped according to school, averaged by school, and compared using a one-way MANOVA. Results show that no statistical differences existed between the three types of programming options.

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CHAPTER I

INTRODUCTION TO THE PROBLEM

With the No Child Left Behind legislation passed in 2000, schools have been working hard to move their low-performing students up to meet Adequate Yearly Progress and try "closing the achievement gap" (U.S. Department of Education, 2005, p 16). Because so much attention has been focused on meeting the needs of their lower-performing students, some schools have been neglecting students who are performing well because they consistently score well on standardized tests. These students are often used as classroom aides with low-performing students in the class. When this occurs, the needs of the high-performing students, especially in the four core subject areas of reading, math, science, or social studies, fail to be addressed (Fiedler, Lange, & Winebrenner, 2002).

According to Rogers (2002a), gifted and talented (GT) students need special services to meet their academic and social needs while in school. Some examples of programming options currently available and used in schools include pull-out programs, in-class accommodations, gifted and talented classes within schools, and magnet schools for GT students. These options may be offered individually or in combination. In-class accommodations can, in turn, include homogeneous grouping, heterogeneous grouping,

cooperative learning, individual learning, cluster grouping, and others. Pull-out programs usually work with students for only part of the school day or week, pulling them out of their regular classes to attend a special class or session just for students identified as gifted (Vaughn, Feldhusen, & Asher, 1991). Classes for GT students that occur in the students' home schools typically are a form of cluster grouping, sometimes including other high-ability students and some low-performing students in the classes. Cluster groups for gifted and talented students assign these students to a few classes as opposed to assigning them to all available classes for that subject or grade level. Another option for school districts to consider is separating students to the extent that they are served in schools designed especially for GT students. In this study, magnet schools provide this level of programming.

Although each of these programming options can be implemented in a variety of ways, the main theme that comes through in the research is that, whether served in the regular classroom, pull-out classes, or special schools, gifted students need the curriculum tailored to their specific learning needs (Shields, 1996). They also need to have the curriculum differentiated to meet their specific social-emotional needs (Reis & Renzulli, 2004).

Purpose

This study was designed to provide a more current look at the relative effectiveness of school programs for gifted and talented students in increasing achievement in the four core academic areas of language arts, mathematics, science, and social sciences. The study compared the effectiveness of programs for gifted and talented middle school students, identified mainly through achievement and ability tests, in

achievement gains in reading, math, science, and social studies. Three groups of gifted and talented students were compared: those who received gifted and talented programming at their home school in the form of within-class grouping; those who attended a magnet school for specific subject areas such as math, science, technology, fine arts, and also received specific programming for gifted and talented students; and those students who attended magnet schools for gifted and talented who are, therefore, cluster grouped. All students who were identified as gifted and talented were included in the study, and all students received programming for their needs based on district guidelines.

Research Hypotheses

H1 There will be no significant differences between students' achievement gains in reading, math, science, and social sciences for students attending magnet schools for math and science, fine arts, technology, or other areas and those who attend their home schools.

H2 Attending advanced classes at magnet schools for math and science, fine arts, technology, or other areas will have less of an effect on gifted and talented students' achievement gains than attending magnet schools for GT students.

H3 Attending advanced classes in their home schools will have less of an effect on gifted and talented students' achievement gains than attending advanced classes at magnet schools for GT students.

Rationale

Gifted and talented students tended to make greater gains in achievement when they were served with other gifted students than when they were served in heterogeneous groups (Kulik & Kulik, 1982, 1992). During the 1950s through the 1980s, this was often accomplished through the practice of tracking, a popular method of grouping students for instruction in schools. While serving high-ability students well, this system for education

did not work well for the students in the lower-track. Minorities and low-income students were placed in lower tracks disproportionately, while White and Asian middle-income students were placed in higher tracks. Once assigned, movement between tracks was very difficult. This led to a well-deserved feeling that grouping students by ability did nothing to promote equal education for all students (Tieso, 2003).

In the 1990s, the use of tracking began to decline, and the trend in schools has been toward meeting the needs of all students in the regular classroom (Oakes, 1985). This anti-tracking backlash has pushed to eliminate gifted programs from schools altogether. Many educators charged gifted programs with elitism for giving gifted students opportunities not afforded to other students (Fiedler, Lange, & Winebrenner, 2002). These educators offered cooperative learning as an alternative. Cooperative learning usually utilizes heterogeneous groups, encouraging the higher-performing students to help teach the lower-performing students. Proponents argue that cooperative learning is good for all students not only because it allows lower-performing students to learn from higher-performing students and provides them with achieving role models, but also that self-esteem is increased for all students with the use of cooperative groups. In their meta-analysis of the research on cooperative learning with GT students, Neber, Finsterwald, and Urban (2001) cited examples of research where cooperative learning increased self-esteem in gifted students when they worked in heterogeneous groups, but lowered self-esteem when students worked in homogeneous groups. However, achievement of gifted and talented students did not tend to improve when they were taught using cooperative heterogeneous grouping. Still, others cite examples of higher levels of achievement and self-esteem when gifted students work together in groups or

classes (Kulik & Kulik, 1982). In summary, cooperative learning may be helpful for some students some of the time, but not all students will benefit academically from this practice.

Recently, the trend in education has been fueled by the federal government's No Child Left Behind (NCLB) legislation. NCLB states that schools should close the achievement gap by making all children into proficient readers by the year 2014, in addition to introducing requirements that schools implement only those strategies for improving achievement which have been scientifically proven to be effective (U.S. Department of Education, 2005). Most schools are concerned with increasing the performance of their students who are currently below grade level. Because most gifted students are already performing at or above grade level, their needs are often being ignored (Tieso, 2003). And, while there are many research reports regarding what programming methods increase achievement in gifted students, see for example Kulik & Kulik, 1982, 1984, 1987, 1992; Fiedler & Lange, 1993; Gentry & Owen, 1999; Hoover & Salyer, 1993; Neber, FInsterwald, & Urban, 2001; Vaughn, Feldhusen, & Asher, 1991, most of the research is decades old. The most commonly cited articles on achievement for gifted and talented students were published in the 1990s. NCLB has changed the face of education because of the emphasis on testing that this act has brought with its passage. Through this study, the author hoped to learn whether gifted students' achievement on standardized tests is increased more with one program than another so their needs can be met by schools without neglecting the needs of others.

Delimitations

1. Age. Students in this study were in middle school (grades 6-8).

2. Geographic Area. All participants in this study attended schools in one school district in the southern United States in order to control for possible differences in policy and practice. This school district enrolled over 209,000 students: 58% Hispanic, 30% African American, 9% White, and 3% Asian/Pacific Islander. Eighty-two percent of students received free or reduced lunch. The district also served over 58,000 students from over 90 primary language backgrounds who were learning English.

3. *Stanford Achievement Test, 10th Edition.* The school district used the *Stanford 10 Test*, a norm-referenced test that measures achievement on a single scale of scores for all levels of the test, with all students every year so gains in achievement could be tracked over time. The scale scores on this assessment were organized so that they could show growth over time (Jorgensen, 2004). The subtest scores of Language, Mathematics, Science, and Social Sciences were used in this study.

4. Programming Options. The school district offered three programming options for gifted students: honors or Pre-Advanced Placement (Pre-AP) classes in students' home schools; honors, Pre-Advanced Placement (Pre-AP), or Pre-International Baccalaureate classes in magnet schools for specific subjects such as Math and Science, Fine Arts, or Technology; and in magnet schools especially designed for gifted and talented students. These were the three programming options under review for this study.

5. Time Spent in Program. Because the author wanted to examine the differences between programming options and the achievement of gifted students, she selected only participants who had been enrolled in the specific type of program for the entire three years under review.

Definitions

For purposes of this study, two terms were defined: (a) gifted and talented; and (b) programming options. These terms are discussed here.

Gifted and Talented

According to the U.S. Department of Education (2004),

> "The term gifted and talented, when used with respect to students, children, or youth, means students, children, or youth who give evidence of high achievement capability in areas such as intellectual, creative, artistic, or leadership capacity, or in specific academic fields, and who need services or activities not ordinarily provided by the school in order to fully develop those capabilities" (p.1).

The district supplying data for this study similarly defined gifted and talented students. Their definition was not stated verbatim here to maintain the district's confidentiality. However, they did include in their definition recognition that gifted and talented students needed special educational services that were different than those normally provided through regular educational programs. This district provided for identification of students based on a higher performance in general academic abilities, specific academic abilities, leadership abilities, creative abilities, or artistic abilities. Although these areas were mentioned, this district did not provide a subject specific identification. For example, students were identified just as gifted and talented, not gifted in creativity or leadership or Math. In the school district used in this study, students were identified as gifted and talented with a combination of ability testing, achievement testing, grades, parent observation forms, and teacher observation forms. Students were

also given extra consideration if they were also identified as needing special education resources, were learning English, or came from a low economic background.

Programming Options

Programming options are methods of serving students in schools in order to meet their academic needs. In order to teach in a gifted and talented program, all teachers in the district must have completed a 30 clock-hour course in the basic needs of gifted and talented students, per state guidelines. Teachers must have had to maintain their certificate with an additional 6 clock-hours of professional development in gifted and talented education annually. All gifted and talented students were assigned to classes that offered differentiated instruction to meet their unique educational needs and were aligned with the state and local standards.

Each school was charged with designing the specific gifted and talented program used at that school and had to assign a GT coordinator to accomplish program goals. Schools were also given district support as needed, and all programs were monitored by the Advanced Academics Department.

Other programming options discussed in this study were:

1. Honors or Pre-AP classes: Classes in which students are grouped by subject area into higher-level classes with more potential for academic rigor than regular classes according to advanced achievement in a particular subject area.

2. Magnet Schools: Schools which drew students from all over the district in order to serve the particular needs of students.

3. Differentiated Instruction: Instruction that included altering the pace, depth, and complexity of the standard curriculum in the four core academic areas of language

arts, mathematics, science, and social sciences to better fit the instruction levels of students.

4. Within-class Grouping: Any form of grouping that grouped students within a classroom, in either heterogeneous or homogeneous groups.

5. Cluster Grouping: A form of group in which students of like ability were clustered into one class, rather than separating them and placing them throughout all possible classes.

Summary

Many studies show the efficacy of serving gifted and talented students in programs designed specifically for them, but the vast majority of these studies were conducted in the 1980s and early 1990s. While there have been research syntheses published more recently, they are not new research studies. This study was designed to provide a more current look at the relative effectiveness of school programs for gifted and talented students in increasing achievement in the four core academic areas of language arts, mathematics, science, and social sciences. Data for this study were provided by a school district in the southern United States in which three different programming options were available to meet the needs of gifted and talented students.

CHAPTER II

REVIEW OF THE LITERATURE

The No Child Left Behind (NCLB) legislation passed by the federal government in 2000 required school districts to implement scientifically based research practices in their classrooms. The U.S. government also desired schools to focus on proven strategies for improving achievement of all students. Together, these mandates have led to a renewed interest in test scores and methods for increasing them. Gifted children compose a sub-group under NCLB. As a group, gifted students need to improve, or at least maintain, their scores every year in order to make Adequate Yearly Progress (AYP) (U.S. Department of Education, 2005). Because many gifted children already performed well on standardized tests, they could be overlooked in classes or schools that had many students not performing at even minimum levels of achievement.

The author wished to examine programming options for gifted students and how these might relate to their achievement in school. The most common options used with gifted students and those upon which this literature review focused include: ability grouping with advanced, enriched, or accelerated curriculum; specific classes designed specifically for GT students; and magnet schools for GT students.

Rogers (2002a) determined in her synthesis of research on grouping that gifted students tended to achieve more when they were grouped with other students of similar ability. Students also reported enjoying the time spent with other gifted children. It should be noted that despite the strong feelings grouping inspires in educators, there is a tremendous lack of recent scientific research on this topic. Therefore, most of the research studies included here are more than 10 years old, although there have been several syntheses published within the last decade.

Grouping in Schools

The debate over using ability grouping in schools dates back to the early part of this century and even the latter parts of the last century--almost as long as modern public education has been around in this country (Kulik & Kulik, 1982). Schools have used many different methods for grouping students including tracking, within-class grouping, and between-class grouping. Since the beginning of its use, grouping has been controversial, with some arguing against the practice as being elitist and undemocratic. Others argued that it allows teachers to better meet the individual needs of all their students (Slavin, 1987a). Whatever the reason for using groups in classes, strong emotions usually accompanied that decision.

Types of Grouping

Three main types of ability grouping are discussed in this paper. They include within-class groups, classes for gifted students or cluster grouping, and magnet schools for gifted students, a more extreme option since it segregates students by school. Using magnet schools to serve gifted children is similar to, but not synonymous with, tracking or streaming as it is called in the United Kingdom.

Within-class groups are those that exist solely within one classroom. This form of grouping can work with homogeneous or heterogeneous groups. It is most often utilized in order to cater instruction to smaller numbers of students at one time. When using homogeneous groups, the students in a class are grouped according to their abilities, usually into three or four groups consisting of 8 to 10 students per group. Most teachers use some form of this type of grouping in their classrooms, although more commonly with reading or other language arts (Slavin, 1988). Heterogeneous groups tend to be smaller than homogeneous groups, enabling students to more readily engage in conversations that enhance learning. Cooperative learning is a form of heterogeneous grouping within classes and will be discussed later.

Cluster grouping works with one or more grade levels. Students are assessed according to their abilities, then placed in groups with other like-ability students, whether or not those students are in the same grade. The most famous use of cluster grouping is the Joplin Plan, conceived in the 1950s by Cecil Floyd, the assistant superintendent of schools in Joplin, Missouri. In the Joplin Plan, reading instruction ocurred at the same time for all students in order for them to move across grade levels as needed for their reading groups (Tieso, 2003). When students were cluster-grouped into classes or subject groups, teachers could benefit as well because they were able to match their instruction to the educational needs of all their students. While some teachers were concerned that when students are grouped by ability, the benefits of having bright children share their thoughts and ideas with the rest of the class would be lost, considerable evidence indicated that the benefits of more homogeneous groups outweighed the disadvantages. Teachers were able to meet the needs of more students when there is not as wide a range

of abilities within a classroom. Also, when the gifted and often most vocal students were in their own group, the other students did not feel overshadowed and were more likely to speak in their groups (Hoover & Sayler, 1993).

Tracking or streaming is used within a whole school. Students are assessed on their general intellectual abilities and placed into classes with like-ability students. This creates a high- class, an average- class, and a low-performing class at each grade level. The more classes per grade level, the more the school can narrow the range of ability within each class (Slavin, 1987a). This practice is currently more common in the UK where it is called streaming. There students are assessed at set intervals and assigned to streams based on those test results (Kerchoff, 1986). Magnet schools are also rigid in their grouping strategies in that they remove students from their home schools based on test scores or other assessment criterion. Once in a different school, teachers can group students even more through the use of within-class or cluster grouping. Magnet schools are optional, however, and students have the ability to withdraw at any time and return to their home school. Tracking, on the other hand, is used within a particular school, and students are not sent elsewhere for their classes. If students' needs are not met by their placement in a magnet school, they are allowed to return to their home school. Tracking is usually rigid, not allowing movement between the tracks. With tracking, students have little, if any, recourse if they believe their needs are not being met or they feel their placement is incorrect.

Cooperative Learning

When teachers use groups composed of mixed ability students, they are often using a technique called cooperative learning. Cooperative learning is another form of

within-class grouping. In cooperative learning, students are grouped heterogeneously and are encouraged to learn from and teach one another. Many educators believe in this form of grouping because the lower-achieving students are given positive role models in the form of higher-achieving students, and the higher-achieving students are given the opportunity to solidify their knowledge by explaining concepts to lower-achieving students. Proponents of cooperative learning suggest that all students benefit from this form of grouping by increasing understanding and self-esteem (Smith, Johnson, & Johnson, 1982). Perhaps the most-cited proponent of cooperative learning and heterogeneous grouping in schools is Jeannie Oakes (1985), although many others such as Anne Wheelock (1992) shared her beliefs about grouping.

In her 1985 book, Oakes suggested that by using tracking, schools created an unfair, unequal environment that forces children into rigid placements. Once placed, students had no opportunity to move up or down into new tracks. The low-track students were given less opportunity to grow than were students in higher tracks. Slavin (1987a) also discouraged this practice, citing low achievement from the lower-track students. They both offered cooperative learning or heterogeneous grouping as the alternative to tracking and as a teaching method that benefits all students. They believed that higher-level students could become teachers and role models for lower-level students, which then reinforced their learning while giving lower-level students not only another opportunity to learn the material, but also examples of good classroom behaviors. However, there was other research that contradictorily suggested students did not model their behavior on higher-ability students, but they modeled themselves on students of similar ability (Hoover & Salyer, 1993).

For many reasons, especially those listed above, the practice of homogeneous grouping in this country is in decline. Wilkinson and Townsend (2000) reported data from the National Assessment of Educational Progress which showed that almost 80% of fourth grade students in the United States were taught using ability groups in reading in 1988. This number fell to 44% of students by 1991, albeit these data came from a different survey: *The International Association for the Evaluation of Educational Achievement.* Berghoff and Egawa (1991) cited many teachers' and schools' reasons for this decline. The most common reason stemed from the idea that there was no evidence to support the use of ability grouping and that, in fact, the practice could be detrimental to the self-esteem and achievement of the students in the lowest groups.

Cooperative Learning with Gifted Students

Cooperative learning requires students to work in heterogeneous groups, and can be an important part of the school experience for gifted students. Joyce (1991) claimed that when used appropriately, cooperative learning could mean any number of several methods of teaching and learning, and that gifted students could benefit from learning how to cooperate with others of differing abilities. However, Matthews (1992) discussed cooperative learning with identified gifted and talented students to get their opinions on the practice. While a few students liked to be in charge of teaching others, most gifted students mentioned that they did not like cooperative learning situations because they ended up doing most of the work in the group in order to get the grades to which they were accustomed.

In addition, there was evidence to suggest that heterogeneous groups did not help increase achievement better than homogeneous groups, either. Hernandez Garduño

(2001) examined the differences between cooperative learning and homogeneous groups with high-ability, mathematically talented, female high school students. She found that students in heterogeneous groups did not learn any better than did students in homogeneous groups. In fact, for students who prefer competition, homogeneous groups or working alone improved achievement more than did competition-liking students who worked in heterogeneous groups. Hunt (1996/1997) also examined mathematics achievement in gifted students when taught in homogeneous and heterogeneous groups. She found that gifted students' achievement in math increased more when they were taught in homogeneous groups as opposed to being taught in heterogeneous groups. Students accomplished more and learned more when they were with other students of similar abilities.

Homogeneous groups used with gifted students helped to increase their achievement slightly, but their self-esteem decreased when this practice was used. Because of this, Mesler (1999) argued that teachers could use cooperative learning as a part of the regular classroom environment because gifted students' self-esteem could remain high while still maintaining modest achievement gains. In a related study, Shields (2002) investigated student attitudes toward homogeneous and heterogeneous groups. She also determined that gifted and talented students' achievement can increase when homogeneous groups are used without deterring the learning of the rest of the students. However, she also discovered that heterogeneously grouped students had higher self-concepts academically. She theorized that this is due to the "big fish, little pond" phenomenon which inflates gifted students' self-concepts when they are at the top of a

mixed-level class, but suddenly find themselves faced with competition in a homogeneously grouped class.

The variety of research on cooperative learning can be difficult to interpret, usually based on the supposed biases of the researchers. While cooperative learning did help increase self-esteem in gifted and talented students, Patrick, Bangel, Jeon, and Townsend (2005) found no definitive evidence in their research synthesis that proved its effectiveness in increasing achievement. They focused their attention on teachers' roles in cooperative learning, and they determined that teachers needed to make groups accountable so all members participated equally and that teachers needed to create a supportive classroom environment where all students felt comfortable sharing. When those situations were present, cooperative learning could work. In summary, cooperative learning can be a part of the educational experiences of gifted students, though it should not be the only part.

Homogeneous or Heterogeneous Grouping for Gifted and Talented Students

In this country, the debate over the use of ability groups has focused on the lack of evidence supporting the effectiveness of grouping for all students and the social issues that might arise when grouping is employed. Many researchers charged that students preferred working with students of different abilities so they could help or learn from their classmates. When students were segregated into ability groups, they were unable to gain indirect learning from higher-ability classmates and could also suffer from lower self-concepts if placed in the "low group" (Elbaum, Schumm, & Vaughn, 1997; Gamoran, 1986; Oakes, 1985; Rowan & Miracle, 1983). Once placed, students' achievement was based on the pacing of the group and expectations of the teacher.

Movement between groups was rare, further limiting how quickly a student might grow in comparison to the rest of the students in the class. There was also concern about the over-representation of minorities and low-SES students in the lower groups which could doom them to be poor readers for the remainder of their school careers, forcing these students into a cycle of low-earning careers and disinterest in education (Davies, Hallam, & Ireson, 2003; Slavin, 1988; Slavin, 1987b; Haller & Waterman, 1985).

With gifted and talented students, heterogeneous groups tended to be much more effective at increasing social outcomes than achievement outcomes (Neber, Finsterwald, & Urban, 2001). Therefore, cooperative learning should not be used to cure the problems with unequal achievement often associated with tracking (Mills & Durden, 1992). Gifted and talented students still need instruction tailored to their needs. A fair education for all does not mean that all students need to receive the same instruction or assignments and that cooperative learning can be used in conjunction with ability groups. Grouping alone does not influence achievement; appropriate and effective instruction needs to accompany any grouping practices because students who are grades apart in their understandings and instructional levels do not contribute equally to group discussion or feel equally connected in the activities.

Those who advocated the use of ability or homogeneous grouping in schools used the argument that instruction could be more focused according to student needs with this format (Shields, 1996). If true, this was an especially important argument when working with gifted or twice-exceptional students. Twice-exceptional students are those who are identified as gifted and who also have an identified disability such as a physical, emotional, or learning disability. While there are many programming options available

for use with gifted students, the majority of schools and districts use one of the forms discussed in this study. Many special educators and teachers of the gifted use small ability groups as the main mode of instruction, pulling students from their regular classrooms for instruction with other students of similar abilities or disabilities. Other schools and districts create classes specifically for gifted students, and some have magnet schools for gifted children and adolescents. Practical realities often limited the use of special classes for gifted students because gifted education does not receive the funding special education does (Holloway, 2003). Therefore, students had been included in more regular education settings for a longer part of the school day, and they were often serviced by the use of within-class ability grouping (Moody & Vaughn, 1997).

Most researchers in gifted education advocated grouping by ability in order to better meet the unique needs of these students (Tieso, 2003). Fiedler and Lange (1993) also countered the movement towards cooperative learning with criticisms of the research done in this area. They claimed that many studies which advocate for cooperative learning or heterogeneous grouping for all students, including the gifted and talented, had not actually included gifted and talented students in their research. Therefore, the findings for this population of students were not valid. Fiedler and Lange also argued that keeping gifted and talented students segregated from one another actually led these students to develop inflated appraisals of their own abilities and promoted arrogance. They did concede that many minorities and special populations have traditionally been underrepresented in gifted and talented education. However, districts should not eliminate gifted programs because of this; rather, they should work to include students from all backgrounds and not rely so heavily on standardized testing. They concluded that

cooperative learning can be a part of the educational experiences for gifted and talented students, but it should not be the only method available for schools to use. Teachers should be able to decide upon appropriate instructional methods for their students.

Determining to use grouping with gifted and talented students and what type of grouping to use was easy for some. Shields (1996) recommended using homogeneous groups with these students because of the gains in students' self-acceptance and academic self-concept. With student responses aiding in the interpretation of the quantitative data, she determined that students enjoy the peer interaction and came to have a more realistic understanding of their abilities and strengths and weaknesses. Students in gifted and talented classes were more able to discuss their learning and had better metacognition than students who were served in the general classroom. They enjoyed the choices offered to them as part of the program and their classroom environment. However, the decision for moving a child to a homogeneously grouped class or school seemed to reside with the parents. When children were happy with their neighborhood school, parents were less likely to encourage their children to try a new school. When students were picked on or otherwise made to feel different, parents tended to encourage their children to change schools or classes. This phenomenon may have something to do with students who participated in homogeneous classes feeling more comfortable in those settings.

How and Why Teachers Group

Many teachers used some form of grouping in their classes but the question of whether ability grouping actually exists was raised by Haller and Waterman (1985). They looked at how teachers assigned students to ability groups in order to determine the criteria teachers used for this process and if a bias existed in applying these criteria. They

determined that reading ability was actually the most-used criteria for placement into reading groups, but it was by no means the only standard used. When group assignment was clear, reading ability was the most often cited reason for placement, but it still accounted for only 51% of placement criteria. General academic competence accounted for 37% of placements. However, when students' appropriate assignments became unclear, teachers tended to rely on other information to make group placement. In these situations, after reading ability (41%) the most often cited reasons for placement became work habits (30%), student behavior and personality (15%), general academic ability (11%), and home background (4%). This led them to the conclusion that there is no such thing as a true ability group. Other factors always seemed to play a role in within-class group placement. These findings were reinforced by the study from Pallas, Entwisle, Alexander, and Stluka (1994) who determined that there was only about a .30 correlation between achievement scores and reading group placement in first grade. This becomes important when one takes into account that reading group placement in first grade can be a major determination of second grade group placement, and that movement between groups is rare (Juel, 1990).

School structures and practical issues play a major role in how and when teachers used grouping formats for instruction. Moody and Vaughn (1997) studied general education and special education teachers' opinions on grouping and discovered that special educators liked to use ability grouping with their students because they believed students made greater progress when they were grouped by ability. However, these teachers also expressed frustration with school structures that set limits on when and how they were able to pull students for groups. General educators preferred using mixed-

ability groups because they believed that low-ability students can gain from having high-ability readers in their groups. They also reported that they preferred using whole-class instruction, despite the fact they felt they were not meeting the needs of all students with this arrangement. When general education teachers grouped for instruction, they tended to use the same trade books or basal readers for every group, regardless of reading level. One thing both groups of teachers had in common was that pressures from administrators and school districts tended to guide which type of grouping practice they used and how frequently they utilized these practices.

The administrators played a major role in the use of grouping at one school in Australia where they decided to implement cluster grouping as a way to meet the needs of its diverse learners. The project turned out to be not as successful as researchers and administrators had hoped, mainly because of teachers' perceptions and biases. Many of the teachers in the school did not believe gifted students needed any special instruction and that by providing any special instruction to gifted students, teachers and schools were actually taking away resources from more needy students like those with disabilities. This highlights the need for schools to train their teachers in the nature and needs of gifted students (Blanksby, 1999).

In the United Kingdom where the use of ability groups has been more government sanctioned than in the United States (Kerchoff, 1986), practical issues also played a role in how and when grouping was used. The staff of a school and its available resources was often the deciding factors in what form of grouping the school used. The ideology of the administrators, while important in what grouping practices the school employed, was only the second factor. In schools that used tracks, or streams as it is known in the UK,

achievement tests were most often used for placement into those classes. Some schools kept banks of tests on hand for use in placement decisions, while others considered information from teachers, parents, and the students themselves when they deemed it was appropriate. These schools found it hard to keep the low-ability groups small based on practical issues such as available teachers and classrooms. Where schools used within-class ability groups, the placement decisions were at the discretion of the teacher. In these situations, as in the findings in Haller and Waterman's (1985) study, factors other than ability were used to determine placement; criteria such as friendships, group size, gender, behavior, and the teachers' estimations of positive working relationships (Davies, et.al., 2003) were used.

The need to move students within groups was emphasized in schools where ability grouping was used; however, practical issues also intervened in these decisions. Keeping groups flexible was difficult, especially when schools used streams because of the difficulty of moving students between classrooms and accounting for any missed instruction. In situations where students were moved between streams, moves were most commonly made at the beginning of the school year. As expected, movement between within-class groups was easier and more common than movement between streams. Students tended not to be concerned with how they were placed into streams or groups as long as they were with friends (Davies, et al., 2003). Kerchoff (1986) believed that group placement in the UK was more determinative of future outcomes than was placement in the U.S. because of the higher stakes, such as testing, which were involved when students were being placed into particular streams or groups. In summary, ability groups were rarely formed solely on the basis of ability, therefore keeping those groups flexible

worked to the benefit of students, and a variety of grouping strategies was desired by students.

Grouping Students Identified as Gifted

Grouping Practices

Grouping practices and program options have been proven to have an effect on the achievement of gifted students (Kulik & Kulik, 1992). Multilevel classes, which some called tracking, had negligible effects on achievement (effect size = .10). The only group that produced any statistically significant gains was the group of high-ability students, but this effect was still small. Cross-grade grouping, such as the Joplin Plan, had larger effects, but were still considered small (effect size = .30). In this case, lower-ability groups had larger effects than high-ability groups. Within class grouping, or ability grouping within a regular education classroom, also had small effects (effect size = .25), but for this condition, higher-ability groups made greater gains. Enriched classes for gifted and talented students had medium effects on achievement (effect size = .41). By far, the largest gains were made by accelerated classes for gifted and talented students (effect size = .87). These data tended to show that when curricula and programs were more tailored to the needs of gifted and talented students, their gains on achievement were greater. Goldring (1990) also conducted a meta-analysis on grouping gifted and talented students. She found that homogeneous groups were more effective at increasing achievement than heterogeneous groups in certain subjects, such as science and social studies. Gifted students in special classes did not show higher levels of creativity or self-concepts, but they did have a better attitude about school.

Cluster grouping is another form of grouping that could offer many benefits to the education of gifted and talented students. Because they were with other gifted students for only part of the day, students had the opportunity to interact with their same-age peers and their intellectual peers. Also, cluster grouping could be a cost effective method of meeting the needs of gifted and talented students because it does not require additional personnel to implement. When third through fifth grade classes were flexibly cluster grouped in a district, teachers discovered that they moved students up into higher groups more than they moved students down in groups. Teachers believed this was because students who might otherwise not speak with the gifted students in the room felt more confident about responding and engaging in classroom activities. Flexible cluster grouping has also shown to increase reading achievement (Gentry & Owen, 1999).

Curriculum compacting is a method of meeting the needs of gifted and talented students in the regular classroom, and it is often combined with ability grouping. In compacting, students are pre-assessed before a lesson or unit. They are then excused from lessons in which they already know the information to be presented, freeing class time to work on other topics. Reis, Westburg, Kulikowich, and Purcell (1998) suggested that curriculum compacting is a necessary part of a teachers' repertoire because more gifted and talented students were being serviced solely in the regular classroom. They claimed that because most gifted students already knew 40%-50% of the standard grade-level curriculum before it was taught, it could be a waste of their time to sit through all the regular lessons. Their research did not find a difference in achievement as measured by *The Iowa Test of Basic Skills* between students whose curriculum had been compacted and students whose curriculum had not been compacted. However, when another group

of students was given a pre-test and post-test to measure gains in achievement, the data showed a significant difference between groups of students who experienced compacting and those who did not, with the compacted group outperforming the non-compacted group. They concluded that high-ability students needed some form of curriculum differentiation.

When students were removed from their regular classrooms to receive gifted and talented services for part of the school day, they were being served in pull-out programs. Vaughn, Feldhusen, and Asher (1991) conducted a meta-analysis and research review on pull-out programs and their effectiveness with gifted and talented students. They found that research on pull-out classes in creativity training shows significant positive effects. Students' self-concepts were only slightly positively affected by the pull-out model, but achievement and critical thinking were both moderately affected. When comparison studies were available, they discovered that full-time gifted and talented programs were effective at increasing reading achievement, but not mathematics achievement. Overall, Vaughn, Feldhusen, and Asher concluded that pull-out programs can be effective at meeting the needs of gifted and talented students, especially when they were combined with grouping in the regular classroom and were an extension of classroom activities and lessons..

Group Pacing

Group pacing has been shown to have great effects on achievement. Rowan and Miracle (1983) researched the influence of peer groups and institutionalization on reading achievement and found that neither peer stratification nor student behavior had virtually any effect on achievement. In tracked classes, the differences between high and low

group achievement was, therefore, based on the pacing of the group; the lower tracks received the slowest group pacing. When reading groups occurred within-class, these differences were reversed, with the lower groups receiving the faster pacing along with more direct interaction with the teachers. This worked to decrease, but not eliminate, the advantage of being placed in the higher reading group. Students in the higher groups still gained more in achievement over the year than did students in the lower groups. Thus, the type of grouping a school chose to use made a difference in how large the achievement gap was between the high and low groups. It was not clear from the study if the higher groups gained more because of the faster learning rates or faster pacing by the teacher.

Other studies also established that grouping affected the pace of the group. Juel (1990) found that the content covered in first grade reading groups was based on group placement, with the higher groups moving through the basal readers at a faster rate. Gifted and talented students were able to move quickly through material and could, therefore, make more gains in reading. Gamoran (1986) conducted similar research, but with slightly different results. He found that the higher the placement in reading groups, the more words a student learned, but that these effects waned over time. Students learned more words when they were exposed to more words, and the higher reading groups were taught more phonics and sight words. Therefore, instructional effects were the most important factor in how much a student learned. However, these differences in learning were no longer apparent after the first semester of first grade and had completely disappeared by second grade. Again, it was not clear whether differences in learning were because of the students' abilities or the teachers' pacing of instruction.

Acceleration

Acceleration could have tremendous impacts on achievement in elementary and secondary gifted and talented students. An early meta-analysis by Kulik and Kulik (1984) examined the effects of acceleration, and they found that when accelerated students were compared to their same-age peers, the accelerated students had grown considerably more than non-accelerated students (effect size = .88). When accelerates were compared to other students who were not accelerated, but who were in the same grade, there was not much difference between the groups. This showed that accelerates did not appear to differ from their new grade-level peers. Kulik and Kulik concluded that gifted and talented students did benefit from acceleration and were able to handle the more rigorous work, eventually becoming indistinguishable from their new class peers. Sayler and Brookshire (1993) wanted to determine if accelerated students were socially well-adjusted. They found that females were more likely to be accelerated than males and that they were more likely to be seen as good students by their classmates. Most probably because of the more appropriately challenging environment, accelerated students were less likely to get in trouble at school than their non-accelerated gifted peers. They found no evidence that accelerated students suffered from any academic or emotional maladjustment. Still, the number of students who were actually accelerated was very small, accounting for only 1.3% of their study sample of 24,599 eighth-grade students.

Other types of acceleration programs were available through talent programs at various universities. One flexibly paced mathematics program was available through the Johns Hopkins Center for Talented Youth (CTY). In this particular program, students were enrolled in classes at the CTY on weekends for 7 months while still attending math

classes at their regular schools. Teachers in the program paced instruction to match participants' needs and educational interests. Students were allowed to focus on a specific mathematical topic or explore many. After the program, a post-test was given to compare students' scores from a pre-test and determine if academic growth occurred (Mills, Ablard, & Gustin, 1994). The researchers discovered that the CTY program raised achievement scores considerably. They theorized that allowing students to work on materials interesting and motivating to them, at their own pace, could improve achievement and the educational environment. Stanley (1973) also conducted a study at Johns Hopkins which examined the effects of a program for mathematically and scientifically talented youth. In his program, students were pre-tested and then received extra instruction in their area of strength, either math or science. He found that schools that offered the traditional type of math programs which used enrichment instead of acceleration did not do enough to increase achievement in gifted and talented students. Students experienced more academic growth when their school programs were augmented with acceleration offered by the Center for Talented Youth. This meant that even supplemental acceleration helped to increase achievement.

Twenty years later, Swiatek (1993) reviewed a decade of longitudinal research gathered through the Study of Mathematically Precious Youth (SMPY). She found that acceleration could be very effective in meeting the needs of high-achieving gifted and talented students. Students who were accelerated also reported feeling very satisfied with their college experiences. The self-esteem of accelerated students was more questionable, but Swiatek believed the difference in self-esteem between students who were accelerated and not accelerated was minimal and due to the social comparison theory.

This theory stated that accelerated students no longer found themselves as high above their peers because they were now with other students of similar abilities, which could lead to a drop in self-esteem. This drop in self-esteem simply led to students having a more realistic self-concept, rather than their previous, inflated self-concept.

Ability Grouping

Ability grouping has been used in schools for decades, especially in reading. Sørensen and Hallinan (1986) designed a study to examine the effects of ability grouping on reading achievement. They determined that the best predictor of future reading ability was past reading ability. They also found that grouped classes were exposed to fewer learning experiences because the teachers' time was split between the groups. The time spent with the teacher in ability groups, however, was more efficient than time spent in whole-class instruction. Their data showed "there was a strong, negative effect of ability group size on learning" (p. 538). This led to the conclusion that smaller, more homogeneous grouping actually produced higher achievement than larger, more heterogeneous grouping. Despite their intent to find that ability grouping had a negative effect on achievement, they found the opposite. Thus, ability grouped students in reading grew more because instruction was tailored to meet their needs.

In New Zealand, where ability grouping was widely used, there did not seem to be the same social bias against the practice. Instead, teachers were encouraged to use homogeneous grouping to better meet the individual needs of their students. Wilkinson and Townsend (2000) found that teachers in New Zealand did not see the use of homogeneous groups as ability grouping. They grouped according to the students' developmental stages and current reading levels. With the attitude that all students could

become highly proficient readers, teachers used leveled books to individualize instruction and give students strategies they needed to become better readers, regardless of their current level. In theory, grouping was flexible, but the researchers found that movement among groups did not occur as frequently as they believed it would. Another important finding from their research was that teachers actually spent more time with groups of at-risk readers or groups that were not progressing at a rate the teachers believed reasonable. They tended to use more groups than the three to four typically used in American classrooms (Slavin, 1987b), allowing group size to be smaller, a technique Sørensen and Hallinan (1986) also found influential to better learning.

Assignment into a particular stream or track had a high influence on how much a student academic growth during the year (Kerchoff, 1986). Kerchoff found that students placed into high streams grew much more academically than did students in the low streams; when compared to students placed into remedial classes, these differences became even greater. High streams were the only groups that showed increases in achievement test performance. He suggested that these findings could be the result of a different curriculum, a difference in the ability level of teachers, peer influences, or a true difference in potential growth, but he did not offer a proven reason for the differences. These institutional effects were smaller in the U.S.; however, parents and teachers still reported that they believe students assigned to high-ability groups were more likely to do better in the future than students assigned to low-ability groups (Pallas, et al., 1994).

Achievement in Gifted and Talented Programs

For gifted and talented students, the findings of all studies were remarkably consistent and in line with findings from other studies for high-ability groups. Namely,

ability groups produced higher achievement for these students than whole-class grouping or smaller, heterogeneous groups. The type of instruction and curricula used in classes for grouped students produced different results, however, with enrichment and accelerated classes for gifted and talented students producing the higher effects (effect size = .41 and .87, respectively) (Kulik & Kulik, 1992). Shields (2002) also found that gifted and talented students in homogeneous classes achieved at a higher rate than those in heterogeneous classes. In addition and perhaps most importantly, she discovered that when the curriculum is similar, students not in gifted and talented groups or classes do not suffer academically when those students are removed from the classroom.

When they compared data for the effects of between-class grouping, Kulik and Kulik (1987) found that the average effect size for this method was to increase achievement scores by .06 standard deviations, with the high-ability groups accounting for an increase of .12 standard deviations, and low-ability groups accounting for 0 growth. The effects for within-class grouping were higher. The average effect was to increase achievement .17 standard deviations. Again, the high-ability groups showed more growth. Gifted and talented groups grew .62 standard deviations, and high-ability groups grew .29 standard deviations, while low-ability groups grew .21, and middle-ability groups only .17 standard deviations.

An earlier meta-analysis found, like in the later studies, that special classes for gifted and talented students produced higher achievement for those students than if they had been in mixed-ability programs (Kulik & Kulik, 1982). These programs were the only ones to produce such high effects. Other grouping formats also produced positive effects on learning, but they were slight, and not to the same high extent as groups for the

gifted and talented. Another interesting trend was that the effect sizes for ability grouping instruction decreased over time. Studies conducted before 1951 showed higher effects of grouping than did studies conducted in the 1970s and 1980s, something they attributed to the possible earlier emphasis on honors classes, rather than the later trend of multi-track systems. McSheffrey and Hoge (1992) also examined achievement of gifted students when they received an enrichment-based education in self-contained classes for GT students. They found that in their program under review, gifted and talented students performed better than those in regular education classes on standardized testing in language arts and mathematics. Wide variability in the data existed, which indicated that this group of students in the gifted and talented program was not a homogeneous group. Because these students performed better, regardless of the variability of the group, they believed the validity of their conclusions was supported. Gifted students from all backgrounds, talents, and interests can benefit from being with other gifted and talented students with curriculum designed just for them.

Using ability grouping with gifted and talented and average students could produce large gains in achievement for these students. Appropriate curricular differentiation that involved students' interests, learning styles, and abilities should be combined with grouping for maximum effects (Tieso, 2003). Because of the negative consequences associated with tracking, Tieso believed that any ability grouping should be flexible, allowing students to move to more appropriate groups as needed. Rogers (2002b) also believed in grouping gifted and talented students together for instructional purposes. She found that full-time gifted programs could result in large gains in achievement and an increase in students' attitudes about the subjects they were studying.

Cluster grouping also showed important academic gains, as did groups for acceleration. Enrichment grouping was shown to be more effective in increasing achievement of gifted students than of students with other abilities. Rogers claimed that she could find no definitive proof that any of these grouping options increased or decreased students' socialization or psychological effects. Most importantly, she claimed, there was no evidence that not using ability groups to narrow the range of abilities and target instruction to students' levels was appropriate or more effective for any students of any ability levels. In fact, the removal of these instructional strategies and techniques could be detrimental to gifted and talented students.

Rural Options for Gifted Students

It could be difficult to serve gifted and talented students in rural areas because of the possible lack of resources in those areas. Jones and Southern (1992) studied the effects of gifted and talented programs in rural and urban Ohio. They were interested in examining how gifted and talented programs worked in these settings and what services were available to students in these areas. They found that urban schools were more likely able to provide more intensive interventions for gifted students. Urban districts were also more able to afford interventions for students based on their giftedness. Both types of districts offered pull-out programs or other grouping methods for their identified gifted and talented students, and both offered some forms of acceleration. However, they also found that opportunities for secondary students in rural districts were more limited than for similar students in urban districts. While school districts in both urban and rural settings had programs for their gifted and talented students, more options were available for students in urban districts than in rural districts, and more teachers in urban districts

were able to receive training for working with GT students than were teachers in rural districts. In a similar study, Howley (2002) examined the effectiveness of gifted and talented programs in rural schools in Jackson County, West Virginia, that focused on acceleration. She claimed that rural districts may have difficulty offering services to their gifted students because of budget issues and the relatively small numbers of identified students at any given school. Howley discussed the importance of not making a gifted and talented program into a one-size-fits-all prescription. Each principal was encouraged to find an acceleration program that fit the needs of each student individually. For accelerated students, the average gain in reading on the *Woodcock-Johnson* was 1.8 years; in math, 1.9 years; and in written language, 2.0 years. Her conclusions were that many different types of acceleration programs work with students, as long as their needs and educational backgrounds are taken into account.

Quality of Instruction

Instructionally, there seemed to be evidence in support of special classes and programs for gifted and talented students. However, the effect of ability grouping on other students has not proven to be highly effective, although there was a trend toward slight, positive influences on achievement. The one influence that seemed to be most important for learning in ability groups was quality of instruction. When teachers used similar instructional strategies and had high expectations, ability grouping was effective at increasing achievement for all students (Wilkinson & Townsend, 2000). Shields (2002) cautioned that the trends toward more heterogeneous, one-size-fits-all approaches to learning are detrimental to gifted and talented students. A study by Tieso (2005) found that using pedagogy from gifted and talented education could increase the achievement of

all students in math. She also recommended using flexible grouping with all students to better meet the needs of every student in class. Tieso also suggested that teachers must emphasize learning over behavior and that they must recognize all students' prior knowledge to better focus instruction. When this is done, all students can improve their achievement.

Curricula or Programs

When gifted and talented students were served in special classes or magnet schools, they were often serviced with special programs or curricula designed for them. Other programs, not designed specifically for GT students, such as International Baccalaureate (IB) or Advanced Placement (AP) were used very frequently in schools to provide advanced or enriched curriculum for all high ability students, not just gifted and talented. Additionally, programs such as the Integrated Curriculum Model (ICM) were designed just for use with gifted and talented students.

The International Baccalaureate (IB) program has been used to provide a challenging curriculum for gifted and talented students. Poelzer and Feldhusen (1996) studied the program as it was implemented in Alberta, Canada schools. They specifically looked at the achievement levels of students enrolled in the Higher Level (HL) and Subsidiary Level (SL) IB classes. HL classes required twice as many hours in class as SL courses. IB schools started in the 1950s, and the number of schools using IB curriculum has grown every year. They were organized by the United Nations Educational Scientific and Cultural Organization (UNESCO) and are required to follow the guidelines set by the International Baccalaureate Office (IBO). IB schools provided a common curriculum and examination program which afforded IB program graduates with the prerequisites

necessary to apply to the college of the their choice. Students took core classes in their first language, studied a second language, sciences,and math, as well as an elective. They were required to take either three classes at the HL and three classes at the SL levels, or four classes at the HL and two classes at the SL levels. Poelzer and Feldhusen specifically looked at the achievement levels of students enrolled in the higher level (HL) and subsidiary level (SL) IB classes. They found that students enrolled in experimental science classes in HLIB and SLIB programs scored significantly higher than students enrolled in regular Alberta schools. Poelzer and Feldhusen determined that the curriculum and examinations provided by the IB program were challenging for gifted and talented students and supplied schools with an appropriate intervention to increase the achievement levels of their GT students.

Another curricular modification often used with gifted and talented students has been advanced placement (AP) classes. The AP program is run by the College Board and was designed to teach college-level material to high-ability high school students. Students enroll in AP classes at their high school and take an exam at the end of the class. With a high enough score, students are allowed to receive college credit for their AP classes. Schools had the option of providing 32 different courses and examinations in 18 subject areas to interested students. Curry, MacDonald, and Morgan (1999) conducted a study of AP programs and discovered that AP classes, while not specifically designed for gifted and talented students, could offer GT students accelerated curriculum and classes not usually offered in high school. When these AP students enrolled in college, they tended to be more prepared, did better academically, enrolled in more challenging majors and classes, and were twice as likely to go on to graduate or professional school.

Some programs were specifically designed for use with gifted and talented students such as the Integrated Curriculum Model (ICM) or the Schoolwide Enrichment Model (SEM). The Integrated Curriculum Model provides resources and curriculum to allow teachers to increase challenge for their GT students. Feng, Van Tassel-Baska, Quek, Bai, and O'Neill (2005) researched how the ICM, which contains curriculum for language arts and science, impacted learning on gifted and talented students. The study examined students' achievement over the course of 7 years. They discovered that the ICM had a significant impact on learning for students in third through fifth grades. When students were exposed to the curriculum for more than one year, their learning was even more significantly improved. The authors suggested that more curricula designed specifically for gifted and talented students and aligned with state and local curricula be developed that ensures that GT students are provided with a standards-based education as well as one that is challenging to them.

The Schoolwide Enrichment Model was designed by Renzulli and Reis (1997) and was based on Renzulli's assumptions that giftedness was a behavior more than an identifiable character trait. It required schools to nominate a talent pool of students (15%-20%) who were then eligible for gifted and talented services. Student needs were assessed by using the tools designed for this model: Total Talent Portfolios, Curriculum Modification Techniques, and Enrichment Learning and Teaching. Teaching activities used with the SEM must be enriching or advanced activities and must allow students to discuss, discover, and follow their interests. Because theorists who support the SEM believed that intelligence is a function of experience and education, they encouraged schools to allow students access to real-world activities that promoted a more complete

understanding of ideas and topics. In this model, the highest levels of activities in which students may engage are Type III activities, which allow students to behave like professionals in their field. Those who have researched this model claim that the SEM can improve achievement in students from first to twelfth grades, whether or not they are identified as gifted. They also claim that this model was especially useful for hard-to-identify populations (Gibson & Efinger, 2001).

Georgia's Project for Gifted Education in Math and Science (Project Ga-GEMS) worked for two years with students identified as gifted in math and science. Ninth and tenth grade students participated in a special curriculum that used real-life experiences and higher-level thinking skills to help students develop a more in-depth understanding of math and science principles. After completing the program, students were given the math and science sections of the ACT, and their scores were compared to a control group. Tyler-Wood (2000) discovered that students who participated in Project Ga-GEMS scored significantly higher on the ACT than did the control group of non-participating gifted and talented students. She believed this was due to the special accelerated and enriched curriculum designed specifically for gifted and talented students. However, this program also utilized other options that were believed to increase achievement of gifted and talented students, such as homogeneous grouping and block scheduling. Based upon the results of this study, schools could provide similarly specific services for students identified as gifted in mathematics and science.

In Iceland, Freeman and Josepsson (2002) examined the effects of a gifted and talented program offered from 1985 to 1996. This study compared program participants' achievement and attitudes to the achievement and attitudes of other students who had not

participated in gifted and talented classes. They found that participants fared better academically than non-participating students, and that students who were in the GT program had a better attitude about their abilities than non-participating students. However, because the culture in Iceland promoted commonalities over individual differences, the authors suggested that success of any gifted and talented program in Iceland may be slightly stigmatized. Freeman and Josepsson mentioned that many parents chose not to have their children not participate in a gifted and talented program because of the potential negative social impact it might have on their children. The researchers believed that for students in this type of democratic socialist society, a program which focused more on all kinds of gifts and talents, not just academic ones, would work better.

Attitudes and Self-Concept

As previously discussed, many programs purport to increase achievement of gifted and talented participants. However, it is important to note that students, themselves, preferred to be grouped with other gifted students. Students reported being more motivated, interested, and challenged when serviced in gifted and talented classes than in traditional education classes. Overall, they felt that gifted and talented programs had positive effects on their lives, regardless of the type of program in which they were involved (Hertzog, 2003). Behavior issues also tended to disappear or diminish when gifted students were appropriately grouped. Immature and socially inappropriate behaviors were often caused by highly able students not being challenged, or their being forced into a situation where their needs were not being met. Some gifted and talented students did not wish to be separated into homogeneous groups all the time. While they did see that homogeneous groups best met their academic needs, they thought that

heterogeneous groups best met their social/emotional needs. In heterogeneous groups, students can interact with other students their own age and feel less competitive with their peers. More importantly, some gifted students reported that they preferred heterogeneous groups because they felt smarter and liked to maintain their high class rank, something in jeopardy in homogeneous groups (Adams-Byers, Whitsell, & Moon, 2004).

The emotional development of gifted and talented students was also an area of interest to researchers. Sayler and Brookshire (1993) examined the social and emotional development of gifted and talented eighth grade students. They found that gifted and talented students were likely to be seen as good students by their classmates. The survey information from this study revealed that gifted and talented students were confident, viewing their intelligence and academic abilities in a generally positive light and their interactions with their peers as generally positive.

Another important skill for gifted and talented students, especially for underachievers, to learn is being able to advocate for themselves. According to Douglas (2004), self-advocacy is recognizing and seeking out learning opportunities specific to one's abilities, and it can be taught. One method he used to develop self-advocacy skills was through an issues seminar, where gifted and talented students met to discuss their unique social, emotional, and academic issues. Douglas found that when GT students were involved in an issues seminar, they were able to increase their understanding of their learner profile, the options available to them as gifted and talented students, and their connections with advocates. She claimed that students could gain a lot from working with a GT teacher, especially because more and more students were being serviced in regular classrooms. When they had the opportunity to work with a gifted and talented

teacher, they could learn how to advocate for their own learning, increasing their achievement.

Gifted and talented students were not immune from self-doubt and the fear of high expectations. They, like other students of varied abilities, suffered from the fear of not living up to others' expectations of them which led them to avoid certain behaviors or situations that called on them to achieve at high levels. Malpass, O'Neil, and Hocevar (1999) found that high-stakes math achievement could improve with positive self-efficacy, but was negatively correlated with worry. When students believed they could achieve, they did. However, when they worried about their achievement, they did not perform as well. Dai (2000) studied task and ego orientations and found that female students were more likely to engage in avoidance behaviors and experienced reduced motivation and performance under failure. When competition was introduced into the situation, females tended to experience an even greater decline in their performance and perceptions of self. He also determined that when presented with a challenge, boys generally would rise to meet it if they thought they could, while females would feel threatened by it. If others perceived them as intelligent, boys would work harder to meet others' expectations. Females worked hard to maintain their status quo.

Many students will be faced with challenges in their lifetimes. Dai (2000) concluded that it should be the role of the school, teachers, and parents to help them learn how to face such challenges. Speirs Neumeister (2004) studied perfectionism as it relates to achievement. She found that while some gifted students became perfectionists because of fear of failure, others became perfectionistic from the motivation to achieve. The socially prescribed perfectionists worked to avoid situations in which they did not feel

confident, focusing their attentions on fields in which they could achieve with little effort or work. Self-oriented perfectionists worked hard because they wanted to do well and achieve their goals. In conclusion, when students had positive images of themselves and their abilities, they achieved more in school.

Programs Included in This Study

The school district that provided the data for this study recognized two programs for servicing their gifted and talented students. They offered students advanced classes at their home schools or magnet schools for specific areas such as math, science, or fine arts; or provided magnet schools designed for gifted and talented students. This school district defined gifted and talented students as those who were so far above their peers that they required special educational services to meet their unique needs. To qualify as gifted and talented, students were assessed using the *Naglieri Nonverbal Abilities Test* (NNAT), *The Stanford Achievement Test, 10th Edition*, their grades, and observations by parents and teachers. They were awarded points based on their performance on those assessments. Students were given special consideration if they were also identified as needing special educational services, were learning English, or participated in the free/reduced lunch program for low-income families by receiving more points if they fell into one of those categories. Through those points they were identified if they met the district's cut-off score. However, while there were several criteria used to help identify students as gifted and talented, the district considered the results on ability and achievement tests more than the other criteria.

A separate application was required for admittance to the magnet schools for gifted and talented students. To qualify for these programs, students must have met only

two criteria: to be identified as gifted and talented, and to return their application by the deadline. If a child was not already identified as gifted when his application to the gifted and talented magnet school was returned, the school district tested the child to determine if he or she qualified for a gifted identification.

In this school district, 21,716 students were identified as gifted and talented in the 2004-2005 school year. This represented a total of 11.6% of the entire district population. These students were more likely to be White or Asian American, be female, speak English as their first language, and not qualify for free/reduced lunch than the general population of the district would suggest (see Table 9 on page 74 for more information on this). The proportion of students identified as gifted at each school varied, with 61.7% of schools having fewer than 5% of students identified as gifted. The state determined the guidelines to which the gifted and talented programs adhered, including requirements in the areas of student assessment, program design, curriculum and instruction, professional development, and family-community involvement. This district allowed schools flexibility in determining the manner in which these criteria were met, but all teachers must have had training in gifted education before having GT students in their classes, and all programs were overseen by the schools' gifted coordinator and the Advanced Academics Department at the district level.

Two recognized programs for gifted and talented students existed in this school district. Students could have been serviced through programs that offered advanced classes, which included honors or Pre-AP classes, or by magnet schools for gifted and talented. For the purposes of the study, the researcher distinguished between receiving services at a magnet school for areas such as math, science, or fine arts and receiving

services at a student's home school. Therefore, the three treatment effects included in this study offered either gifted magnet schools or advanced classes for their identified GT students, but within three grouping settings of magnet school for gifted, magnet schools for areas such as math, science, or fine arts, and home schools. While none of these programs had set curricula, they were required to have trained GT teachers who differentiated the regular curriculum to meet the needs of their gifted students, while still meeting the requirements of state and local standards. This allowed teachers the freedom to develop their own lessons and activities. It also meant that the actual delivery of the gifted and talented program looked different on each campus and in each classroom, depending on the school's philosophy, teacher abilities, and available resources.

All programs, gifted magnet schools and advanced classes in other magnet schools or students' home schools, were used in this study to supply achievement information. Students who attended magnet schools were not part of a gifted and talented magnet school also received honors, Pre-AP, or Pre-IB classes. Teachers in the district were expected to provide the identified gifted students with curriculum that had been modified for added depth, increased complexity, and accelerated pacing. In addition, the differentiated curriculum had to follow state and local standards.

All teachers who worked with gifted students were expected to have at least a basic training in the nature and needs of gifted and talented students and to have participated in professional development related to gifted students every year. Initially, a 30-clock-hour training was required by the state that covered the basics regarding the needs of gifted and talented students and how to meet those needs in the classroom. After the first year, teachers had to obtain 6 clock-hours per year in additional training in gifted

and talented education. Teachers were not allowed to have gifted and talented students in their classes if they had not attended these trainings. The district also encouraged schools to cluster group GT students in advanced classes.

Conclusions

Gifted and talented students' needs in school have been neglected because of the No Child Left Behind (NCLB) legislation passed by Congress in 2000 (VanTassel-Baska, 2005). While most schools' mission statements include the desire to meet the needs of every student, they are becoming increasingly cognizant only of the needs of their low-performing students or sub-groups who are not making adequate yearly progress (AYP). Gifted and talented students are being serviced more in regular classrooms than in years past (Tieso, 2003). Teachers, however, tend to not understand the needs of this group or learners or the reasons for differentiating their curriculum (Blanksby, 1999). They must be aware of the special needs of gifted and talented students and the appropriate curricular modifications that increase achievement and learning in these students (Tieso, 2005; Patrick et.al., 2005). There is a great deal of evidence to suggest that grouping students by ability can help improve achievement (Kulik & Kulik, 1992; Vaughn, Feldhusen, & Asher, 1991), but there is also evidence suggesting that gifted and talented students prefer to be with other students of mixed abilities (Hertzog, 2003; Neber, Finsterwald, & Urban, 2001).

This study concentrates on two types of grouping. While all three programs used many different types of grouping, including cooperative groups, the three different treatment effects offered two main forms of grouping. Cluster grouping was used in

magnet programs for gifted students where students were clustered into classes and programs to spend their day with other students who were also identified as gifted. Magnet schools for specific subjects, such as math and science, technology, and fine arts, used within class grouping to serve gifted and talented students. Students who attended their home schools were also grouped in the same manner, taking advanced classes or honors classes according to ability. In their classes, students were offered within-class grouping through differentiation. This study was designed to examine the relative effectiveness of the different types of grouping on increasing the achievement scores for gifted and talented students.

CHAPTER III

METHODOLOGY

Sample

This study used a sample of students enrolled in three different programs in a large, urban school district in a southwestern state. The three programs included: students enrolled at their home school, receiving gifted and talented programming through Pre-AP or honors classes; students enrolled in magnet schools for subjects such as math and science, fine arts, or technology, but grouped with other gifted and talented students; and students who attended magnet schools for gifted and talented students. This was, therefore, a purposeful, convenience sample because participants were identified as gifted and talented, but were not randomly assigned to a group; their program was based on the educational and instructional needs of the students and the services available through the district. Students also must have been enrolled in the same program for all three years in order to better compare the achievement based on the services provided.

Any student in sixth through eighth grades in the selected schools who was identified as gifted and talented in any area of giftedness, who had standardized testing data available, and who had attended the same school for all three years was included in this study. Gifted students who received gifted and talented services at their home school

made up the first group. Programming for gifted and talented students in these schools was offered through advanced classes such as honors or Pre-AP classes. Gifted and talented students who attended a magnet school for specializing in an area besides giftedness, such as math and science, fine arts, or technology composed the second treatment effect. These students were offered specialized classes based on the type of magnet program as well as honors or Pre-AP classes in their regular subjects. Gifted students in these two programs were not separated from other students in the school in any class. There were no classes that were entirely designed for them, but all teachers must have had minimal training in gifted education to teach any GT students and must have provided programming for all students in their classes. This training consisted of a state mandated initial 30 hour workshop followed by 6 hours per year of further training in gifted education. Both of the first two program options offered within-class differentiation for gifted students in addition to other grouping forms such as cooperative grouping. Finally, students who attended the magnet schools for gifted and received programming in this way constituted the third treatment effect. Gifted magnet programs clustered gifted students in classes. In this type of program, students identified as GT were in classes only with other GT students, although they attended non-core classes like PE and electives with all students in the building.

Programs Included in the Sample

To be identified as gifted and talented in this district, students must have obtained a combination of high scores on the *Naglieri Nonverbal Ability Test* (NNAT) and *The Stanford Achievement Test* as well as their grades, a parent recommendation, and a teacher recommendation. Identification was not made in a certain area, but as a general

identification. Participation in a particular programming option was based on student choice. Students attended their home schools unless they chose to apply to a magnet program and were accepted into that program. At the time of this study, the school district maintained 45 middle schools, all of which provided honors classes or Pre-AP classes to high-level students. Twenty-eight middle schools had magnet programs, and 8 of the magnet programs were gifted magnet schools. No middle school in this district had a self-contained magnet school where all students who attended the school were admitted to the magnet program; the magnet schools were school-within-a-school programs. This meant that some students were zoned to the school as their home school, but were not admitted to the school's magnet program. Students were zoned to a school according to geographic location of their residence. Students who lived within the school boundary were zoned to that school, supplying the students' home schools. Students who wanted to be part of a magnet program, even a program at the students' zoned school, must have applied for admission. In this city, students did not have to attend their home school if they applied for and were accepted into a magnet school. The original intent of the magnet program was to desegregate the school district. Students were bussed across the city to attend schools that were not in their neighborhood, thus helping to desegregate the schools. The schools included in this study and the type of programs they offered are illustrated in Table 1.

Table 1

Schools and Programs Offered

School #	Program Type	Number of Students Cohort 1	Cohort 2
1	Gifted Magnet School	81	75
2	Math/Science/Technology Magnet School	26	45
3	Home School – No Magnet	5	1*
4	Communication Magnet School	0	3
5	Fine Arts Magnet School	5	2
6	Home School – No Magnet	14	25
7	Fine Arts Magnet School	0	5
8	Home School – No Magnet	18	9
9	Home School – No Magnet	7	11
10	Fine Arts Magnet School	3	0
11	Gifted Magnet School	66	77
12	Math/Science Magnet School	16	12
13	Home School – No Magnet	9	16
14	Math/Science Magnet School	0	12
15	Gifted Magnet School	14	14
16	Gifted Magnet School	34	31
17	Fine Arts Magnet School	34	64
18	Math/Foreign Language Magnet School	4	9
19	Gifted Magnet School	267	264
20	Gifted Magnet School	28	19
21	Fine Arts Magnet School	2	9
22	Home School – No Magnet	0	4
23	Fine Arts Magnet School	19	108
24	Languages Magnet School	86	76
25	Math/Science Magnet School	32	28
26	Technology/Spanish Magnet School	16	36
27	Gifted Magnet School	85	88
28	Gifted Magnet School	16	8
29	Architectural	3	14
30	Math/Science Magnet School	6	30
31	Home School – No Magnet	1*	4
32	Home School – No Magnet	59	140
33	Math/Science Magnet School	4	0
34	Home School – No Magnet	5	0
35	Home School – No Magnet	0	1*

*Students eliminated from the study

Although schools were required to teach according to state and local standards, the process and specific content was determined by schools; the school district required

no specific curriculum for any of the programs used in this study. The only requirement of the district was that schools modify the depth, complexity, and pacing of their chosen curriculum for gifted and talented students. District recommendations for possible methods used in the schools to do this included incorporating the Ascending Levels of Intellectual Demand system, using concepts to encompass big ideas, differentiation, and the use of products to exhibit learning. Ascending Levels of Intellectual Demand required teachers to continually increase the level of complexity to create a challenging content for students. Questioning and discovery activities were encouraged through teaching broad concepts, while meeting the standards incorporated into those concepts. Differentiation encompassed the themes of scholarly behavior, thinking skills, and independent research or study by using those techniques to modify the regular curriculum and pacing. Teachers were also encouraged to allow students to demonstrate their learning through the use of products or performance. These schools were in all areas of the city and enrolled students from a variety of racial and economic backgrounds. This sample was representative of all types of gifted and talented students; because the diversity within the district was great, the sample included a wide range of ethnic and socioeconomic backgrounds of students.

Variables

Independent Variables: Programming Option

The independent variables were represented by one of three programming options available to gifted and talented students in the school district whose data was used in the study. These were: honors or Pre-AP classes at students' zoned schools; magnet schools for specific subject areas such as math and science, fine arts, or technology; and magnet schools for gifted students.

Dependent Variable: Achievement Scores

This study used student achievement scores from the Reading, Math, Language, Science, and Social Studies subtests of the *Stanford Achievement Test, 10th Edition* as the dependent variable. The scaled scores from the tests were compared because this information has been standardized to represent the same scale, regardless of the level of the test given. For example, this would mean that a score of 750 represents the same level of score if earned in sixth grade as it would in eighth grade, even when different levels of the test were administered (Jorgensen, 2004).

Instrumentation

The district supplying the data for this study used *The Stanford Achievement Test, 10th Edition* to measure students' achievement every year. This instrument has high internal reliability as measured by the Kuder-Richardson Formula #20. Each of the subtests and the composite score had reliability coefficients ranging from the .70s to the .90s. The test-retest reliability for each of the subtests ranges from the .70s to .80s, and the content validity has also been established, based on state and national educational standards. The construct validity was shown to correlate with ability. The test was normed using 450,000 students from across the country. There had been some debate about using grade-level tests with gifted and talented students because the possibility exists that they can score as high as the test will allow. If this were to occur, the ability to show growth decreased because the researchers did not know if the score obtained was the maximum of the student or the test. This phenomenon is called the ceiling-effect. However, because this study averaged growth scores of all students within a school, the ceiling-effect was not a factor. Even if a few students were able to score as high as the

test allowed, scores of other students in their group who did not score as highly were included to get an average test score for the class. Also, because the researcher examined the growth of scaled scores, rather than the grade percentile or the age percentile, there was more of a basis for comparison across the three groups.

The *Stanford Ten* assesses students in reading, mathematics, language, spelling, listening, study skills, writing, science, and social studies. The only subtests used in this study were reading, mathematics, science, and social studies because of the academic nature of these subjects and their influence on traditional school achievement. The reading subtest includes test questions on vocabulary, initial understanding, interpretation, critical analysis, and awareness and usage of reading strategies using literary, informational, and functional texts. The reading test also gives a Lexile level, which approximates the students' reading levels. The mathematics subtest asks questions based on the recommendations of the National Council of Teachers of Mathematics and state standards. The areas of inquiry include: number sense and operations; patterns, relationships, and algebra; geometry and measurement; and data, statistics, and probability. Questions are designed to measure problem solving and procedures. The science subtest asks questions about life science, earth science, physical science, and the nature of science in order to assess students' understanding of basic science concepts. Students are required to use their reasoning skills to estimate, make calculations, seek patterns, make observations, recognize cause and effect, read standard instruments, and draw conclusions. The social studies subtest includes the disciplines of history, geography, political science, and economics. National standards for each of these subjects

were used to guide the questions, which also assess problem-solving abilities as well as knowledge of the subject (Harcourt Assessment, 2006).

Design

The research hypotheses were:

H1 There will be no significant differences between students' achievement gains in reading, math, science, and social sciences for students attending magnet schools for math and science, fine arts, technology, or other areas and those who attend their home schools.

H2 Attending advanced classes at magnet schools for math and science, fine arts, technology, or other areas will have less of an effect on gifted and talented students' achievement gains than attending magnet schools for GT students.

H3 Attending advanced classes in their home schools will have less of an effect on gifted and talented students' achievement gains than attending advanced classes at magnet schools for GT students.

To test the hypotheses, scaled scores on *The Stanford Achievement Test* were collected from the district participating in the study. Students who were enrolled in the Gifted magnet schools Programs at the eight middle schools consisted of one treatment group; gifted students who were enrolled in other magnet programs like those for math and science, fine arts, or technology composed the second treatment effect, and gifted and talented students who attended their home school and received their gifted programming through within-class groups, like honors and Pre-AP classes, composed the final treatment group. All schools that enrolled gifted and talented students were included in this study. In order to maintain confidentiality, no schools were identified by name. Two cohorts of students were included in this study--those who began sixth grade in the fall of 2002, and those who began sixth grade in the fall of 2003. The groups were assumed to be relatively equal in ability because all students had been admitted to the gifted and talented program in this district based upon the same criteria. There was no subject

specific identification, only a general gifted and talented identification, therefore students in all programs could be compared. In addition to achievement score data, demographic information was also collected to determine whether the sample of gifted students represented the demographics in the entire district.

To calculate the test statistics, the scaled scores on students' sixth grade scores were subtracted from their eighth grade scores to find a growth score. The growth scores of gifted and talented students in each of these programs were then grouped into their respective schools and years. This allowed the data to be averaged for each cohort at each school. Averaging the data according to school and cohort was necessary because the students in each of those groups received the same treatment effect and had to be considered as a group rather than as individuals independent of each other. Any school with only one student enrolled in that cohort was excluded to ensure that results were representative of the treatment, not the individual student. This resulted in three students' scores being excluded from the final analysis. The cohort's averages were then compared using a one-way MANOVA. The demographic data collected were also analyzed to compare the students included in the study to those of the entire district.

Analysis of Data

Data were analyzed using a one-way MANVOVA. All students who completed their three years of middle school at a specific school in the study were compiled into a school group. The dependent variables were the students' growth scores on the subtests of *The Stanford Achievement Test, 10th Edition*. The four scores in reading, math, science, and social studies were grouped according to school and year. The scores on the four subtests were then averaged according to subject. These averaged scores composed the

data set entered into the analysis. Any school with only one student identified as GT was excluded because there was no way to know if the students' scores were unique to the student or school. As a result, a total of three students were eliminated from the data set this way. Over two thousand students' data (N = 2,246) were included in the study, for a total of 59 school averages. Once all school averages were compiled, they were compared across the three treatment groups. Because there was only one independent variable, programming option, a simple one-way MANOVA was used. SPSS, a statistical analysis software, was used to compute the results of the MANOVA. A Dunnet t (2 sided) post-hoc analysis for multivariate data was performed to further analyze differences in the data and to verify the results of the overall MANOVA.

In addition to the MANOVA, tests were run to determine if any assumptions were violated, including Box's *Test of Equality of Covariance Matrices* and Levene's *Test of Equality of Error Variances*. A lack of fit test was run to ensure the model was appropriate for the data. Mean and standard deviation data were collected on the school average data and plotted to assess the normality of the data. A regression scatterplot and standardized residual plot were used to help determine if the assumption of normality in the data was upheld. Descriptive data were also compiled on the group demographics. This revealed the percentage of students who received free or reduced lunch, the ethnicity of the students, student gender, and whether the students spoke English as their first language. These data were also compared to the district data as a whole to determine if the population of students in the study was representative of the population of the district in general.

Conclusion

This study used historical data to examine achievement growth in gifted and talented middle school students in the four subject areas of reading, math, science, and social sciences. Students were identified generally as gifted and talented, rather than in a specific subject area. Students were given three programming options from which to choose. Students could attend their home school, a magnet school for a specific subject, or a magnet school for gifted and talented. Their sixth grade scaled scores on *The Stanford Achievement Test, 10th Edition* were subtracted from their eighth grade scaled scores to determine growth scores. The growth scores were averaged with other students who also attended their school in that year. School cohort averages were used in the one-way MANOVA to determine if one program type was more effective than another in increasing achievement in the four subject areas.

CHAPTER IV

ANALYSIS OF THE DATA

Scaled scores on the Reading, Mathematics, Science, and Social Science subtests of *The Stanford Achievement Test, 10th Edition* from two cohorts of middle school students in a large urban school district in a southwestern state made up the complete data set. All students in the district who entered sixth grade in 2002 or 2003 and who were identified as gifted and talented were included in the study. In addition, students were enrolled in the same school for all three of their middle school years. The data provided by the district did not include any student names or identifying characteristics, but did include demographic information on ethnicity, gender, socio-economic status, and English language status. With the data, a list of schools and the programs offered at each school was provided by this district

To begin the analysis, the data were examined to exclude any student with missing information or and student who did not stay in one school for the entire three years of middle school. The remaining students were then grouped into their respective schools and programs. Cohorts of students were formed by grouping students according to their school and year. Once students were grouped according to school and year, averages were found for each of the subtests. This was done because students at each

school received the same treatment and, therefore, could not be considered completely separate from each other. The averages were then saved into a separate data set for ease of analysis. A descriptive analysis of the data was run to ensure that the assumptions of the MANOVA were upheld. Frequency histograms with a normal curve, descriptive statistical tests for mean, median, mode, skewness, and kurtosis, and a regression analysis were performed. The assumption of normality appeared to be upheld by all tests. The frequency histograms in Figures 1-4 provide a visual comparison to a normal distribution.

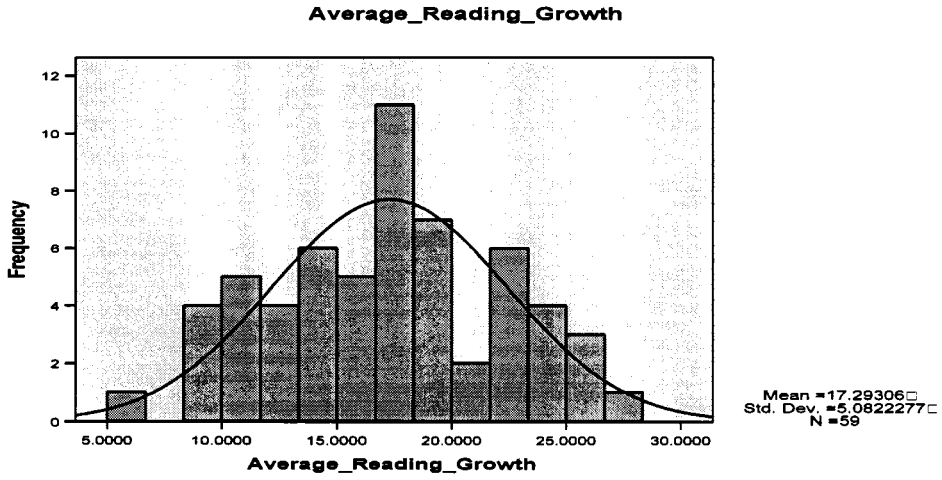

Figure 1. Average Reading Growth

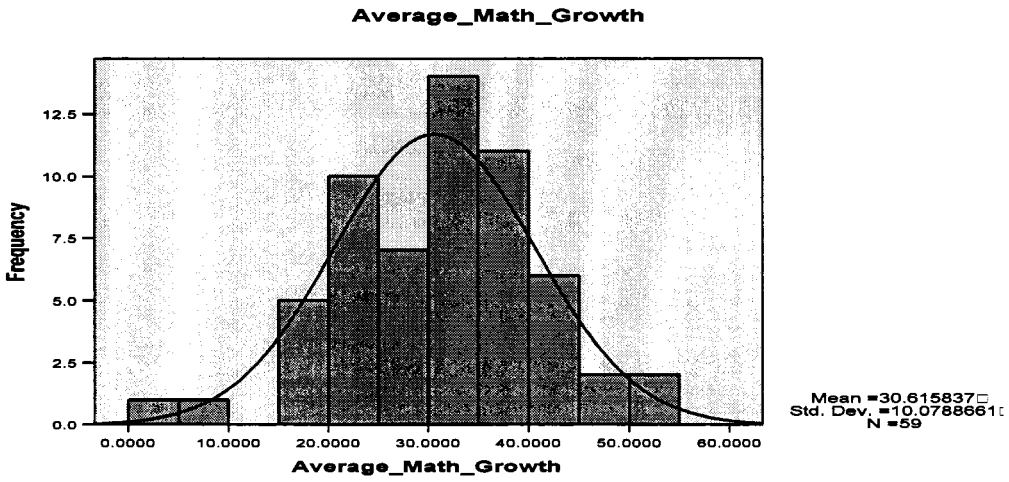

Figure 2. Average Math Growth

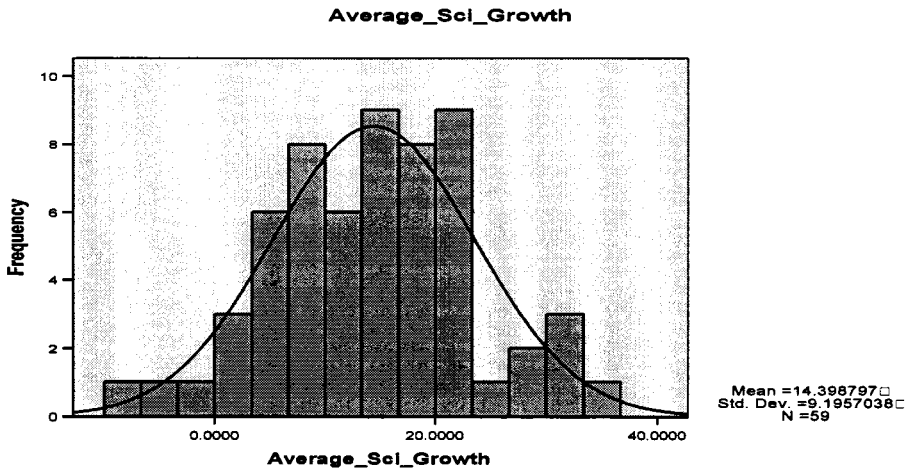

Figure 3. Average Science Growth

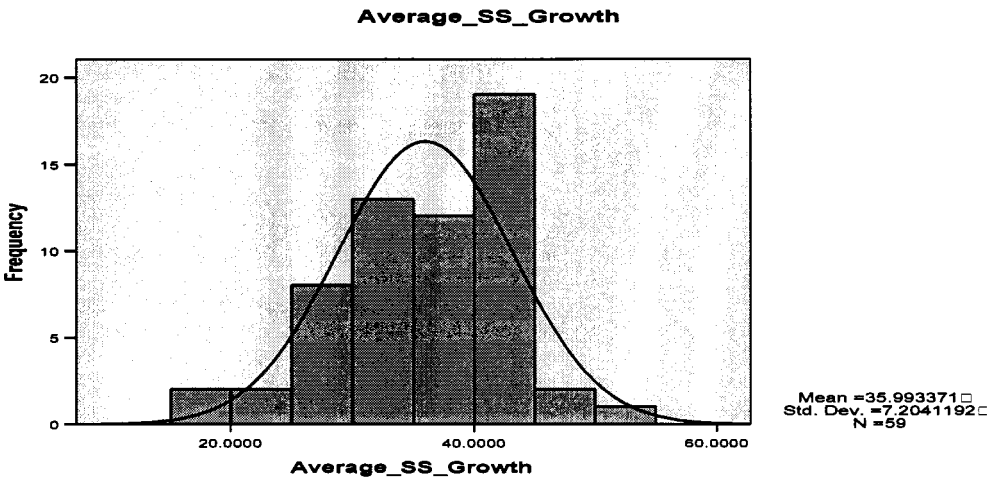

Figure 4. Average Social Science Growth

Skewness was slightly negative in all groups, ranging from -.035 for average reading growth to -.550 for average social science growth, which is within the normal range. Kurtosis was also slightly negative, ranging from .387 for average math growth to -.643 for average reading growth. These levels are also in the normal range (see Table 2).

A regression analysis was run using the dependent variables of average growth scores in reading, mathematics, science, and social science as independent variables. A nominal identification number was assigned from 1 to 59 for each of the data points to use as the dependent variable. A standardized residual normal plot and a scatterplot of regression standardized residuals showed the data were distributed within the bounds of a normal distribution (see Figures 5 and 6).

Table 2

Descriptive Statistics of the Mean, Standard Deviation, Skewness, and Kurtosis for the Independent Variable and All Dependent Variables

Growth Type	N Statistic	Minimum Statistic C	Maximum Statistic C	Mean Statistic C	SD on Statistic C	Variance Statistic C	Skewness		Kurtosis	
							Statistic C	Std. Error	Statistic C	Std. Error
Average Reading Growth	59	6.0000	27.777	17.293	5.0822	25.829	-.035	.311	-.643	.613
Average Math Growth	59	3.0000	53.750	30.615	10.078	101.58	-.216	.311	.387	.613
Average Science Growth	59	9.500	33.571	14.398	9.1957	84.561	-.153	.311	-.054	.613
Average SS Growth	59	7.200	50.555	35.993	7.2041	51.899	-.550	.311	.-.044	.613
Valid N (listwise)	59									

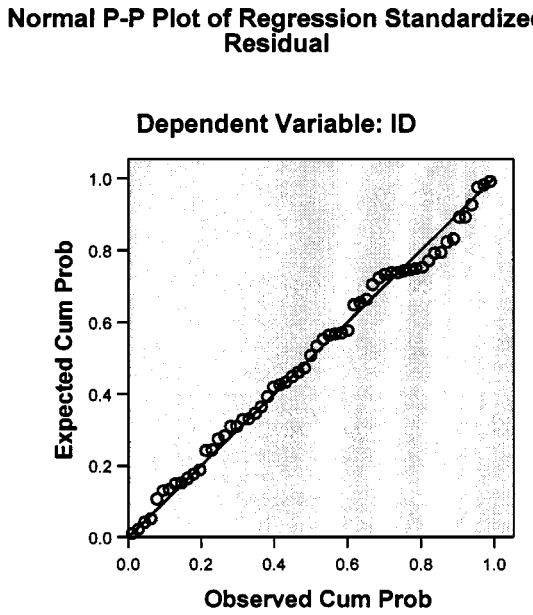

Figure 5. Normal P-P Plot of Regression Standardized Residual

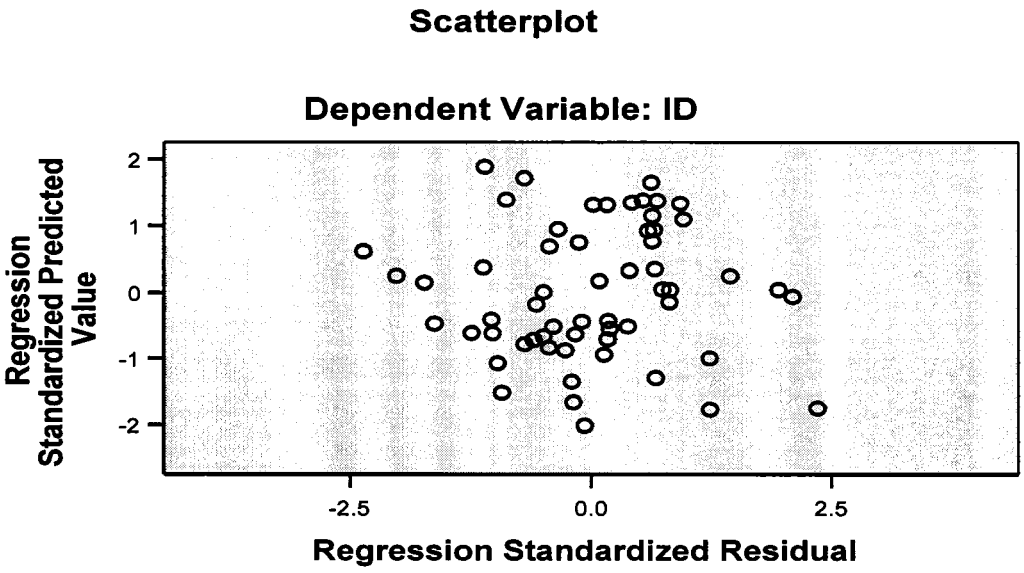

Figure 6. Scatterplot of Residuals to Determine Normality

The data were also checked to establish that assumption of equal covariance was upheld. Box's *Test of Equality of Covariance Matrices*, $F = .991$, $p = .470$, revealed that there was not sufficient evidence to suggest that covariance matrices were unequal (see Table 3).

Table 3

Box's Test of Equality of Covariance Matrices

Box's M	22.488
F	.991
df1	20
df2	6128.079
Sig.	.470

Levene's *Test of Equality of Error Variances* was run to check the assumption of equal error variance. For all but average social science scores, the null hypothesis was upheld. Equal error variances could not be assumed for the average social science growth scores, $F = 4.044$, $p = .023$ (see Table 4).

Table 4

Levene's Test of Equality of Error Variances

Growth	F	df1	df2	Sig.
Average Reading Growth	.444	2	56	.644
Average Math Growth	.093	2	56	.911
Average Sci Growth	.832	2	56	.440
Average SS Growth	4.044	2	56	.023

However, because the other three variables were within the acceptable range and because of the robustness of the MANOVA test, this slight difference in error variances did not invalidate the study. Finally, a lack of fit test was run to confirm the appropriateness of the model. The lack of fit null hypothesis for multivariate data was

maintained. This shows that the model under review was well suited to the data used (see Table 5).

Table 5

Lack of Fit Test Statistic—Multivariate Tests

Dependent Variables		Value	F	Hypothesis df	Error df	Sig.
Average Reading	Pillai's Trace	.000	.	.000	.000	.
Growth, Average Math	Wilks' Lambda	1.000	.	.000	54.500	.
Growth, Average Sci	Hotelling's Trace	.000	.	.000	2.000	.
Growth, Average SS	Roy's Largest Root	.000	.000(a)	4.000	52.000	1.000

a Exact statistic

The research hypotheses examined in this study were:

H1 There will be no significant differences between students' achievement gains in reading, math, science, and social sciences for students attending magnet schools for math and science, fine arts, technology, or other areas and those who attend their home schools.

H2 Attending advanced classes at magnet schools for math and science, fine arts, technology, or other areas will have less of an effect on gifted and talented students' achievement gains than attending magnet schools for GT students.

H3 Attending advanced classes in their home schools will have less of an effect on gifted and talented students' achievement gains than attending advanced classes at magnet schools for GT students.

All three hypotheses were tested at the same time. To asses whether any differences between groups were present, a one-way MANOVA was conducted with average growth in reading, average growth in mathematics, average growth in science, and average growth in social sciences as the dependent variables. Program type was the independent variable. The programs types were coded as follows: 1 = magnet schools for gifted;

2 = magnet schools for specific subjects; and 3 = honors or Pre-AP classes within a student's home school. Average growth scores in each subtest were found by grouping students into their school and year to obtain a cohort of students who received the same treatment effect, then averaging all scores for the groups. These growth scores used data from a total of 2,243 students to make 59 school groups, eliminating schools that had only one GT student enrolled that year. The group average growth scores were entered into the statistical analysis software, SPSS. A one-way MANOVA was used because the subtest scores in Reading, Mathematics, Science, and Social Science were all from one test taken by each student and were, therefore, not independent of each other. The results of the MANOVA show that there was insufficient evidence to suggest that differences exist between the treatment groups. Wilks' Lambda was used because of the robustness of the test statistic. This test showed that the differences between the groups was not great enough to be anything more than chance, $F = .809$, $p = .174$ (see Table 6). This result was likely due to the wide differences within groups, as evidenced by the large standard deviations found in the descriptive statistics (see Table 7).

Table 6

Multivariate Analysis of Variance Test Statistics

Effect		Value	F	Hypothesis df	Error df	Sig.
Program_type	Pillai's Trace	.194	1.451	8.000	108.000	.184
	Wilks' Lambda	.809	1.479(a)	8.000	106.000	.174
	Hotelling's Trace	.231	1.505	8.000	104.000	.165
	Roy's Largest Root	.212	2.858(b)	4.000	54.000	.032

a = Exact statistic; b = The statistic is an upper bound on F that yields a lower bound on the significance level; and c = Design: Intercept+Program_type.

Table 7

Descriptive Statistics of Data Set Entered Into MANOVA

Growth	Program Type	Mean	Std. Deviation	N
Average Reading Growth	GT Magnet	18.704094	4.5967162	16
	Other Magnet	16.835990	5.1281607	29
	Home School	16.627236	5.5516531	14
	Total	17.293060	5.0822277	59
Average Math Growth	GT Magnet	31.054651	10.1614327	16
	Other Magnet	30.157305	9.7240705	29
	Home School	31.064151	11.3795409	14
	Total	30.615837	10.0788661	59
Average Science Growth	GT Magnet	17.468884	8.1727039	16
	Other Magnet	11.733805	9.7421920	29
	Home School	16.410466	7.9986808	14
	Total	14.398797	9.1957038	59
Average SS Growth	GT Magnet	34.978301	6.3908902	16
	Other Magnet	37.589789	5.8095858	29
	Home School	33.846586	9.9906019	14
	Total	35.993371	7.2041192	59

While the test statistic for Roy's Largest Root showed a significant difference between groups, $F = 2.858$, $p = .032$, this test was not used because it looks only at the largest eigenvalue, not the entire data set. A post-hoc analysis of multivariate data, Dunnett t (2-sided) was also conducted to verify the results of Wilks' Lambda. These pair-wise comparisons also showed that there were no significant differences between groups verifying the use of Wilks' Lambda over Roy's Largest Root (see Table 8).

Table 8

Post-Hoc Analysis Using Dunnet T (2-sided)

Dependent Variable	(I) Program_ Type	(J) Program_ Type	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Average Reading Growth	GT	Home	2.076858	1.86474	.421	-2.127362	6.281079
	Other	Home	.208754	1.65826	.987	-3.529941	3.947449
Average Math Growth	GT	Home	-.009500	3.74995	1.000	-8.464080	8.445080
	Other	Home	-.906846	3.33472	.943	-8.425267	6.611575
Average Science Growth	GT	Home	1.058419	3.27732	.921	-6.330581	8.447419
	Other	Home	-4.676661	2.91443	.191	-11.247492	1.894170
Average SS Growth	GT	Home	1.131715	2.61315	.865	-4.759848	7.023279
	Other	Home	3.743203	2.32380	.188	-1.495999	8.982405

Note: Dunnett t (2-sided), based on observed means; a Dunnett t-tests treat one group as a control, and compare all other groups against it.

Plots of the four dependent variables showed what differences existed in the data, even though these differences were insignificant. Each subject showed different trends in achievement growth in the data (see Figures 7-10).

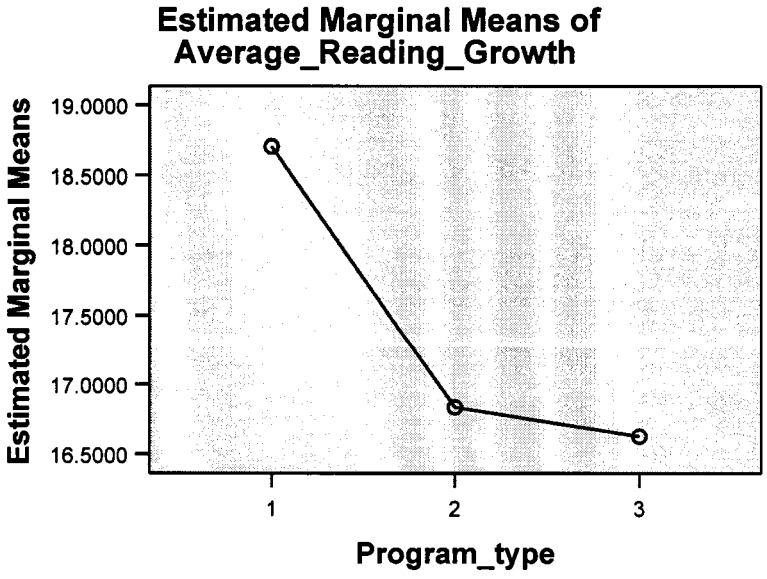

Figure 7. Estimated Marginal Means of Average Reading Growth

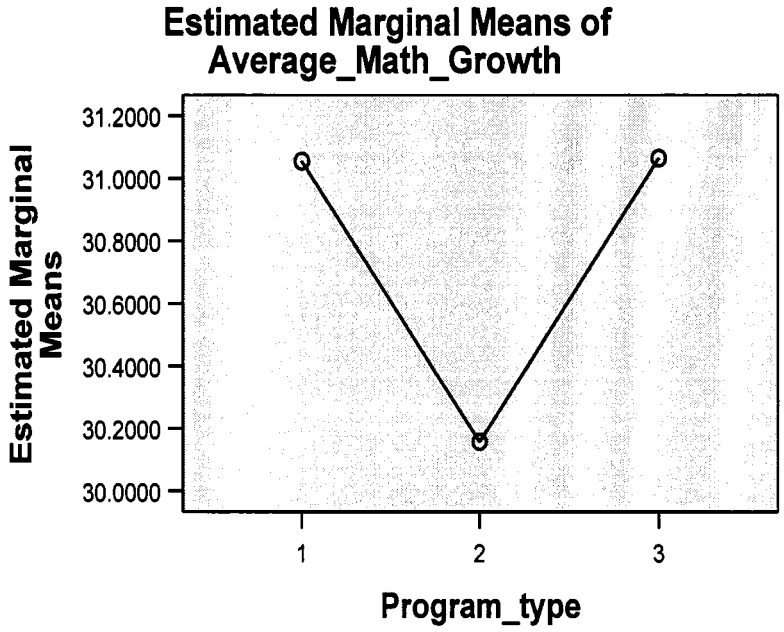

Figure 8. Estimate Marginal Means of Average Math Growth

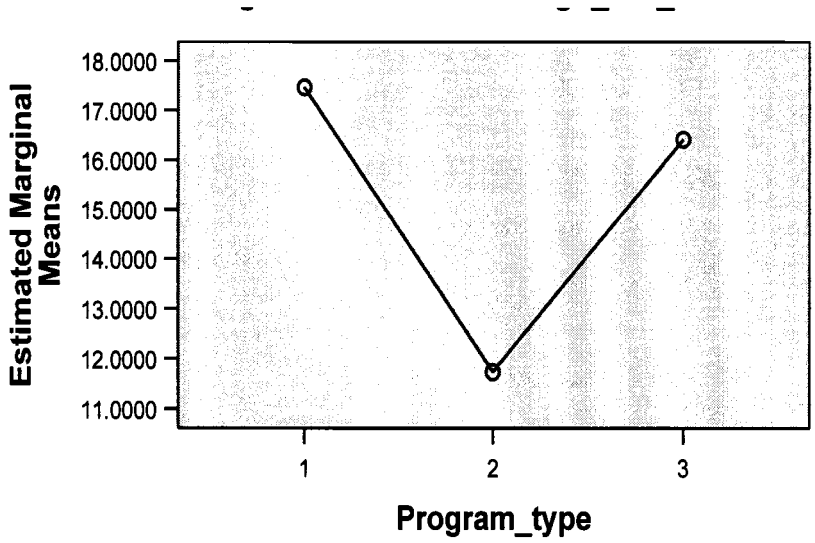

Figure 9. Estimated Marginal Means of Average Science Growth

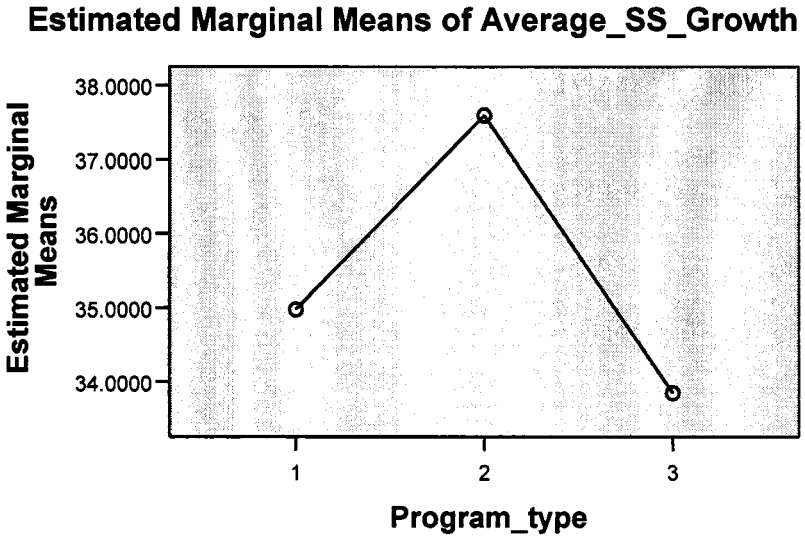

Figure 10. Estimated Marginal Means of Average Social Science Growth

Finally, frequency information on the demographic information of students included in the study concerning ethnicity, socio-economic status, gender, and English language proficiency were analyzed. Of the study population, 1,247 students were female and 999 were male. The number of Hispanic and White students included in the study was greater than any other ethnicity (n = 836, or 37.2%; and n = 828, or 36.9% respectively). African American students represented 14.2% (n = 318) of the population, Asian students represented 11.5% (n = 259), and Native American students represented 0.002% (n = 5). Only 19 students (.008%) were identified as Limited English Proficient (LEP). This means that English was not the student's native language. Finally, a total of 42.2% of students (n = 947) were identified as economically disadvantaged, meaning they qualified for the free or reduced lunch program in school (see Table 9).

Table 9

Descriptive Statistics of the GT Students in the Study and the Whole District

Demographic Category	Percent of GT Population in Study	Percent of Whole District
White	36.9%	9%
Asian	11.5%	3%
Hispanic	37.2%	58%
African American	14.2%	30%
Free and Reduced Lunch Participants	42.2%	82%
Limited English Proficient	.008%	27%
Male	44.5%	Not available
Female	55.5%	Not available

The students were not evenly distributed among the schools, with magnet schools enrolling far more gifted and talented students than schools without a magnet program. This may have contributed to a limitation for the study based on why students chose to attend their home school as opposed to a magnet school. A total of 1,154 students (47.2%) attended a magnet school for gifted and talented students in this district. There were only eight middle schools that offered this type of program. The second highest program enrollment for GT students was in other magnet schools (n =765, 31.3%). Thirty-seven middle schools in this district offered magnet programs for specific subjects such as math, science, or technology. GT students attending their home school and taking advanced classes composed the smallest group, including only 327 students, or 14.6%. Not every school enrolled gifted and talented students. This entire group of students was served by a total of 34 schools. This means that out of 45 middle schools in the district, 11 had no gifted and talented students attending their site for all three years.

Conclusions

The data collected on gifted and talented students from the large, urban district in a southwestern state did not show a significant difference in achievement growth between the three programs under review. There was insufficient evidence in the data to support the research hypotheses which supposed a difference would exist between treatment groups. The assumptions of the MANOVA, normality of the data and equality of the variance and the covariance, were upheld. The differences within groups were large as evidenced by the standard deviations of the average growth scores, making comparison between groups difficult. The demographics of the students included in the study were varied, but did not exactly match the demographics of the district in general. In general, students in this group were more likely to be female, White or Asian/Pacific Islander, and did not participate in the free/reduced lunch program compared to the typical student in the district.

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

Questions and Design

This study sought to examine whether any differences in achievement growth existed between three groups of gifted and talented students. These students received three different programming options during their years in middle school in a large, urban district in the southwestern United States. To be included in the study, all students must have been identified as gifted and talented by their school district, attended all three years of middle school at the same school, and entered sixth grade during the 2002-2003 or 2003-2004 school years. Scaled scores on *The Stanford Achievement Test, 10th Edition* were gathered for all students in four subtests: Reading, Mathematics, Science, and Social Science. Sixth grade scaled scores were subtracted from eighth grade scaled scores in each subtest to obtain growth scores for each student. These growth scores were then grouped according to school and the year in which the child entered sixth grade. These groups' growth scores were averaged to find average growth scores for each subtest. The average growth scores in reading, mathematics, science, and social science were used as the dependent variables in this study. Program type was used as the independent variable. The three different program types offered at schools in this district were magnet schools

for gifted; magnet schools for specific subjects such as math and science, technology, or fine arts; and honors or Pre-AP classes at students' home schools.

The research questions asked whether students who attended magnet schools designed for gifted and talented students would have greater achievement growth than students who attended other magnet schools or their home school. The three research hypotheses described the expected differences between these three groups; namely, that no differences would exist between other magnet schools and advanced classes at students' home schools, but a difference would exist between the previous two groups and magnet schools for gifted in favor of the magnet schools for gifted. The study used an ex post facto, causal comparative design to examine differences. All data were historical and owned by the district. No student names or identifying information was supplied with the data, although demographic information was included to offer a better understanding of the students contained in this study. A one-way MANOVA was conducted to determine if differences in achievement growth existed within the data. Additional tests were performed to ensure the data did not violate the assumptions of the MANOVA, to examine any differences determined by the MANOVA, and to inspect the demographic data. Results of the MANOVA showed that there was not sufficient evidence to support the research hypothesis that differences existed for average growth scores between program types. However, a conclusion cannot be drawn that this means that all schools were adequately improving achievement, merely that all schools produced similar achievement gains over the three years of middle school.

Discussion of Results

The district that supplied data for this analysis offered advanced classes at every middle school, enabling students to engage in more challenging material regardless of where they attended classes. The district also required teachers to have training in the needs of gifted and talented students before having those students in class. District reports published by its Advanced Academics Department claimed that the department was responsible for overseeing all services provided by the schools to their GT students, and ensuring that services included differentiation and increased rigor. Therefore, the three different programs reviewed had similar stated objectives and designs. However, there were differences between the programs offered by the district such as the amount of time spent with other gifted and talented students.

One difference between the programs was the time spent with other gifted and talented students. In magnet schools for gifted and talented, students were in core classes with only other identified gifted and talented students, although they could take electives with other non-identified GT students. In the other two programs reviewed, students took honors or advanced classes in mixed-ability classrooms. Another difference was in the variety of classes offered. Magnet schools for specific subjects often offered students a chance to specialize in a certain area. Fine arts magnet schools, for example, offered more classes and choices in art, music, or drama than did other middle schools in the district. These magnet programs appealed to students interested in furthering their knowledge of the particular topic offered by the magnet program.

It was supposed by the author that these various programs created a difference in achievement growth because when all students were identified as gifted and talented, the

pacing and challenge could be elevated beyond that for a mixed-ability classroom. However, this supposition was not proved. The results of the MANOVA showed that there were no statistical differences between program types on average achievement growth. This means that schools did a relatively equitable job of increasing achievement in their gifted and talented middle school populations. Magnet schools for gifted and talented students did no better at increasing achievement gains than did other magnet schools or advanced classes at students' home schools. There was wide variability within groups, which most likely contributed to the difficulty of finding differences between groups. For example, the mean scores for Reading growth in the three treatments were 18.7 for GT magnets, 16.8 for other magnet schools, and 16.6 for home schools. The standard deviations for these means were 4.5, 5.1, and 5.6 respectively. Because the difference between groups was at most 2.07 points, the differences within groups were too large to find that the differences between groups were significant.

Previous studies have found that programs designed for gifted and talented students increase achievement more than regular educational programs. For instance, Rogers (2002b) synthesized literature related to achievement and grouping and found that the type of grouping a student received impacted achievement, with the highest achievement gains seen in programs that were geared specifically towards the needs of GT students. This study was designed to determine whether the type of gifted program in which a student was enrolled also had an impact on achievement. The results of the analysis suggest that the type of program in which a student is enrolled does not have an impact on achievement growth. This could mean that the type of programming gifted and talented students received was not as important as their receiving at least some type of

services. In general, all programs did a basically similar job of increasing achievement and, therefore, this study must conclude that the type of programming is not the most important factor in determining achievement growth. This result is not consistent with other published studies, a finding that might be due to limitations of the design or the sample of students under review.

Another area reviewed in this study was the demographic information provided on students. Through frequency distributions, the author sought to examine the differences between the demographics of the students identified as GT compared to the demographics of the district population at large (see Table 9 on page 74). While the students included in this study represent a diverse population of identified gifted and talented students, they were not representative of the district as a whole. The ethnic breakdown of the entire district was 58% Hispanic, 30% African American, 9% White, and 3% Asian/Pacific Islander; however, the ethnicity of the gifted and talented population was 37% Hispanic, 14% African American, 37% White, and 12% Asian/Pacific Islander, thus over-representing the White and Asian/Pacific Islander ethnic groups. The entire district was composed of 27% English language learners, and 82% of the population participated in the free/reduced lunch program. Less than 1% of the GT population was classified as limited English proficient (LEP), and only 42% participated in the free/reduced lunch program. Despite the differences between the entire district and the population of identified gifted and talented students, there was still a great deal of diversity represented within the identified GT population. This is important because it shows that the program effectiveness was not dependant upon a certain ethnicity or socio-economic status. However the difference between the demographics of the sample and

the demographics of the entire district further complicated the generalizability of the results. It was not clear that given a more diverse population, the results would have been the same, nor whether the type of program impacted various types of students differently.

This difference between the district demographics and the gifted and talented population demographics highlighted a common problem in schools. More white, affluent, English speakers were identified for gifted and talented services than are represented in the district as a whole. The researcher believed that this was most likely due to the emphasis placed on achievement and ability test scores for identification. Students were given points for achieving different benchmarks, and the most points were awarded for high scores on the *Naglieri Nonverbal Abilities Test* and the *Stanford Achievement Test*. A student needed to score a certain amount of points, awarded through various assessments, including grades and teacher and parent observation forms, as well as standardized testing data. While the district did attempt to identify more of its underserved populations, through providing extra points in the identification process for having been identified as needing special education services, learning English, or coming from a low socio-economic background, those extra points were not enough to make identification more equitable. These data showed that possibly because of the district's attempts to identify more diverse students as gifted and talented, they were identifying more students who, in other districts, might not be identified. With over 11% of the entire district identified as gifted and talented, this district was well above the 3-5% typically expected for identified gifted and talented students. And despite their best efforts, they still were not able to match their GT population to their general population.

Limitations

Because the study was ex post facto, causal comparative, the results have limited applications to the population of gifted and talented students in general. The only variable controlled in this study was that of school enrollment. The researcher did not travel to the district to ensure fidelity of treatment; rather, she relied upon stated district policies to ensure that schools offered the programs they said they did. Neither teacher quality nor training was controlled which could have had an effect on achievement outcomes (Tieso, 2005). This analysis was not designed to control for these variables because the researcher was interested in whether there were, at the very least, differences in achievement growth between the programs, regardless of teacher quality and other possible influences. There were none suggested by the data. Further studies could examine whether the fidelity of treatment was upheld (i.e., did schools actually provide the services they said they were providing) and could control for other possible influencing variables.

Another limitation of the study was also related to the design. Because there was no group of students who were similar enough to constitute a control group, it was impossible to determine whether access to the gifted and talented programs offered by this particular district increased achievement of GT students in their district more than having no program access. Because this district identified a large percentage of their population (over 11%) as GT, the author decided that a control group of similar, yet unidentified students, simply did not exist. A second group of student who were high-ability, but who were not identified as gifted, would have been in the top 84%-89% of all students in this district. While this group of students could have been used for

comparison, the two groups of students (identified and unidentified GT students) were, nonetheless, different. Therefore, a comparison between those groups would have been unjustified. Related to this, the high number of students identified as gifted and talented was possibly an extra limitation to the study because it could have added to the wide variability with the groups, making comparisons between groups more difficult.

Also a limitation is the absence of a covariate. Additional data, a covariate, would have helped explain some of the differences within the groups, allowing differences between the groups to be more visible. After the original data analysis revealed no apparent differences between program types, the researcher requested additional testing information from the district to be used as a covariate, but was turned down. A follow-up study should be attempted to gain access to this data, using students' scores on *The Naglieri Nonverbal Ability Test*, a screening in which all students wanting to be identified as gifted and talented must take part, as a covariate in analysis.

It should also be noted that even though no differences were found in achievement growth between groups, it did not mean that the program in which a student was enrolled did not matter. Some students might have performed better in certain grouping situations than others. The high numbers of White and Asian students, females, native English speakers, and moderate to high-income students compared to the district demographics also begged the question of whether different groups of students would perform differently based on their school program. This study did not analyze those data, however a future study could examine if an interaction occurs between ethnicity, socio-economic status, gender, native language and culture, or area of giftedness and the type

of program in which a student was enrolled to determine if certain students do better academically in different settings.

Conclusions

This research study investigated the differences between three programs for gifted and talented middle school students in achievement growth as measured by *The Stanford Achievement Test, 10th Edition.* The types of programs included in the study were: magnet schools for gifted and talented students; magnet schools for a topic other than gifted and talented, such as math and science, technology, or fine arts; and honors or Pre-AP classes at students' home schools. Historical data were collected on students' sixth grade and eighth grade scaled scores for the Reading, Mathematics, Science, and Social Sciences subtests. Two cohorts of students provided the test scores used. These scores were then grouped according to the school attended and the year in which the student entered sixth grade. Averages for each school were found and used as the data points entered into the MANOVA.

No differences in achievement growth between program types were suggested by the data. The ex post facto design of the study limits the generalizability of the results, however. This design was chosen because the researcher was interested only in examining whether differences existed between program types in achievement growth, knowing that further research could determine how and why any possible differences might have occurred. This meant that other variables that contributed to the model were not included in the analysis. The basic design did allow the author to study, regardless of the similarity or diversity of the student population, or the quality of the teachers, or how

students chose their school, whether one program was better than another at increasing achievement. This study showed that despite the possible existence or contribution of an extraneous variable, the program alone was not the biggest determinant of achievement growth. Results of further research in this area may help to understand why differences were not found in the data and whether this was unique to this school district, or whether this finding was true of other populations of gifted and talented students.

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