THE EFFECTS OF STUDENT ENGAGEMENT ON HIGH SCHOOL MATHEMATICS

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The following faculty members have examined the final copy of this thesis for form and content, and recommend that it be accepted in partial fulfillment of the requirement for the degree of Master of Arts with a major in Sociology.

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ABSTRACT

My thesis focuses on the impact student engagement has on tenth grade mathematic test scores. Using secondary data from the Education Longitudinal Survey, I examined the math scores of 7,480 tenth graders in 2004. I predicted that students who were more engaged in their school environment will have higher test scores. In addition to engagement, I examine the impact that social networks and parental influences play in these math scores. I predicted that school engagement, school factors, parental influences, and peer relationships would play a role in determining tenth grade math scores. In addition, I predicted that socioeconomic status (SES) would play a role in determining extracurricular activities and parental involvement.

Overall, many of the hypotheses tested were supported, indicating that increasing student engagement with their school will have a positive impact on their math scores. Parental involvement had a more positive impact on math scores among higher SES families, particularly because the social expectations and network surrounding the students. SES had a significant impact on math scores by impacting the school, the expectations, and the parental influence on the child. Peer influences researched here had a negligible impact on math scores. Future research from here needs to focus on the implementation of student engagement activities and the effectiveness of these activities.

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CHAPTER 1

LITERATURE REVIEW

1.1 Introduction

Throughout his presidency, President Barack Obama has stressed the importance of education and has focused his efforts on all age groups, ranging from efforts to increase early childhood education within the Head Start program to new attempts to alter the high school dropout age in order to better ensure that students are graduating from high school. These broad strokes in federal policy are admirable in their attempt to improve the education of American students, yet the President's proposed legislation overlooks an important part of the educational process. Several of his attempts simply mandate additional classroom time. While improved attendance may be a step in the right direction, the nation should be taking steps to *encourage* rather than to mandate attendance. Research indicates that students who feel positively about their school perform better in school than those who have negative feelings about school (Crosnoe, Johnson, and Elder, 2004; Bryan, Moore-Thomas, Gaenzle, Kim, Lin, and Na, 2012). Through an improved understanding of the link between school engagement and academic success local school districts will be able to take steps to better educate children than is possible through broad federal legislation.

In this paper, I will examine factors that contribute to the academic success of students. First, I will examine student level factors, such as prior academic performance, number of extracurricular activities in which the student participates, or a student's personal expectations of academic achievement. Secondly, I will examine the ways in which the school environment can impact student success. The third factor to be considered will be the impact of family environment on student test scores. My last factor will concern the possible impact of a

student's peer group on the student's tenth grade math score. The focus of this paper is on mathematic success operationalized as performance on math standardized scores because math success is strongly linked with other positive outcomes, such as college completion and commonly used to measure academic success (Trusty and Niles, 2002).

I will use three theoretical perspectives to frame the research. I will first discuss networking theory and its relationship to academics. Networking theory focuses on a student's social network. I argue that students who are engaged in a greater number of extracurricular activities will have a wider social network from which to draw support for the development of school and social skills. The second theory on which I will focus is Overlapping Spheres of Influence. This theory focuses on the impact of parent participation on the education of their children. There are five spheres of influence that the theory discusses, and the theory purports that the more each distinct sphere overlaps with other spheres, the more involved the parent is in the academic life of the child. The last theoretical perspective will focus on structural inequality and the impact socioeconomic status (SES) will have on students. SES has an impact on many educational variables, such as quality of schools and educational expectations.

If a link can be established between student engagement and student success, schools may be able to help struggling students. In addition to mandating further classroom time, the schools can focus on drawing students into school activities that will help promote an environment of learning. If an increase in student resources, such as increased internet access, has an impact on test scores, an option may be to provide additional resources for the student body. Also, if parental involvement is critical for academic success, the schools should devise programs to encourage parents to be more involved in their child's academic life. These factors may come with a price tag, but through research we may find ways to improve test scores with

only limited expenditures. Lastly, by examining the impact that social inequality may have on math scores, steps may be taken to limit the negative influences that social inequality may have on tenth grade math scores.

1.2 Student Factors

Sex and race play a significant role in academic performance. Prior research has demonstrated that gaps in academic achievement that occur from sex and race-related differences (Bryan et al. 2012). For example, high school females score lower than their male counterparts on high school math exams (Lindberg, Hyde, Peterson, and Linn 2010). Based on these findings, I hypothesize that males will score higher than females on math assessments. However, research is not conclusive on the gender gap in math scores. Research suggests that the gender gap is shrinking and that the effect size is close to zero, indicating test scores of males and females are essentially similar (Hyde, Lindberg, Linn, Ellis, and Williams 2008).

Black/African American, Hispanic, and Multi-Racial students also score significantly lower than their White counterparts on math tests, while Asian students score the highest of all categories (Bryan et al. 2012; Entwisle, Alexander, and Olson 2005). However, when controlling for academic success, African American students were underrepresented in advanced high school classes and were overrepresented in remedial classes (Dauber, Alexander and Entwisle, 1996). Teacher quality for minority students appears to be lower than that of White students. Minority students are more likely to be exposed to unqualified teachers which may stunt minority students' educational growth (Eccels and Roeser 2011).

There are also differences in disciplinary measures taken against minority students. Edward Morris (2006) described the differences in monitoring and punishment, suggesting that Black and Hispanic males are seen as instigators in classroom disruptions and are, therefore,

more harshly punished than White males exhibiting the same behaviors. Teachers were also more willing to attempt to regulate the behavior of minority females to make them more "lady-like" (Morris 2006). These behaviors by teachers stigmatize these minority students and lead to harsher disciplines than those given to their White counterparts. However, one study suggests that African-American students may be rewarded for good behavior more often than are their counterparts (Entwisle et al. 2005). However, judging by the math and reading standardized testing scores, the best behaved African-American children were not learning as much as their classroom grades would indicate (Entwisle et al. 2005). Based on the current literature and theory, I predict that minority students will score lower on math tests than their White counterparts will.

Learning, physical, and mental disabilities create challenges for student learning. These students may struggle in the classroom, and their disabilities may contribute to being unprepared to participate in main stream society (Deshler, Lenz, Bulgren, Schumaker, Davis, Grossen, and Marquis 2004). Deshler and colleagues point out that only 6.6% of the disabled students in their study carry a grade of a "B" or "A." This is dramatically different from non-disabled students in which 31% carry that grade (Deshler et al. et al. 2004). While these students have lower GPAs, it is not always due to lower intelligence. Students with learning disabilities typically have average or above-average intelligence, but deficits with memory, language, and attention may affect their development and achievement in the classroom (Miles and Forcht, 1995). These deficits may particularly affect their mathematical achievement because math problems are often multi-step problems and students struggling with these deficits may not remember every necessary step (Impecoven-Lind and Foegen, 2010). Therefore, I predict that disabled students will score lower on standardized math tests than do their peers.

One of the greatest indicators of future academic success is past academic success (Glanville and Wildhagen, 2007). Future academic performance is affected by learning deficits accumulated from past grade levels (Hawkins, Gua, Hill, Battin-Pearson, and Abbott, 2001). For example, in typical math courses, current material relies on a mastery of previous math courses. If students struggled with Pre-Algebra, it is unreasonable to expect them to excel in Algebra during the next school year if they do not address the learning deficit. For this reason, it is crucial to prevent these deficits before they appear. In fact, these learning deficits may be the greatest cause of the sex and race-related gaps in education. Bryan et al. (2012) discussed a large gap in these groups that was almost eliminated when accounting for prior academic success. I hypothesize that students who excelled in previous grades will continue to succeed in tenth grade math classes.

Out of class preparation is also an important factor for academic success. The number of hours a student spends on homework is often used as a measure of the student's preparation. However, this may not always be an appropriate measure because there are potential problems associated with it. For example, in classrooms where less homework is assigned, students cannot spend as much time on it (Glanville and Wildhagen, 2007). Further, students who have different aptitudes will spend different amounts of time on the same homework assignment (Glanville and Wildhagen, 2007). While two students are equally engaged and equally prepared, one student will often appear to spend more time preparing for a class. However, one cannot discount the importance of being prepared for school. If students procrastinate on their homework, which may be a sign that they will not perform the task well, they show higher levels of anxiety towards school (Rosário et al. et al., 2008). Based on the literature and theory, I predict that

students who spend more time on homework each week will score higher on their high school math exams.

Children who are more enthusiastic will be more engaged in school, and they will learn more in school than their less enthusiastic, less engaged peers (Entwisle et al. et al., 2005). In fact, early disengagement for students may lead to more severe disengagement later in their academic careers (Finn, Pannozzo, and Voelkl, 1995). Not only is engagement important for high school education, but Finn et al. et al. (1995) advocates that early detection of disengaged students is needed to prevent later disengagement, and they state that this is a solution that not only teachers, but also aides and other specialists in the school system need work together to implement. Student engagement is a key component in "academic resilience", which Finn and Rock (1997) divided into three levels. Students who had academic success and graduated from high school were classified as "resilient." Students who did not have academic success but who still graduated were classified as "nonresilient completers," and students who did not graduate were classified as "dropouts" (Finn and Rock, 1997)

Students were more likely to drop out of high school if they do not feel engaged to their school, through perceived irrelevance of course material and low interest in their education (Finn, 2006). If students are struggling to feel engaged with their school and curriculum, it may be important for school to offer more intriguing classes for their students. However, there has been little progress in evaluating the curriculum offered to the students to make the material seem more meaningful (Eccles and Roeser, 2011). There are other steps that schools can take to increase engagement by attempts to "scaffold" the learning process. By choosing materials that are at an appropriate level for the students, forcing students to think critically through multi-step problems, and allowing the students to assist in learning can promote interest and engagement

from the student body (Eccles and Roeser). Promoting the interests of the student body can be important because increased interest is related to greater engagement and mastery of the material (Fredrick et al. et al., 2004).

Extracurricular activities can also increase student engagement. To students, extracurricular activities can serve as a connection to school (McNeal, 1995). Extracurricular activities can also help students boost their self-esteem by offering leisure activities they enjoy and, possibly, at which they can excel (Broh, 2002; Mahoney and Cairns, 1997; Darling, 2004). Students with higher self-esteem perform better in school (Darling, 2004). The higher self-esteem also serves as a buffer to adolescent stressors that can cause students to perform poorly in school (Thotis, 1995). Furthermore, a bolstered self-esteem can mediate the harmful effects potentially caused by negative thoughts in other areas (Thotis, 1995; Fredricks and Eccles, 2006). Prior research has demonstrated that students with a mixed group of extracurricular activities, both sports and non-sports, reported higher self-esteems than students participating in only one of these types of activities (Blomfield and Barber, 2009). This bolstered self-esteem can then help students remain in high school and graduate (McNeal, 1995).

In addition to building teacher-student relationships (Darling, 2004) and promoting peer relationships (McNeal, 1999), certain extracurricular activities are also associated with high social status within the school (Eder and Kinney, 1995). Participating in extracurricular activities helps to foster a feeling of community in schools (Akerlof and Kranton, 2002). While extracurricular activities can help to raise students' self-esteem, there are specific activities that can have a greater effect on self-esteem (Eder and Kinney, 1995). In fact, the status that is achieved through certain activities (athletics for males, cheerleading for females) can elevate the participating students into the perceived elite group of students (Akerlof and Kranton, 2002; Eder

and Kinney, 1995; McNeal, 1995). For these students, participating in elite activities would greatly enhance their social network because their peers tend to view them as popular and want to be friends with them (Eder and Kinney, 1995). Extracurricular activities have been shown to have positive effects on academic success for students (Darling, 2004; Mahoney and Cairns, 1997; McNeal, 1995; McNeal, 1998). According to McNeal (1995), this is not simply because the students who participate in extracurricular activities are better students. If students participate in more activities and spend more time at those activities, they demonstrate higher academic achievement, and this benefit still occurs even after controlling for prior academic performance, indicating that these activities have an impact across all achievement levels (Bryan et al., 2012).

Activities may also hold different significance to schools of differing SES levels. While athletics is an elite activity, participants are not always viewed as academic achievers. In high SES schools, non-athletic participants were viewed as academic achievers while in low SES schools it was the athletic participants that were viewed as achievers (Guest and Schneider, 2003). In addition to the peer perceptions, different activities provide different social benefits to the participants. For example, participation in groups focusing on community service appears to help limit various risky behaviors throughout the high school years (Eccles and Barber, 1999). However, it is more likely that high SES students will participate in these types of activities. As a result, extracurricular activities may offer different benefits to different SES levels.

Networking theory can help explain many positive outcomes from extracurricular activities. Students will boost their social network through their extracurricular activities. Having a broad network can have many positive effects on the student, and students with the most diverse extracurricular activities will likely have the broadest network because of the

additional peers from each diverse group. This network will likely include both students and teachers who serve as leaders for each activity.

Although everyone has a social network that they utilize, how these networks form varies, but most include friends and co-workers (Henslin, 1993). A social group can offer many benefits to the members. Some of the benefits of a broad social network include a boosted self-esteem, socioemotional support, and situational courage (Statham, Miller, and Mauksch, 1988). Based on networking theory and this research, I predict that the more extracurricular activities a student participates in, the higher their tenth grade math scores will be.

Deviance also can play a role in the school environment. Student deviance has a negative relationship with academic success, indicating that the more deviance a child participates in the lower the student's academic success (Bryan et al., 2012). Deviance can be mitigated by fostering an environment in which the students feel connected to their schools (Payne, Gottfredson, and Gottfredson, 2003). Akerlof and Kranton (2002) describe one school in which a five-year transformation took place in which teachers struggled to create a sense of order in their classrooms due to the student deviance. However, over the course of five years, the school developed new policies that helped the students to internalize the school's values and the students were better behaved (Akerlof and Kranton, 2002). I would predict that students who are more deviant will have lower test scores.

It is also important for students to have positive feelings about their school since the opinions of the students toward their schools have implications for their own academic success. Research demonstrates that school bonding variables, such as attachment to teachers, attachment to schools, school commitment, and school involvement, were significantly related to math achievement (Bryan et al., 2012). This research also demonstrates that many of the school

bonding variables, with the exception of perceived school fairness and school commitment, are related to prior academic performance (Bryan et al., 2012). And this relationship to prior academic performance is important because the strongest indicator of twelfth grade achievement was tenth grade achievement (Bryan et al., 2012). Based on the literature, I predict that students who have positive views of their teachers will score higher on high school math exams than students who have negative views toward their teachers.

1.3 School Factors

The school atmosphere is crucial to student success. There are many school factors that can positively or negatively affect students' learning. Wealthier school districts have an opportunity to provide better resources to their students than do poorer districts (Darling-Hammond, 2004). Even school districts in the same city can have drastically different resources for their students. In the wealthiest school district in New York City, the district spent an average of $19,238 per student (Perrucci and Wysong, 2003). At the opposite end of the spectrum, the poorest district spent an average of $3,127 per student (Perrucci and Wysong, 2003).

The wealthy school districts can spend more per student to provide more classroom resources, making the educational experience better for the high-SES students (Perrucci and Wysong, 2003). These resources can extend from the quality of teachers to the instruments that are provided to the teacher for individual classrooms (Darling-Hammond, 2004). Wealthy school districts are more likely to have fully qualified teachers, while poor school districts have higher percentages of teachers with only emergency credentials (Darling-Hammond, 2004). Qualified teachers are important, because more qualified and more experienced teachers are better educators for their students then their less experienced counterparts (Clodfelter, Ladd, and

Vigdor, 2010). In fact, teacher quality may help to exasperate the learning deficit between high achievers and low achievers in the classroom since inexperienced teachers are more likely to be assigned to low-achieving classrooms (Feng, 2010). And with the increased spending options, wealthy school districts are able to maintain higher teacher retention rates, benefiting their students (Darling-Hammond, 2004).

Even the most experienced teachers cannot teach as effectively if they are not given the proper tools for the job. One example provided by Darling-Hammond (2004) occurred in St. Louis. While the poorer school districts in St. Louis do not have the tools for basic lab equipment for science courses, neighboring districts offered expensive extracurricular activities such as lacrosse and ice hockey. Equally concerning, low SES school districts have limited computer access for students while the high SES districts may supply laptops or tablet computers for every student for no direct cost.

Personal laptop and tablet devices allow students to take notes more easily or to make up missed course material more readily than may students from low SES school districts (Oliver and Corn, 2008). With proper integration, these mobile computing devices can be used to reinforce the class activities. Students who used mobile devices demonstrated improved learning achievements in natural science courses (Chu, Whang, Tsai, and Tseng, 2010). Use of these mobile devices also increased student interest in natural science courses and increased participation among the students (Chu et al., 2010).

The school districts that provide one-to-one computing devices for students also have improved results on reading and math test scores (Rosen and Beck, 2012). Not only did the students using the one-to-one computing devices have higher scores, they also demonstrated higher motivation in their math and reading classes than their peers who were not using these

devices (Rosen and Beck, 2012). In one sample, the experimental group, the students using the computing devices, closed the learning deficit between the students in the control group and finished the year with higher scores than the control group (Rosen and Beck, 2012). Students were also more likely to have a positive attachment to the school if they used these school-provided electronics (Oliver and Corn, 2008). These devices, when used in math classrooms, had beneficial effects for all students, but they were more beneficial for underachieving students in particular (Shin, Norris, and Soloway, 2006). Low achieving students who participated in electronic math games showed greater improvement in their scores than did high achieving students (Shin et al., 2006). In fact, for high achieving students in math, traditional paper math games increased test scores more than did the electronic games (Shin et al., 2006).

The benefits of a wealthier school district extend outward from the classroom to many other areas inside of the school. One of these additional areas is the school counseling that schools can provide. School counselors can help serve has advocates for the students (Bryan et al., 2012). These school counselors also help pair necessary students up with caring adults in the school community (Bryan et al., 2012). I predict that students from wealthier schools will have higher math scores than students from less advantaged schools.

1.4 Family Factors

1.4.1 Overlapping Spheres of Influence

Student and school related factors are not the only considerations that can impact high school academics. I feel that the theory of overlapping spheres of influence explains why parental involvement is also crucial for the academic development of children (Epstein, 1990; Epstein and Van Voorhis, 2010). This theory maintains that when parents' and teachers' have shared or overlapping intentions for the children, the students will perform better in school

(Epstein, 1990; Epstein and Van Voorhis, 2010). Parents who are involved with the education of their children experience these overlapping intentions (Epstein, 1990). Epstein outlines five types of parent involvement: basic obligations of parents, basic obligations of schools, parent involvement at school, parent involvement in learning activities at home, and parent involvement in governance and agency (Epstein, 1990).

Research has not produced solid conclusions on all the types of involvement. Either not enough research has been completed on a type of involvement, or the results have been inconsistent with the conclusions of other projects (Ho and Willms, 1996). The three types of involvement that I will focus on for this segment will be parent-school communication, parent-school involvement, and parent involvement in governance and agency.

The first type of involvement that I will discuss is the basic obligation of schools to communicate with the parents. This involvement includes parent-teacher conferences and letters that are sent home to the parents (Epstein, 1990). Schools are now developing programs that will encourage parents to take a more active role in their child's education. Research has shown that parents want to help, but sometimes they do not know what they can do (Lawson, 2003). That is why it is important for schools to actively involve parents. For instance, parents in these programs take a more proactive role in assisting their children with homework (Lawson, 2003). Parents also feel better about their ability to help students when given direction by teachers (Becker and Epstein, 1982; Ziomek-Daigle, 2010).

While parents sometimes do not know what to do to help, teachers sometimes do not know how to involve parents (Lawson, 2003). Schools need to take the initiative to involve parents because school programs impact actions of the parents (Hoover-Dempsey, Walker, Sandler, Whetsel, Green, Wilkins, and Closson, 2005). It may also be important to examine the

motivations behind the parental involvement. Low SES parents are more likely to become involved with the school if their children are at risk academically (Ho and Willms, 1996). Schools may need to target low SES parents to get them more involved in their children's education before they become at risk.

The second type of involvement is parental involvement at the school. Through this involvement, parents volunteer in the classroom or participate in other school functions, such as sporting events and concerts (Epstein, 1990). Children's achievement is positively associated with parental school-based involvement. This effect is seen predominately seen in children's reading scores, although parent participation at school had only negligible effects on math achievement (Ho and Wilms, 2006).

It is likely that this association exists because parents will be knowledgeable about the curriculum their children are working on (Hill and Tyson, 2009). This will allow parents to be better prepared to interact with their children at home about their school activities (Hill and Tyson, 2009). However, regardless of their own socioeconomic status (SES), parents are also more likely to volunteer or participate in the school's PTA/PTO if the child attends a high-SES school compared to a low-SES school (Ho and Wilms, 1996). The increased participation can strengthen the social network and affect the norms and expectations of the children (Ho and Wilms, 1996). Parents who volunteer may also help to reduce the social-class inequality between groups (Ho and Wilms, 1996).

The third type of involvement I will discuss is parental involvement in learning activities at home such as in helping with homework and with other class projects (Epstein, 1990). How often a parent reads to his or her child is related to better test scores on reading assessments as early as the kindergarten level (Joe and Davis, 2009). Yet parent-child communication is

important throughout the child's academic career. Blondal and Adalbjarnardottir (2009) found that parent-child communication about school is positively associated with higher grades among high school age students. Parental involvement affects more than just grades. It also decreases the likelihood of the student dropping out of high school (Blondal and Adalbjarnardottir, 2009; Ziomek-Daigle, 2010). Based on these three spheres of influence, I predict that students who have parents actively involved in their academic lives will have higher math scores.

It is important to recognize that it is quality, not quantity that needs to be considered with regards to parental assistance (Blondal and Adalbjarnardottir, 2009). Studies indicate that children benefit if parents remain actively involved in their education throughout high school (Ho & Willms, 1996; Lee, 1994; Simon, 2000). Among these studies, some of the positive reported effects were attendance, grades, and overall preparedness. These positive effects remained consistent after certain considerations were accounted for, including family background and parental education.

When a parent can communicate with a child about school, the parent is able to reinforce the school curriculum and to assist with homework (Hill and Tyson, 2009). According to Hill and Tyson (2009), "academic socialization" had the strongest association with higher grades than any other type of involvement. The more educated the parents, the more effective they may be at helping their children with their homework (Dumont, Trautwein, Ludtke, Neumann, Niggli, and Schnyder, 2012).

However, if the assistance becomes a source of conflict between the parent and child, student performance suffers because the students may view the assistance, such as checking homework completion, as intrusive (Dumont et al., 2012). If parents initiate the homework help, instead of children requesting help, several negative outcomes may occur (Patall, Cooper,

and Robinson, 2008). Children are not able to develop necessary problem-solving skills to deal with difficult problems and it is more likely that children will view the parents as intrusive which may cause conflict (Patall et al., 2008).

The child's perception of their parent's competency with their schoolwork affects the amount of conflict between the parent and the child (Dumont et al., 2012). The resources in the house also affects perceived parental competency. Households with more books see higher perceived parental competencies and lower conflict levels (Dumont et al., 2012). Thus, more highly educated parents and families with more academic resources in the household are more likely to provide the quality of help that students need to gain the benefit of parental participation.

When parents become involved in their child's academic career, the spheres of influence between the school and the home overlap and benefit the child. The children receive a consistent message throughout all aspects of their lives, and educational priorities become clearer for the children. When parents and schools communicate, they are better able to serve the interests of the children. The factor of trust between parents and teachers is important to examine. If there is trust between parents and teachers, teachers can teach how they feel is appropriate (Hoy, 2012). Teachers can insist on high academic standards because they know the parents will support their methods (Hoy, 2012). Students also respond to higher expectations with greater effort (Kariya and Rosenbaum, 2006). Returning to the discussion of academic resilience, resilient children are much more likely (72% of resilient students) than nonresilient completers and dropouts (50% and 36%) to have parents who expect them to complete at least a two year college degree (Finn and Rock, 1997).

When the relationships break down between parents and teachers, students are the main victims (Lawson, 2003). When these conflicts exist, students feel that parents are only involved with negative outcomes (Lawson, 2003). When students have these feelings, they are discouraged about involving their parents in their education (Lawson, 2003). When parents do not participate, the school representatives feel it is because of a lack of family caring (Lawson, 2003). I feel that there is a cyclical pattern associated with the communication amongst the students, the parents, and the teachers. Students may have negative feelings about their parents being in the school and, therefore, they do not tell their parents of events taking place at the school. When parents do not attend, teachers feel it is because the parents do not want to participate. Teachers may then draw divisions between involved and uninvolved parents to the detriment of the children whose parents are perceived as uninvolved in the (Lawson, 2003). Students may then feel that they are treated negatively by the teachers, and the cycle repeats itself.

Using the theory of overlapping spheres of influence, I predict that a child with more involved parents will have greater academic success. These parents will be more likely to be aware of what their children are working on in school. One of the spheres of influence focuses on the ways that the parents interact with the school. I predict that higher levels of parental-school involvement will have a positive impact on math scores.

In addition, family structure and size can have an impact on the students' academic scores. Families with two parents can provide more resources for their children than can be provided by other family structures, and these families may have lower levels of family conflict (Kurdex and Sinclair, 1988). Within larger families, there is more competition for these educational resources (Chiu, 2010). Also, these resources, whether they stem from high-SES,

native born parents, or cultural possessions, help to raise test scores (Chiu, 2010). Chiu's research (2010) conducted across many different countries of varied levels of SES, indicates that these cultural possessions (books and family relationships) had a consistent positive effect on the students' math scores. It appears to be important for families to provide these types of resources to their children if they have a consistent impact across many SES levels. I predict that if students have more family resources in their household, their math scores will be higher.

However, a critical influence on academic achievement is family socioeconomic status (SES). There is a link between SES and academic success (Carneiro and Heckman, 2002; Frenette, 2007). Children from higher SES families scored higher on math, reading, and science tests in middle school when compared to lower SES families (Frenette, 2007). Children from higher SES families also attend and graduate college at higher rates than lower SES families. These numbers are not solely because lower SES cannot financially attend college. Studies completed on financial constraint have estimated fewer than 10% of students who want to attend college cite finances as a reason they do not (Carneiro and Heckman, 2002; Frenette, 2007). Since many lower SES students could financially attend college but do not, we must consider possible structural reasons that they attend college less often than higher-SES students.

1.4.2 Networking Theory

We return to our examination of networking theory. Most often, in families with a high SES, at least one parent has earned a college degree and it is more likely that both parents have earned college degrees (Frenette, 2007). It seems that, from a young age, these children are expected to attend college (Carneiro and Heckman, 2002; Frenette, 2007). The converse also seems to be true. Children with a lower SES do not appear to be pushed to attend college after high school (Frenette, 2007).

Having higher educated parents can also help a student during the school day. Students with higher educated parents show less anxiety towards school and tests than do children with lower educated parents (Rosário et al., 2008). This is likely because more highly educated parents see school as important and provide children with necessary resources, instilling the children with a sense of preparedness (Rosário et al., 2008). Even if the parents wish to help their children with their homework and other educational activities, low SES parents are more likely to have struggled themselves in school (Alexander et al., 2007). Because of their own struggles, they may not have the means to provide their children with the necessary support (Alexander et al., 2007). However, before a test, children with higher educated parents have their anxiety spike, perhaps because their parents place higher expectations on the children (Rosário et al., 2008).

If children are expected to attend college, they seem to associate with people who possess similar expectations (Frenette, 2007; Perrucci and Wysong, 2003). Their parents and peers help to reinforce that a college education is the likely option after high school (Frenette, 2007; Ho and Wilms, 1996; Perrucci and Wysong, 2003). In fact, each year, high SES students receive an average of 3 college-affirming signals, such as parents expecting the child to attend college, to every college disconfirming signal, such as parents not expecting the child to attend college (Bozick, Alexander, Entwisle, Dauber, and Kerr, 2010). Once again, the converse occurs with lower SES children. They are not pushed by their parents and peers to attend college, and they do not see a college diploma as a probable achievement and receive only one college-affirming signal to three college-disconfirming signals each year (Bozick et al., 2010; Carneiro and Heckman, 2002; Ho and Wilms, 1996; Perrucci and Wysong, 2003). Parents who have high expectations for their children also lobby the school more frequently about their children being in

advanced courses, and this increases the probability that their students will be enrolled in advanced classes (Dauber et al., 1996). Due to this literature, I predict that students who have a personal expectation of earning a college degree will score higher on math tests.

In fact, while personal expectations of attending college stays fairly constant from fourth grade until eleventh grade for high SES students, (fluctuating between 91.2% and 86.3%), the same expectations for low SES students tracks down as they go through their school career (77.0% to 52.1%) (Bozick et al., 2010). The social network around students has an impact on their post-high school destination, and higher SES children have higher expectations. Among students who never expected to go to college, 84.9% of the students came from low SES households while zero percent of high SES never expected to go to college (Bozick et al., 2010).

1.4.3 Concerted Cultivation vs. Accomplishment of Natural Growth

There are also dramatically different childrearing styles between high-SES parents and low-SES parents. The two forms of childrearing are called "Concerted Cultivation" (high SES) and "Accomplishment of Natural Growth" (low SES) (Lareau, 2002). In Concerted Cultivation, parents are highly involved in the daily planning of their children's activities (Lareau, 2002). They participate in several activities that can help to refine talents, such as musical and athletic, of the child. They also encourage their child to intervene on their own behalf (Lareau, 2002). Direct encouragement is different from accomplishment of natural growth. These children will not participate in many organized activities, mostly as a result of financial constraint (Lareau, 2002; Lawson, 2003). Each activity or sport can cost as much as $5,000 a year (Halbfinger, 2002). Instead of organized activities under adult supervision, these children will seek out their own activities with peers (Lareau, 2002). Unlike concerted cultivation in which parents

encourage their children to intervene, accomplishment of natural growth children may not be as comfortable talking with other adults such as doctors or teachers (Lareau, 2002).

In fact, parenting practices can reproduce the social structure and thus reproduce inequality. Children raised under concerted cultivation will likely gain the skills needed to maintain or exceed their current SES because they develop a sense of entitlement. Children raised under accomplishment of natural growth develop under a sense of constraint and believe that it is normal to lack the skills necessary for upward social mobility (Dumais, Kessinger, and Ghosh, 2012).

1.5 Peer Factors

The role that peers play in the educational process also may play a role in academic success. This research suggests that students will associate with peers of similar demographic backgrounds and SES. Since students associate with peers from similar upbringings, this reinforces behaviors that they have learned at home. Peers will also associate with students of similar engagement levels, which strengthens existing differences in peer engagement (Fredricks et. al, 2004). However, research has produced mixed results on the direct effect peers have on academics. Research has shown no relationship between peer groups and achievement (Hanushek, 1992, Hanushek, Kain, Markman, Rivkin, 2003). Further, differences in SES among peers do not appear to negatively affect test scores (Hanushek et al., 2003).

Networking theory can help to explain why student peer relations may also help to keep the students in school. Students who have a greater number of social ties with their peers possess a greater attachment to the school, and thus a lower chance of dropping out of high school (McNeal, 1995). Simply adding to the social network of a student is not always a solution. A study on Reconnecting Youth, a prevention program for students deemed at-risk, showed

inconsistent results for student success (Cho, Hallfors, and Sanchez, 2005). While immediate results from the study were mixed, at the six month follow up, all five indicators for success were negatively related to participation (Cho et al., 2005). Researchers expected the positive gains to slowly decrease over time, but instead the results were reversed from what they intended: Students bonded with other at-risk students while distancing themselves from the school and conventional peers (Cho et al., 2005). I predict that students with friends who engage in positive activities and do not drop out of high school will score higher on math tests.

1.6 Intersections of Structure and Family SES

In addition, the quality of the school system that high SES families choose is another structural factor that helps high-SES students to achieve success. If their SES is high, the children have better access to higher quality schools and higher quality preschool and kindergarten programs (Carneiro and Heckman, 2002; Entwisle, Entwisle, Alexander, Cadigan, and Pallas, 1986). These preschool and kindergarten programs are important because students with more preschool experience achieve higher on achievement tests in first grade than do students with less preschool experience. This remains true even after controlling for SES among the students (Entwisle et al., 2005). Even though first grade is early in an education of children, their success in first grade can set them up for academic success years in the future. The structural effects of schools also play a role in the achievement gap between students at the high school level. The quality of the high school can account for as much as 84% of the achievement gap (Frenette, 2007). Children from high SES families are more likely to attend schools with a focus on producing college students (Frenette, 2007; Perrucci and Wysong,, 2003). And, regardless of family background, if the students attended a high-SES school, they performed better on math and reading tests (Ho and Wilms, 1996).

In addition to attendance at better schools, students from high SES families have the possibility of participating in better out-of-school programs. During the summer months when students are out of school, high SES students are able to attend beneficial family and community events not attended by low SES students (Alexander, Entwisle, and Olson, 2007; Entwisle et al., 2005). During the school year, high SES and low SES students make similar academic progress and, yet, once summer starts, the learning gap starts to appear (Alexander et al., 2007).

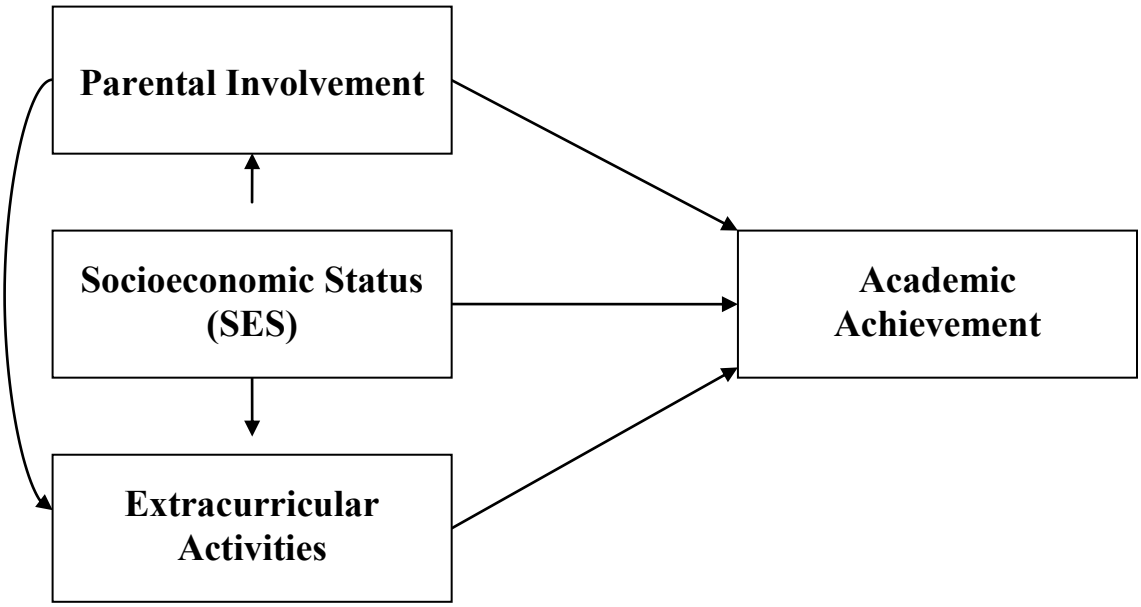
Summers typically offer inconsistent learning experiences for low SES students but reinforce learning for high SES students. Low SES students may learn a little, or they may forget material learned in the previous school year (Alexander et al., 2001; Heyns, 1987). However, they will begin the next school year near, or below, the level where they had finished the previous school year (Alexander et al., 2001). However, for high SES students, this is not the case. High SES students will continue to learn throughout the summer months, albeit at a slower pace than during the school year (Alexander et. al., 2001). However, this means they typically start the new school a year ahead of where they were at the end of the previous year (Alexander et al., 2001). Thus, they will start the new school year ahead of their low SES classmates. Due to this literature, I predict that students from high SES households will score higher on math tests than students from low SES households.

Structural aspects of class are seen in the classroom culture. In a classroom that had not established specific rules for requesting help from teachers was dominated by requests from middle class students (Calarco, 2011). The middle class students would call out their requests to the teacher or would even approach the teacher directly (Calarco, 2011). Since the teacher assumed that students would inform the teacher when the students did not understand the subject at hand, students who were not direct with their requests received less help than did the more direct students (Calarco, 2011). Working class students were also less likely to admit their lack of understanding. In two examples, a working-class student declared uncertainty only after a middle-class student asked the same question (Calarco, 2011). Students raised by the concerted cultivation method were more willing to approach a problem on their own and be more direct about their needs.

Lareau's research on the parenting implications of class background helps to demonstrate both networking theory and overlapping spheres of influence. I shall start by looking at networking theory. The high-SES students in the research were encouraged by their parents to expand their social networks and to engage in extracurricular activities. I expect their numerous activities will put them in new surroundings with new peers, peers who will have similar SES and parental expectations. According to the overlapping spheres of influence theory, since the high SES parents communicate with the schools more frequently, the spheres of influence overlap and the child is more likely to succeed. Based on the literature, I will test for interactions between SES and parent-school involvement as well as SES and extracurricular activities. I predict that high SES parents will have higher involvement than low SES parents. Due to the influential nature of SES, I expect that extracurricular activity involvement and parental involvement will have a different outcome for different SES levels. Based on the prior work of Ho and Willms (1996), there is a relationship between the type of parental involvement at school and SES, so I expect that different SES levels will have different outcomes. Also, since high SES students have access to extracurricular activities that low SES students may not have access to, I expect that more extracurricular involvement will benefit high SES students greater than low SES students.

CHAPTER 2

THEORETICAL MODEL



In this proposed model, my independent variables are parental involvement, SES, and student extracurricular participation**.** I expect these to have an impact on my dependent variable academic achievement, which will be operationalized as test scores for this paper. In addition, I will test for interactions with SES and parental involvement as well as student extracurricular activities.

CHAPTER 3

HYPOTHESES

From the literature review and theories used to construct the model, I propose several hypotheses for this research project:

3.1 Student Factors

Extracurricular activities help to promote many positive outcomes for participating children. I feel it should be expected that these activities should help to raise test scores because the social network of the children should be wider than children who do not participate in as many activities. Broadening the social network of the students will help to facilitate positive outcomes.

1a. Net of other factors, males will score higher than females on tenth grade math tests

1b. Net of other factors, minority students will score lower than their White counterparts on tenth grade math tests

1c. Net of other factors, disabled students will score lower than their peers on tenth grade math scores.

1d. Net of other factors, students who performed well in previous grades will score higher than their peers on tenth grade math exams.

1e. Net of other factors, students who expect to complete college will score higher than their peers on tenth grade math tests.

1f. Net of other factors, students who spend more time on homework a week will score higher than their peers on tenth grade math exams.

1g. Net of other factors, students who participate in more extracurricular activities will score higher than their peers who participate in fewer extracurricular activities on tenth grade math scores.

1h. Net of other factors, students who participate in deviant behaviors will score lower than their non-deviant peers on tenth grade math exams.

1i. Net of other factors, students who have positive opinions of their teachers will score higher than their peers who have negative opinions of their teachers on tenth grade math scores.

1j. Net of other factors, students who have more distractions at school will score lower than students who have fewer distractions at school.

3.2 School Level

The school environment is important to foster the education of the students. The teachers have an impact on how well students learn, so if schools have subpar teaching, students will be less likely to learn. Wealthy schools also have more funding to provide a diverse collection of resources to benefit their students.

2a. Net of other factors, students who hail from schools with higher percents of students in college prep programs or fewer students enrolled in free or reduced lunch programs will score higher than students at schools with lower percents of students enrolled in college prep programs or higher students enrolled in free or reduced lunch programs..

3.3 Parental involvement

Parents play a leading role in the development of their children, and when there is effective communication between families and schools, there are positive outcomes for the children. According to Epstein's theory of Overlapping Spheres of Influence, when parents take an active role in the life of their child's education, the child has more success in school. Also, SES has an impact on the structure of the network around the child. First, high-SES children are afforded more opportunities to supplement their education than low-SES children. In addition to more

opportunities to supplement their education, they also have more possibilities to broaden their social network.

3a. Net of other factors, the more involved student's parents, the higher the student's test scores

3b. Net of other factors, the higher family SES a student has, the higher their test scores.

3c. Net of other factors, the more resources a student has access to, the higher their test scores.

3.4 Peer Level

4a. Net of other factors, the fewer friends that have dropped out of high school, the higher the test scores for the students.

4b. Net of other factors, the more positive activities their friends participate in, the higher the student's test scores.

CHAPTER 4

METHODS

4.1 Data

This paper evaluates factors that impact students' academic achievement. Data from the Educational Longitudinal Study of 2004 (ELS) are utilized for this research. The data was collected from regular public, charter, Catholic, and other private U.S. schools. There were 1,268 schools sampled, and 1,221 were eligible. A total of 752 schools responded, for a response rate of 67.8 % (weighted). The vast majority of schools were public (75%) with 11% Catholic and 14% other private schools.

Sixteen thousand and two hundred fifty two students enrolled in tenth grade, their parents, and school officials were interviewed. The same students were resurveyed every two years. The students' questionnaire was divided into seven sections: locating information, school experiences and activities, plans for the future, non-English language use, money and work, family, and beliefs and opinions about self. The student survey was a self-administered instrument with the largest section of the survey focused on school activities and experiences.

The parent questionnaire was completed by a parent or a guardian most familiar with the school situation of the sophomore. The survey included information in five topic areas: family background, child's school and family life, parent-opinion of the child's school, and aspirations and plans for child's future.

Several sample restrictions were used to narrow down the sample. The student had to participate in both waves of data and be in the senior cohort. There also had to be valid parent and school questionnaires for both waves. Parent's had to complete the full survey, not the abbreviated survey. After sample restrictions, the dataset consists of 7480 cases for the students

after the weight is applied. The weight variable was constructed by the ELS research staff. The data was collected from a nationally representative sample of schools to allow the results to be generalized. A relative weight was created from the standard weight variable by dividing the standard weight by its mean. The relative weight was constructed to adjust the standard errors and to calculate the results based on unbiased parameters.

4.2 Variables

4.2.1 Dependent Variable

The research examines the academic achievement of ELS students. This measure was operationalized as standardized math test scores. This variable ranges from 22.49 to 75.02. For this study, math scores will be used as a proxy for overall academic achievement. Math scores are one of the strongest indicator of Bachelor's degree completion, often considered the barometer of academic success (Trusty and Niles, 2003).

4.2.2 Independent Variable

4.2.2.1 Student Variables

A dummy variable was created for the biological sex measure. Males were coded 0, and females were coded 1. For the race variable, Non-Hispanic Whites were coded 0, and Black non-Hispanic; Hispanic race-specified; Hispanic no race specified; Native American/Native Alaskan; Asian, Hawaii/Pacific Islander; and Multiracial, non-Hispanic were all coded 1.

A dummy variable was created to measure the disability status of the students. The disability status measure is constructed from responses on the parental survey to seven disabilities: Speech/Language impairments, mental retardation, emotional disturbance, hearing impairments, orthopedic impairments, visual impairments, and any other impairment. Disability status is coded 1 if a student has 1 or more disabilities and 0 otherwise.

A dummy variable was created for English as first language based on the student questionnaire. If a student's native language was English, the student was coded as 0. All other students were coded as 1.

A dummy variable was created to measure the past academic performance of the students. Four variables were used to create the dummy variable: ever in a remedial English class, remedial math class, dropout prevention program, or the special education program. If the student participated in at least one of these, they were coded 1. All other students were coded 0.

A dummy variable was created to measure student honors. Three variables from the student questionnaire were used to construct the measure: winning an academic honor, being recognized for good attendance, and being recognized for good grades. If the student received one or more of these recognitions, they were coded 1, with all other students coded 0.

The student expectations measure assessed if youth expected to earn a college degree or an advanced degree. Students with expectations to earn a college degree or an advanced degree were coded as 1. All other students were coded 0.

How many hours spent on homework is coded, into nine categories ranging from 0 to 20 or more hours a week: 1=None; 2=Less than 1 hour/week; 3=1-3 hours; 4=4-6 hours; 5=7-9 hours; 6=10-12 hours; 7=13-15 hours; 8=16-20 hours; and 9=Over 20 hours. This variable measures how much time the student spends on homework both inside and outside of school.

The index of extracurricular activities measures participation in ten groups: intramural sports, interscholastic sports, school band or chorus, school play or musical, academic honor society, yearbook or newspaper, service clubs, academic clubs, hobby clubs, and vocational clubs. An index was created with the application of a count procedure. For instance, a score of 7

indicates that a student participated in seven of the ten extracurricular groups. The index ranges from 0-10.

An index was created to measure the deviance status of the students. The index taps five forms of deviance: cutting classes, being absent from school, getting in trouble, having an in-school suspension, or being suspended. The deviant acts index ranges from 0 to 5 with higher values indicating greater engagement in deviant behaviors.

A measure that assesses student perceptions of all their teachers and the classrooms was created. All four questions are ordinal level variables based on the following scale: Strongly Agree (4), Agree (3), Disagree (2), and Strongly Disagree (1). The first question addresses if the student thinks the teaching quality is good in his/her classes. The second question taps if the student feels the teachers are interested in the students. The third question measures if the teacher praises the effort of the students. The last question assesses if the student often feels put down by the teacher. The first three items in the index were coded 1 if the respondent selected Agree or Strongly Agree. The last variable will be recoded so that the positive feelings of the student (the teacher does not put the student down) will be coded as 1. The index ranges from 1 to 4 with higher values indicating more positive feelings toward teachers. The last variable for this model segment was dummy coded and measured how strongly a student felt disruptions by other students negatively affected their own learning. This was recoded so that students who agreed or strongly agreed were coded as 1; all other answers were recoded as 0.

4.2.2.2 School Variables

The first variable examined in this model segment is the percent of students who were enrolled in college prep classes. This was an interval variable with a possible range of 0-100%. The school administrators were asked to estimate this percent for the survey. The next variable

was the percent of students enrolled in the Free Lunch Program at their school. The variable was divided into seven categories measuring the percent of students in the school enrolled in the free lunch program: 1=0-5%; 2=6-10%; 3=11-20%; 4=21-30%; 5=31-50%; 6-51-75%; and 7=76-100%. For the free lunch variable, the school administrator reported this information from the student files of the school.

4.2.2.3 Family Variables

Parents' socioeconomic status was a composite measure created by the ELS research staff. It included five different variables on the parental survey: mother's occupation, father's occupation, mother's education, father's education, and family income. The final variable is an interval level score and ranges from -1.97 to 1.98. Each of these five variables are equally weighted and standardized variables. The SES variable is a standard score with a mean of 0 and a standard deviation of 1. With the current sample restrictions, the variable ranges from -1.97 to 1.98.

The parental survey asked the question about the number of siblings. The number of siblings variable ranged from 0 to 6. A value of 6 indicates that a student has at least six siblings. Four questions were asked of parents that formed the basis of an index of family rules. Parental respondents indicated whether his/her tenth grader maintained an A grade average, did homework or household chores, and watched TV. These were coded as a Yes=1, No=0 variable. These items were summed with higher values suggestive of households with a greater degree of rule enforcement.

An index of parental involvement in school was constructed from four items administered to parents. Each respondent was asked about how often they participated in the following four activities: belong to parent-teacher organization, participate in parent-teacher organization

activities, volunteer at the school, and belong to other organizations with parents from school. Participation was coded 1 and any other answer was coded zero. A score of one will indicate little parental involvement while a score of four will indicate frequent parental involvement.

The last index created for this model segment asked the students about family resources. The ELS has ten family resource variables: family has a daily newspaper, magazines, computer, internet access, DVD player, dishwasher, clothes dryer, more than 50 books, own room, and fax machine. These items were summed to give a possible range of 0 resources to 10 resources.

4.2.2.4 Peer Level

For the last section, peer variables were examined from the perspective of the target student. The first variable examined how many of the respondent's friends dropped out of high school. This variable was coded into five categories: none (1), a few (2), some (3), most (4), and all (5). To measure the impact of positive peer behavior, an index was created from five variables. The student respondent was asked how important it was to their friends to attend class regularly, study, get good grades, finish high school, and continue education after high school. These items were coded 1 for agree or strongly agree and then summed. The index ranged from 0 to 5.

CHAPTER 5

RESULTS

5.1 Univariate Results

5.1.1 Dependent Variable

This analysis first examined univariate statistics. There were a total of 7480 respondents scoring between 22.49 and 75.02 on standardized math scores. The mean of the sample was 51.41. The standard deviation of the sample was 9.81. All tables can be found in the appendix at the end of the paper.

5.1.2 Independent Variables

5.1.2.1 Student Variables

The majority was female (51%) and White non-Hispanic (71%). Four percent of the students had a disability, and 9% of the students reported that English was their second language. Sixteen percent of the students had poor academic performance. Sixty four percent of the students had been recognized for a school honor. Seventy nine percent of the students expected to earn a college degree or more. The average time spent on homework was between 4 and 6 hours a week. The mean of the extracurricular activities index was 2.12 with a standard deviation of 1.67 meaning that the average student participated in at least two extracurricular activities and most students participated in at least one. The index of deviant acts had a mean of 1.51, SD=1.06, indicating that the average student participated in at least one deviant act. The average student reported satisfaction with teaching (Mean = 3.02; SD=1.20). Forty two percent of students reported that school disruptions had impacted their learning.

5.1.2.2 School Variables

Nearly two-thirds of students (61%) were enrolled in a college preparatory program. Between 11-19% of students were enrolled in the free lunch program

5.1.2.3 Family Variables

The socioeconomic variable is a composite of five variables constructed by ELS research staff. The mean of the variable was .13, with a standard deviation of .72. Also, when looking at family size, 93.1% of the sample had at least one sibling, with a mean of 2.18 siblings (SD = 1.48). The index of Family Rules had a mean of 3.19 (SD= 1.04) which suggests that most students had several family rules about homework and school. An Index was created to measure the parental involvement with the school. Four variables were combined to form the index, and 60% of parents participated in at least one of the activities with a mean of 1.23, SD= 1.29. The next index that was created for this model segment examined the family resources the students had access to. When these were combined in the index, the mean was 6.87 (SD = 2.85) which means that the average family had almost seven different resources at home for the child's education.

5.1.2.4 Peer Variables

Fifty seven percent of the students reported that none of their friends had dropped out of high school, with 34% reporting that "a few" friends dropped out. For the positive peer engagement index, students reported that their peers participated in an average of 3.49 positive activities (SD = 2.16).

5.2 Multivariate Analysis

A multiple regression analysis was conducted to evaluate how the independent variables influenced test scores. All variables were entered in one block. Two interactions were also tested. The model explained 43% of the variance in test scores. Although the dependent variable was not normally distributed, a stem-and-leaf display of the studentized residuals was reviewed which was symmetric with no clear outliers. Outlying and influential data were also analyzed with Mahalanobis distance and Cook's distance. In sum, there were no observations that substantially influenced the results of the analysis. There was no evidence of multicollinearity as judged by the Variance Inflation Factor statistics and correlations among independent variables. This indicates that no two variables are testing similar phenomena.

5.2.1 Student Variables

After controlling for other variables, females scored 3.03 points lower than males on math test scores (β = -.15). Net of other factors, minority students scored 2.53 points lower than White students (β = -.12). Net of other factors, disabled students scored 4.29 points lower than non-disabled students (β = -.09). After controlling for all other variables, there were no statistically significant differences between native and non-native speakers. Net of other factors, students who had poor academic performance had scored 4.02 points lower than students who had made good academic progress (β =-.15). Net of other factors students who received an academic honor scored 2.73 points higher than students who had not received an academic award (β =.13). Net of other factors, students who expected to complete an undergraduate or advanced degree scored 2.96 points higher on math scores than their counterparts (β =.12). After controlling for other variables, a one unit increase in the homework measure increases math scores by 1.04 points (β =.18). After controlling for other variables, for each additional

extracurricular activity students participated in, students scored .48 points higher on their test scores (β =.08). Net of other factors, for each unit increase on the deviance index, students scored .49 points lower (β =-.05). This indicates that the more deviant a student was, the lower the test score.

Net of other factors, math scores increased by .34 points for each unit increase in the positive perception of teacher measure (B =.34; β = .04) which provides evidence that the quality of student-teacher relationships impacts math scores. Net of other factors, students who report that their peers disrupt the learning environment earn lower math scores than their counterparts (B =-1.31; β = -.07) suggesting that math scores will be higher in classrooms that cultivate a culture of student learning**.**

Several of these variables had a noticeable impact on the model, according to the standardized betas. The number of hours spent on homework had the largest standardized beta at .18 which indicates that the number of hours spent on homework has the largest impact on test scores. Other variables had large standardized betas: sex (-.15), academic achievement (-.15), prior academic success (-.15), academic honors (.13) student expectations (.12) and minority status (-.12). These standardized betas indicate that these variables had the strongest impact on test scores when compared to other variables.

5.2.2 School Variables

Net of other factors, a one-unit increase in the percentage of students who participated in a college preparatory programs led to a marginal increase in math scores (B = .01; β = .03). This would suggest that college preparatory programs played a minimal role in enhancing student achievement as assessed by the standardized coefficient. Net of other factors, a one-unit increase in student participation in the free lunch program decreased test scores by .57 points. (B =-.57; β

= -.10). These findings indicate that free lunch programs which serve in this analysis as a proxy for the socioeconomic status of schools exert the strongest influence on math achievement of any school-related factor.

5.2.3 Family Variables

After controlling for other variables, each unit increase on the family SES variable, students scored 2.53 points higher on math tests (β = .19) indicating that students from wealthier families score higher on math tests than students from poorer families. After controlling for all other variables, for each sibling that a student had, the student scored .18 points lower on math scores (β =-.03), indicating that students from larger families score lower on math tests than students from smaller families. Net of other factors, each additional rule put in place on the family rules index, students scored .60 points lower (β =-.06), indicating that students from restrictive households score lower on math tests than students from less restrictive households. After controlling for all other variables, the parent involvement index was not statistically significant indicating that parent involvement did not have an impact on test scores that can be generalized to the population. Net of other factors, on the Family Resource Index, for each unit increase students scored .25 points higher on math scores (β =.07), indicating that the more resources a student has in the household, the higher the students will score on math tests. After controlling for all other variables, SES had the highest standardized beta of all the variables with a coefficient of .19. This indicates that SES had the most influence on test scores compared to the other variables. The other variables in this model segment had markedly lower standardized betas and thus less influence on math scores when compared to the other variables.

5.2.4 Peer Variables

Net of other factors, for each unit increase in the number of friends that dropped out of high school, students scored .58 points lower on their math scores (β =-.04), indicating that the more friends who dropped out of high school a student has, the lower they score on math tests. After controlling for all other variables, the measure, friends' engagement in positive activities, was not statistically significant. This measure indicates that friends' participation in positive activities does not impact a student's test scores. This model segment had far less influence on math scores compared to other segments with two of the lowest standardized beta values when compared to all the variables.

5.2.5 Interactions Between SES and Other Variables

Although the models are not presented, an interaction between SES and parent participation and between SES and extracurricular involvement were tested. Both interactions were graphed in Excel. In Figure 1, when analyzing the relationships between SES and parent participation in school, the data shows that among high-SES families' students score higher in math when their parents are more involved in school compared to parents who are less involved. On the other hand, among low SES parents, math scores were actually lower among parents who were highly involved in the school compared to those who were less involved. The coefficient was .266 with a standardized beta of .026. This interaction was significant at the $p<.01$ level.

The second interaction that I tested for examined the interaction between SES and extracurricular activities (Figure 2). Test scores for low SES students were similar regardless of the students' extracurricular involvement. However, as SES increased, the impact on math scores becomes greater. Students in the high SES category scored an average of 3.42 points

higher than their less involved peers. The coefficient for the interaction was .278 with a standardized beta of .034, and the results were significant at the $p<.001$ level.

CHAPTER 6

DISCUSSION

6.1 Student Factor

Overall, my findings suggest that extracurricular activities and parental factors increase math test scores, but academic achievement, sex, race, and family SES status were among the strongest indicators of student success. My student factor hypotheses were mostly supported. My first hypothesis focused on sex of the student. I predicted that males would score higher on their math test than female students. Net of all other factors, this hypothesis was supported. However, other research suggests that the gender gap is narrowing (Hyde et al., 2008). When examining a T-Test that was conducted on sex and math scores, this gap is small. Before controlling for other variables, males scored slightly higher than one and a half points higher on the math test than females scored. This is consistent with the findings of Hyde et al. (2008) that the gender gap is narrowing.

I feel there are several steps that can be taken to help close the narrowing math education gap between males and females. Since mathematics education for females is culturally less valued than that of males, females lower their effort in these classes (Akerlof and Kranton, 2002). When controlling for ability, fewer female students enroll in high level math classes, such as calculus, than male students (Correll, 2001). One explanation is that fewer female students intend on going into college majors that require high-level skills, such as engineering or physics (Correll, 2001). When female students feel encouraged about their math competency, they enroll in advanced math classes at equal rates to similarly competent male students (Correll, 2001). Using this information, I think high schools need to do a better job of encouraging female students to see math education as valuable and a possible future if the student wishes.

My second hypothesis predicted that minority students would score lower on their math tests than their White peers. This hypothesis was supported. Net of other factors, minority students scored more than two and a half points lower than their White peers. Research suggests that minority students feel less engaged in their course material than their White peers (Eccles and Roeser, 2011). However, since the control variable was constructed as a binary with all minorities grouped together. This may create an incomplete picture of minorities' educational achievements. While Hispanics and Blacks score lower on math test scores, Asian students actually score higher than White students (Bryan et al. 2012). As a result, the minority/majority dichotomy in my thesis is not entirely representative of all minorities. By offering steps to better engage lower achieving minority students through their curriculum, the racial gap in math scores may start to narrow.

My third hypothesis predicted that disabled students would score lower on their tenth grade math scores than their peers. This hypothesis was supported. Even though disabled students are as intelligent as their peers (Miles and Forcht, 1995), they are not scoring as high as their peers. Net of other factors, the disability-associated gap was more than four points in my study. According to Miles and Forcht (1995), problems for students with learning disabilities become more pronounced as they reach levels of math that are more abstract, such as Algebra and Calculus. By their tenth grade years, students should have taken at least an introduction to algebra, so for my sample, the learning deficits should have already been created. Extra school resources may need to focus on preventing these learning gaps before students start algebra. Another solution may be to redesign mathematics courses to tailor to the disabled students' different mental processes.

My fourth hypothesis predicted that students who succeeded earlier in their academic careers would continue to succeed on tenth grade math tests. This hypothesis was supported. Academic inertia appears to be very difficult for students to overcome. Net of other factors, academic success had a prominent influence on math scores. Students appear to struggle to overcome their learning deficits, so extra attention should be given to students who have learning deficits. Future academic performance suffers because of these deficits (Hawkins et al., 2001), so if students are struggling earlier with math, it is important to work to correct the students and set them on a path to success in the math classroom.

My fifth hypothesis in my thesis predicted that students who have expectations of college completion would score higher than their peers. This hypothesis was supported. Students who see college as a likely destination worked to achieve that goal, and one of those crucial steps is success in the classroom. Through the previous research, it was consistently shown that expectations played an integral part of academic success. Expectations of college success can affect other aspects of the student's life by affecting the social networks that the student participates in (Frenette, 2007) and their effort in the classroom (Kariya and Rosenbaum, 2006). It is important to have high expectations for the student, and net of other factors, this variable had a strong influence on their tenth grade math scores.

My sixth hypothesis predicted that the more time a student spends on their homework a week, the higher their tenth grade math scores would be. This hypothesis was supported. It is important for students to come prepared for their classes, because students exhibit lower anxiety towards their classes if they are prepared (Rosário et al., 2008). Net of other factors, this variable had one of the strongest impacts on tenth grade math scores when looking at the standardized betas.

My seventh hypothesis predicted that participation in extracurricular activities would positively impact tenth grade math scores. This hypothesis was supported. Net of other factors, students who participated in more extracurricular activities scored higher on their tenth grade math scores. According to networking theory, students who participate in more activities would have a wider social network than students who participate in fewer activities. This is consistent with the literature that suggests that extracurricular activities help to engage students in their school environment (Akerlof and Kranton, 2002; Darling, 2004; McNeal, 1995; McNeal, 1999).

In the context of the interaction between SES and extracurricular activities, there is a more pronounced effect on students coming from high SES households. Low SES students score about the same on math tests regardless of how many extracurricular activities they participate in. This is different for high SES students. Students participating in many extracurricular activities score several points higher than their high SES, low extracurricular activity peers. Perhaps having a wide social network may have more influence on high SES students.

Another possible explanation is the difference in benefits for high SES and low SES students is the types of extracurricular activities that students participate in. For example, high SES students participate in more pro-social activities, such as volunteering or other community service organizations (Eccles and Barber, 1999). Participation in these activities served as a protective influence, limiting students' risky behaviors during the high school years, and students participating in pro-social groups have a more positive opinion of their school (Eccles and Barber, 1999).

Participation in athletic activities is also related to SES, as higher SES students are more likely to participate in school sports (Shifrer, Pearson, Muller, and Wilkinson, 2012). However,

in schools with lower SES, athletics is seen as a viable way to achieve upward mobility (Guest and Schneider, 2003). In low SES schools, athletes are often viewed as the "achievers", where in high SES schools, participants in non-athletic organizations are viewed as the "achievers" (Guest and Schneider, 2003).

It may be that the positive effects gained through various activities, such as the pro-social and athletic activities, are limited to high SES students. If low SES students are not participating in these types of activities, they may not be seeing the wide range of benefits that high SES students are able to achieve with more diverse extracurricular activities. It may also be that in lower SES schools, students view an athletic career as their future and not through academics.

My eighth hypothesis in the student section predicted that net of other factors, students participating in deviant activities would score lower on their math tests than their non-deviant peers. This hypothesis was supported. Deviance can detract from the learning environment in a school (Akerlof and Kranton, 2002), so it should be expected that deviance had a negative impact on math scores when accounting for other factors. If schools could foster a more engaging environment for their students, prior research indicates that deviance will decrease (Payne et al., 2003).

My ninth hypothesis in the section focused on the student perceptions of their teachers in their high school. Students with these higher opinions of their teachers scored slightly higher than their peers which was consistent with my hypothesis. Prior literature suggests the necessity that teachers are perceived as genuine and likable by their students (Bryan et. al, 2012).

My last hypothesis in the student section focused on the student perception of distractions in the classroom. I predicted that students who reported more distractions in the classroom would score lower on their tenth grade math tests than their counterparts. This hypothesis was

supported. The more disruptions in their classroom, the lower their tenth grade math scores. Research indicates that the level of classroom disruptions is an indication on the school administration and the teachers (Hernandez and Seem, 2004). If schools lacked necessary communication between administration and faculty, the schools had higher levels of classroom disruptions (Hernandez and Seem, 2004).

6.2 School Factors

My first hypothesis in the school section focused on two proxies that measured the SES of the school. I predicted that higher SES schools would have higher tenth grade math scores than low SES schools. This hypothesis was supported. The percent of students in college preparatory programs had minimal impact on overall test scores when controlling for other variables. However, the second proxy variable, the percent of tenth graders receiving free lunch had much stronger impact on test scores net of other factors and is another indication of the important role that resources play in laying the foundation for a quality education. It may also help to identify schools that need some added resources to provide a high quality learning environment. It may also be the case that low SES schools having a much higher chance of attracting low quality teachers (Darling-Hammond, 2004). Low SES schools need to use lengthy recruiting programs to have enough teachers, and these programs are expensive and divert funds away from the education of the children (Darling-Hammond, 2004).

6.3 Family Factors

My hypothesis predicted that students from high SES households would score higher on their tenth grade math scores when controlling for other factors. This hypothesis was supported. SES had the strongest standardized betas of any variable in my study, indicating the strongest relationship to tenth grade math scores. This relationship has been consistently supported

through research (Bryan et al., 2012, Bozick et al., 2010), and the surrounding structure of the student seems to play a large part in their increased test scores. From a networking perspective, having a higher SES can place students in different social networks that lower SES students cannot achieve (Lareau, 2002). They also may have increased opportunities in the classroom. High SES students are over-represented in advanced classes due to their parents increased willingness to lobby the school on behalf of their child (Dauber et al., 1996). By being in more advanced classes, they are more likely to have more qualified and experienced teachers (Feng, 2010).In addition to their increased social networking opportunities, students are better able to address their own problems or questions with authority figures, such as teachers, if they hail from high SES households due to their Concerted Cultivation upbringing (Lareau, 2002).

In addition, math scores were lower when more family rules were enforced. While my construct does not discriminate why the rules were instituted, it is possible that parents may have instituted stricter rules about academics and television privileges to counter poor grades in school.

My next hypothesis focused on parental involvement and the impact on their child's tenth grade math scores. I predicted that, net of other factors, the more involved the parents were in their child's academic career, the higher their child's math scores. This hypothesis was rejected. However, there was an interaction between SES and parental-school involvement that was statically significant. For high SES students, math scores are higher for those students with more parental-school involvement. On the other hand, in low SES households, math scores were higher if parents were less involved in school activities.

There may be several explanations for these findings. For example, the motivation for involvement may be different between SES levels. Parents are more likely to volunteer and

participate if their child attends a high SES school (Ho and Willms, 1996). It may be the case that for low SES parents they may be more active in school-based activities and communicate with the school if their children are at risk academically (Ho and Willms, 1996). If parents communicate frequently with schools about their struggling students, it would give the appearance of highly involved parents and struggling students.

Schools may need to take steps to make parents feel more welcome in their involvement. One method may be to develop programs that increase communication and involvement between schools and parents. When programs are developed to better involve parents in their child's education, parents are better able to help their children on homework (Lawson, 2003; Ziomek-Daigle, 2010). If schools can create programs that increase parental involvement, parents may be more comfortable addressing the schools or the teachers. These programs may be especially beneficial for low SES parents. According to Lareau (2002), low SES parents are not as comfortable as high SES parents when talking to authority figures, such as teachers. This uncomfortable nature then gets passed down to the low SES students. By creating a program to increase parental participation, it may also allow low SES parents to feel more comfortable when addressing teachers. However, without outside funding, it is reasonable to expect that these programs would be more likely to appear at high SES schools. Since low SES schools may struggle to field qualified faculty (Darling-Hammond, 2004), the low SES schools may struggle to implement the program with the constraints of their budget.

My next hypothesis predicted that, net of other factors, the more academic resources a child has access to in the household, the higher their tenth grade math scores will be. This hypothesis was supported. While some of the resources are expensive and may not be affordable to low SES households, such as computers and internet access, I feel there are steps that schools

can take to utilize this research to offer a better education to their students. One example would be school-provided electronics that offer more use of the electronic devices, or cities could offer subsidized computers or internet for lower SES households in order to strengthen learning outcomes.

6.4 Peer Factors

My last section focuses on the peer influence on tenth grade math scores. I predicted that students with fewer friends who dropped out of high school will score higher on their tenth grade math scores. This hypothesis was supported. Net of other factors, having more peers that dropped out of high school decreased math scores of the student. However, we can see when examining the standardized beta indicates the relationship is among the weakest in the study. Based on the work of Cho et al. (2005), peers who participated in a program targeting "At-Risk" students had the opposite impact intended. Peers began to bond with their deviant program participants and distanced themselves from their conventional peers (Cho et al., 2005).

I predicted that net of other factors, students who had peers engage in more positive activities would have higher test scores. This hypothesis was rejected. These two hypotheses support the work of Hanushek (1992) in that there is not a link between peer groups and achievement. Hanushek et al. (2003) offers an explanation why peers have a limiting influence. Because of the reciprocal nature of a peer relationship, both students affect each other and it is difficult to evaluate the influence on just one party. Peers also may have a small impact due to the age of the participants.

CHAPTER 7

CONCLUSION

Some of the learning gaps that exist in today's high schools may be addressed by increasing student engagement (Eccles and Roesner, 2011; Fredricks et al., 2004). More broadly, there are several steps that can be taken to increase math scores through increasing student engagement.. While President Obama has addressed the need for national reform, I think the steps are better implemented at a local level with the assistance of state and federal governments instead of focusing on standardized testing, as the current No Child Left Behind policy does.

Another option may be to offer other methods that offer a connection to the school. Two suggestions that may help students of all SES levels may be to offer more engaging curriculum or more engaging technology. Learning gaps may be narrowed by altering course structures and course materials to better engage struggling students. By offering courses students feel are more interesting and relevant, these gaps may be narrowed to offer the best education to all students in the school. Better engaging students may not only have a positive impact on their math scores, but also for other classes as well (Payne et al., 2003).

Schools may be able to increase student engagement by developing a 1 to 1 computing program. These computing programs helped increase student engagement with the learning material and increased student interest in the curriculum (Chu et al., 2010; Rosen and Beck, 2012). However, increasing engagement is not the only solution available to increase math scores among the student body. There are steps that can be taken to increase student success that do not also increase school expenditures.

At the local level, students need to feel that college is their likely destination. These steps are even more crucial for academically and financially struggling students. Since low SES students receive more college disconfirming signals than confirming signals (Bozick et al., 2010), this trend needs to be reversed. By emphasizing coursework in the context of preparing for college, these low SES students will receive more college confirming signals (Bozick et al., 2010) and see college as a more likely destination. With higher expectations, the students will hopefully work harder on their math and other courses.

However, some of these changes cannot be made without governmental assistance. Many solutions cost money that school districts may not be able to afford. National and state governments should increase funding for schools if they use the money in an attempt to better engage their students, are through extracurricular activities, through a 1 to 1 computer program, or through another solution. Governments should also help support low SES schools by assisting with their budget to hire and retain quality teachers. In addition to retaining quality teachers, governments should work to eliminate the high percent of teachers working on emergency teaching credentials that plague many low SES school districts (Darling-Hammond, 2004). All of these steps should help to improve the math scores of the student body. While the federal government needs to be concerned about the education of its citizens, the solution should come from the local level and by engaging students.

CHAPTER 8

LIMITATIONS AND FUTURE RESEARCH

The nature of a cross-sectional study does not allow me to determine the causal direction. For example, it is impossible to determine if family rules were instituted to combat lagging test scores or if lagging test scores are a results of restrictive families. It is plausible that a wider range of measures particularly with parent-school involvement may have provided more explanatory power. This study only evaluated the quantity of parental involvement, rather than assessing parental motivation for school-related involvement. Future research should look into a link between other factors besides parental education that contributes to the quality parental-school involvement to gain additional insight.

This research helps to establish the link between student engagement and high school math scores. For this research to be utilized, school districts need to implement better school engagement policies. After these steps are conducted to better engage students, further research will need to be conducted on the effectiveness of the strategies. If the strategies are successful, more work will need to be done to implement the programs in more school districts. If the strategies are unsuccessful, research will need to be conducted to modify the strategies to improve on the shortcomings.

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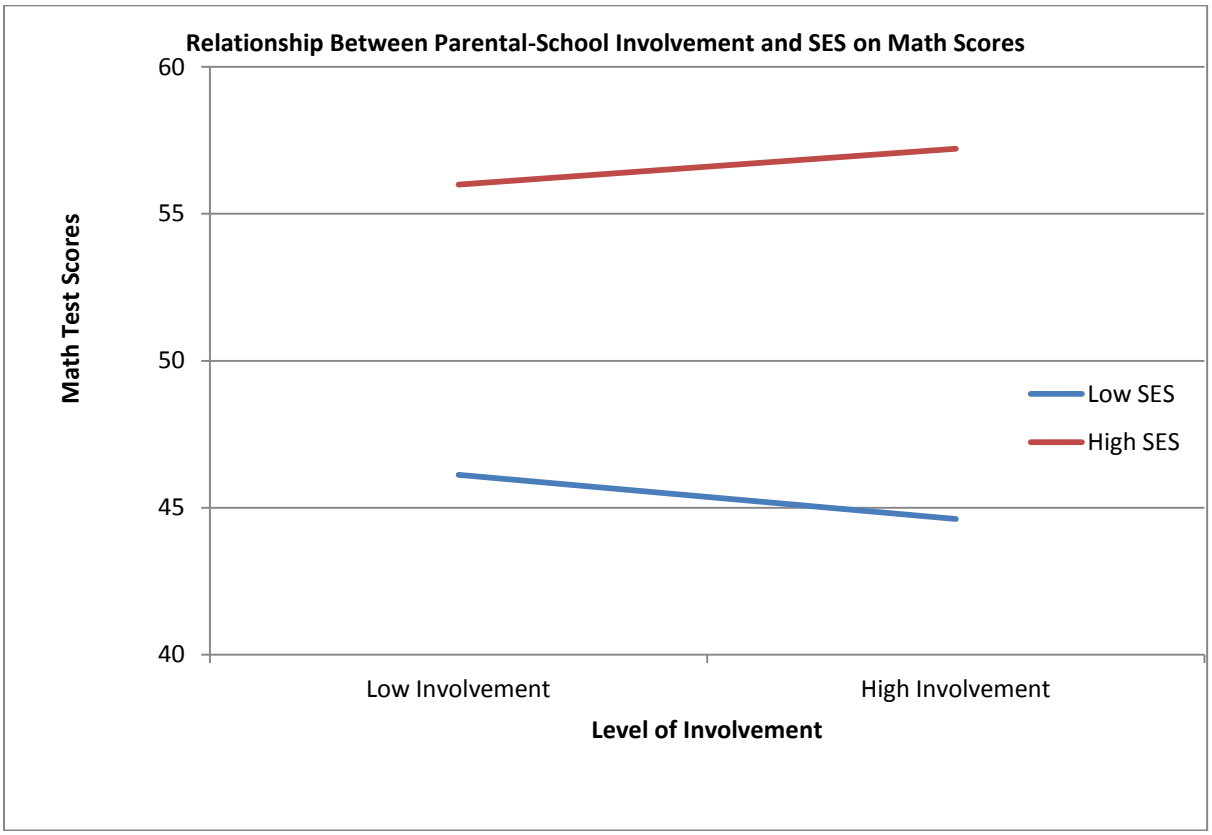
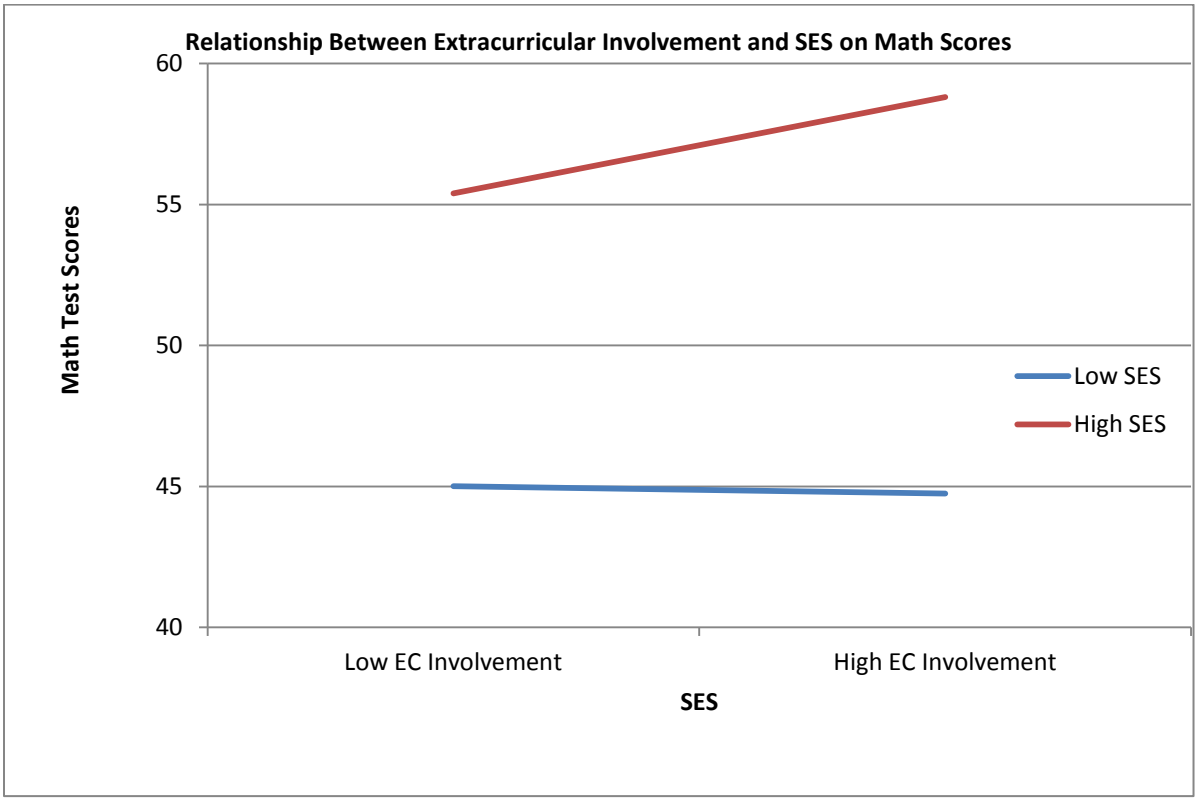
APPENDIX

APPENDIX A

Table 1: Descriptive Statistics					
Variable	N	Minimum	Maximum	Mean	SD
Math Standardized Score	7480	22.49	75.02	51.41	9.81
Sex (Female=1)	7480	0	1	0.51	0.50
Race (Minority=1)	7480	0	1	0.29	0.45
English not First Language (=1)	7480	0	1	0.09	0.29
Student Disability(=1)	7480	0	1	0.04	0.20
Poor Academic Performance (=1)	7480	0	1	0.16	0.36
Student Honor Recognition (=1)	7480	0	1	0.64	0.48
Student Expectation of at least College Completion (=1)	7480	0	1	0.79	0.41
Hours/Week spent on homework	7480	1	9	4.13	1.71
Index of Extracurricular Activities	7480	0	10	2.12	1.68
Index of Deviant Acts	7480	0	5	1.51	1.06
Index of Positive Student Opinions of Teachers	7480	0	4	3.02	1.20
School Disruptions Impact Learning (=1)	7480	0	1	0.42	0.49
% of Students in College Prep Programs	7480	0	100	60.63	31.64
% of Tenth Graders receiving free lunch	7480	1	7	3.15	1.80
Base Year SES Status	7480	-1.97	1.98	0.13	0.72
# of Siblings	7480	0	6	2.18	1.48
Index of Family Rules	7480	0	4	3.19	1.05
Index of Parent Involvement	7480	0	4	1.24	1.55
Index of Family Resources	7480	0	10	6.87	2.85
Number of Friends who Dropped out of High School	7480	1	5	1.53	0.71
Index of Friends engagement in 5 Positive Activities	7480	0	5	3.49	2.16

Table 2: OLS Regression			
Variable	Unstandardized Beta	SE	Standardized Beta
Constant	47.55***		
Sex (Female=1)	-3.03***	0.2	-.15
Race (Minority=1)	-2.53***	0.2	-.12
Student Disability(=1)	-4.29***	0.4	-.09
English not First Language (=1)	0.54	0.3	.02
Poor Academic Performance (=1)	-4.03***	0.2	-.15
Student Honor Recognition (=1)	2.73***	0.2	.13
Student Expectation of at least College Completion (=1)	2.96***	0.2	.12
Hours/Week spent on homework	1.04***	0.1	.18
Index of Extracurricular Activities	.48***	0.1	.08
Index of Deviant Acts	-.49***	0.1	-.05
Index of Positive Student Opinions of Teachers	.34***	0.1	.04
School Disruptions Impact Learning (=1)	-1.31***	0.2	-.07
% of Students in College Prep Programs	.01**	0	.03
% of Tenth Graders receiving free lunch	-.57***	0.1	-.10
Base Year SES Status	2.53***	0.1	.19
# of Siblings	-.18**	0.1	-.03
Index of Family Rules	-.60***	0.1	-.06
Index of Parent Involvement	-0.02	0.1	.00
Index of Family Resources	.25***	0	.07
Number of Friends who Dropped out of High School	-.58***	0.1	-.04
Index of Friends engagement in 5 Positive Activities	0.07	0.1	0.02
Adjusted R-Squared	0.43		
N=7480			
*p<.05, **p<.01, ***p<.001			


Relationship Between Parental-School Involvement and SES on Math Scores
Math Test Scores
60
55
50
45
40
Low SES
High SES
Low Involvement
High Involvement
Level of Involvement


Relationship Between Extracurricular Involvement and SES on Math Scores
Math Test Scores
60
55
50
45
40
Low SES
High SES
Low EC Involvement
High EC Involvement
SES