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PARENT INVOLVEMENT AND STUDENT ACHIEVEMENT: EFFECTS OF INDIRECT PARENT INVOLVEMENT ON STUDENT ACHIEVEMENT IN MATHEMATICS

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PARENT INVOLVEMENT AND STUDENT ACHIEVEMENT: EFFECTS OF INDIRECT PARENT INVOLVEMENT ON STUDENT ACHIEVEMENT IN MATHEMATICS

A Dissertation

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by

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ABSTRACT

Parents are often seen through a deficit lens despite all that they do for their children. Parents want to do all they can to help their children be successful in school and in math specifically. This can be challenging due to the increasing pressure for students to perform well in math, the current methods for teaching math, and the math work students bring home. This quantitative study investigates how home-based parent involvement strategies predict student's math grade point average (GPA). The data in this study was derived from 23,503 participants within the High School Longitudinal Study of 2009 (HSLS:09). With indirect parent involvement strategies, the following had a statistically significant relationship with student math GPA: parent's expectations of student education level, how often parents discussed applying to college, and parents encouraging their children to take a math course. With indirect parent involvement strategies, this study found a statistically significant negative relationship between how often a parent helped with math homework and student math GPA. A statistically significant relationship was also found between a student's mathematics identity and their math GPA. It was also found that parents in this study were least confident in helping their children with math homework compared to English and science homework. The findings from this study suggest that indirect parent involvement strategies are more beneficial to students than direct parent involvement strategies, and that the development of a positive mathematics identity can also help with student achievement.

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I also want to thank my husband Josh for supporting me through this journey. Our son Bentley was only 18 months when I started this program, and then a couple of months later, I was pregnant with our daughter London. I didn't take a break and I pushed through it all to finish in a little over three years and couldn't have done it without lots of help. To Debi and Randy, I can't thank you enough for all the support with the kids while I was in class or studying. You two are a blessing and I couldn't have done this without you. I also want to thank my grandmother Jeanne for showing me how to be a lifelong learner and to always remain curious.

DEDICATION

I'd like to dedicate this work to my children Bentley and London, and to moms everywhere. I was told many times to wait until my children were older to complete my doctorate degree. However, after much contemplation, I realized that a man likely would not hear these reservations from so many people. A woman should never feel like pursuing her dreams should wait for any reason, especially because she has children. My hope is that other women would feel supported to pursue their hopes and dreams; and that mothers would have the courage to show their children that there is no limit to what a women can do, no matter their stage of life.

I'd also like to dedicate this work to all the parents who feel like they are not doing enough to help their children in math. Parents should be more appreciated in educational systems. I beg educators to help the educational system evolve to truly value parents and to view parents as an asset. If parents do not know how to do the math, they may believe they are not helping their children. I hope this dissertation helps to further validate that parents can, and do make a difference even without knowing how to solve the problems in their child's math homework.

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CHAPTER ONE

INTRODUCTION

Parents are their children's first teachers and know more about their children than any teacher ever will. Even with the wealth of knowledge that parents bring to the table, parents are labeled as uninvolved when they do not adhere to the educational system's definition of involvement (Spring, 2006). Policies and mandates to increase parent involvement are historically rooted in parent's physical attendance at school events and are typically created without parent's input. Educators view parents that do not show up to school events through a deficit lens (Nieto, 2004). Educators need to reframe their deficit-minded perceptions of parents. Educators with an asset lens perceive parents as contributors to their student's academic success and understand that parents do not receive recognition from the educational system (Jeynes, 2010). Educators with an asset lens also recognize that school systems need to create structures in which parents are involved in every step.

Pressure is being accumulated in the subject of mathematics specifically. Mathematics has become a focus subject in school due to the U.S. Economics and Statics Administration's report that job opportunities in science, technology, engineering, and math (STEM) have continued to increase and are projected to continue on this trajectory. Technology also continues to advance, requiring an increase in the need for math skills among the workforces. Mathematics is emphasized because it is used as a factor in overall school achievement, and

student's math scores are also used in college admissions. Mathematics achievement is also often used in research to determine future success in education, and future careers (Borghans et al., 2016).

Children are most likely to have homework when they get home from school to complete, and they look to their parents for help. Homework has been a debated topic throughout its inclusion in the United States school system for over one hundred years (Gill & Schlossman, 2004). The homework supporters believe that homework increases student achievement and aids in developing responsibility. In contrast, the contesters believe that homework is too demanding and takes away a child's time to be involved in activities outside the school (Bempechat, 2004). Kohn (2006) also found that homework can cause frustration and anger.

In facing potential frustration and anger from children due to homework, parents can implement two main types of involvement within the home: direct and indirect. Direct parent involvement is when parents directly help their children with homework and tell them what to do to accomplish the task at hand. On the other hand, indirect parent involvement is when parents do not directly intervene, but they point to resources and maintain high expectations for their children (Vukovic et al., 2013). Indirect parent involvement also includes discussions and encouragement (McNeal, 2014; Wang & Sheikh-Khalil, 2014). Parent involvement at the high school level is significant to study because parents feel less confident about their role in their children's schooling as the child moves up

in grade level. This lack of confidence creates an “un-connectedness” feeling within parents (Ferrara, 2009).

In support of indirect parent involvement strategies, Bamaca-Gomez and Plunkett (2003) revealed that positive academic outcomes occur if parents monitor their child's work. Wagner et al. (2005) stated that parent involvement is essential to deter adverse long-term effects for students who show consistent and extreme behavioral and academic problems. Students who experience higher levels of parent involvement are more attentive in class, develop higher self-esteem, view themselves as more competent, and make more effort to learn (Izzo et al.,1999; Tusty & Lampe, 1997). When students view themselves as competent, they develop their mathematics identity positively (Sfard & Prusak, 2005). Parent involvement is also an influencing factor on student’s intrinsic motivation in not just mathematics, but also in writing and reading. (Shaver & Walls, 1998; Fan & Williams, 2010, Pavalache-Ilie & Ţîrdia, 2015).

Indirect involvement strategies have been found to have the most substantial positive relationship with academic achievement in comparison to direct involvement strategies. Some indirect parent involvement strategies include parents relaying the importance and value of education, maintaining high expectations of how far their child will go in school, having discussions about future college and career choices, and providing encouragement (Wang & Skeikh-Khalil, 2014; Vukovic et al., 2013). When parents utilize indirect involvement strategies, their child’s self-regulatory skills develop. Pintrich (2000)

states that self-regulation is a process where learners must set their own goals for their learning and then regulate and control their thinking, behavior, and motivation through the plans they created.

Parents are often treated as a source of blame for student's achievement gap (Louque et al., 2020). For example, the Coleman Report (1996) pointed to family characteristics for causing low student success. The Nation at Risk Report also stated that parents need to be more connected to schools to change the varying achievement levels (National Commission on Excellence in Education, 1983). Some principals also blame parents by attributing lack of attendance at school events to low student achievement (Flessa, 2008). Instead of blaming the parents, the Cultural Proficiency Model works to move from the mindset that students are underperforming to the mindset that schools are underserving. The Cultural Proficiency Model does not operate from an outside-in approach where the aim is to change those outside the school, but rather the Cultural Proficiency Model works on changing policies, practices, and beliefs from an inside-out approach (Lindsey et al., 2003). A way to serve the communities would be to give parents a voice and acknowledge all they do and bring to the table. Parent involvement has typically been through one-way communication from the school to the parent when it should be through two-way communication.

Narrow definitions of parent involvement have typically focused on educators' perspectives, such as teachers and administrators (Ferrara, 2009). Defining parent involvement through the lens of individuals other than the parents

makes capturing the involvement done at home incomplete. Schools have channeled their energy into getting parents to attend on-campus events, stressing that increased parent attendance will lead to higher academics for their children. When parents cannot or do not feel comfortable going to these school events that educators highly value, non-attendance could leave parents feeling inadequate. Schools have the opportunity to build relationships between educators and parents, where discussions could include other forms of parent involvement besides parent attendance at events. Discussions could also include findings on parent's valuable contributions curated at home without even stepping foot onto a school campus. Consideration must be made to ensure that these relationship-building efforts should not perpetuate the idea that educators are the “all-knowing” entities and parents are the “not-knowing” counterparts (Thompson, 2008). Treating parents like they need to be taught right from wrong creates the notion that parents are a deficit and that parents need to be changed (Nieto, 2004). In contrast, school leaders should train educators in how valuable parents genuinely are. This educator training can help grow the mindset that parents are an asset and could help in the development parent-school relationships.

The focus of PK-12 mathematics education has evolved from only focusing on basic procedures and routine memorization to including concentrated efforts to increase student’s conceptual understanding of mathematics, including written explanations and multiple ways to solve mathematical problems

(Common Core State Standards Initiative, 2018). When students are at home and need assistance with their math homework, they look to their parents for guidance with questions. Parents did not learn through the Common Core Standards which were brought upon in 2009 to provide the nation with English and math benchmarks (Common Core State Standards Initiative, 2018). Math is now taught differently with the Common Core State Standards compared to the way parents learned, thus further complicating homework assistance from parent to child. Parents want to help but are often unsure how to do so (Deslandes & Barma, 2016). Parents are willing to be involved with their child's homework but want their interactions to be fruitful and positive (Van Voorhis, 2011). Solomon et al. (2002) also note that many parents feel they do not have the competence to help with math homework, which creates tension because parents are aware of society's pressures to succeed in math. Responsibility is on the schools to build relationships with parents and communicate to them that they are competent. Schools could also reveal to parents that what parents most likely are already doing at home is beneficial to their children. Schools should acknowledge parents for what they naturally bring to the table. When parents maintain high expectations for their students and utilize indirect involvement strategies, they enhance their student's academic success even if they do not know the details of their child's homework content (Vukovic et al., 2013). Schools should acknowledge parents for their efforts. The hope is that through parents learning

what they already are doing at home is beneficial, parent's confidence will increase, and they can feel competent in helping.

Purpose Statement

This quantitative study aimed to determine how indirect and direct parent involvement strategies predict student's mathematics grade point average. This study also aimed to inform educators and parents on the relationship between the student characteristic of math identity and mathematics grade point average. Examining how parent's confidence levels in helping with homework varies between different subjects was also a purpose of this study. The High School Longitudinal Study of 2009 (HSLS:09) was chosen as the source of data in response to a lack of known studies on direct and indirect parent involvement strategies involving a large sample size from the United States.

Research Questions

RQ1: To what extent if any, does direct and indirect strategies have on student's mathematics grade point average at the end of their high school career?

RQ2: To what extent if any, does the indirect strategies of how far a parent expects their child to go in school, college discussions, and encouragement have on student's mathematics grade point average at the end of their high school career? To what extent if any, do the direct strategies of helping directly with homework, and helping to put together

an educational/career plan have on student's mathematics grade point average at the end of their high school career?

RQ3: To what extent if any, does student's mathematics identity have on student's mathematics grade point average at the end of their high school career?

RQ4: To what extent if any, does parent confidence levels in helping with homework vary among English, math, and science.

Significance of Study

Vukovic et al. (2013) call on parents to know more about indirect versus direct involvement strategies. Calling parents to learn more about any topic is operating from a deficit mindset, indicating that parents do not know enough and need to be educated (Nieto, 2004). To help develop parent and teacher relationships, grounded in the mindset that parents are assets, researchers should call on educators to acknowledge parents for all they are doing already. Educators should also be called upon to know more about the influential impact parents have inside the home without even stepping foot onto a school campus. An educator's more profound understanding of how valuable parents are to their child's academic success can help set the foundation needed to formulate a two-way relationship-building group amongst educators and parents. This two-way relationship group should prioritize parents being able to voice their concerns and should provide them the space to share their resources and strategies with other parents because they bring a tremendous amount of knowledge to the table.

Within the various subjects that students have homework on, mathematics is stressed most by teachers. Mathematics is intimidating for both students and adults, with 93% of adults reporting experiencing math anxiety (Jackson & Leffingwell, 1999). Math anxiety occurs when someone feels like the math cannot be done. To help with parent's math anxiety, educators should prioritize letting parents know how significant their contributions are through indirect parent involvement strategies that do not even involve doing the math. This study will contribute to the body of literature by examining how parental confidence in helping with math homework relates to other subjects such as English and science. Although math can cause a specific type of anxiety, there is no known research on parent's confidence in helping with math homework compared to confidence in helping with other subject's homework.

When students feel as though they don't understand the math homework right away and therefore exhibit a lack of self-confidence, they are at a standstill, which makes completing homework or studying difficult (Filippello et al., 2018). Parents are already helping their students tremendously in indirect and encouraging ways, providing students with the tenacity needed to push through and keep trying when tasks get tough (Wang & Skeikh-Khalil, 2014; Vukovic, et al., 2013). Being able to evaluate what one knows and does not know and how to make a plan to be able to persevere through hard times despite being intimidated is indicative of self-regulation (Pintrich, 2000; Zimmerman, 2002). Fostering characteristics of self-regulation is intertwined with indirect parental involvement

strategies. On the other hand, direct parent involvement strategies involve jumping in like a superhero to ‘save the day' by showing the child the steps they need to take to solve the problem. Solving student's problems can relay a “I don’t think you can do it, so I will do it for you” type of mindset even though a parent intends only to help positively. Encouraging academic discussions and holding high expectations can say, “I believe in you, and I am not going to do the problem for you because I know you can do it.” As self-regulation skills in students increase with indirect parent involvement strategies, students can move closer to identifying as a person who “can do the math,” thus increasing their mathematics identity (Sfard & Prusak, 2005).

This study can bring a deeper look into direct and indirect parent involvement strategies within a large population generalizable to all ninth graders across the United States. Definitions used to describe parent involvement typically revolve around parent's physical attendance on a school campus. Knowing more about home-based parent involvement strategies can help broaden the definitions of parent involvement that have been too narrow. Parents do so much at home and do so much that is unseen (Auberbach, 2007; Curry & Holter, 2019). Therefore, parent involvement definitions should move away from relying solely on outside-of-the-home involvement. Even without parents jumping in to solve student's problems, parents are still superheroes by helping their students grow their self-regulatory skills by utilizing indirect parent involvement strategies. A student's mathematics identity, which is the belief that one is a math person or not,

will also be examined in relation to math achievement. With the information gained from this study, parent's ways to help foster math identity in students could be a topic worthy of discussion in the relationship developing groups formed between parents and educators.

Theoretical Underpinnings

This study focused on the Hoover – Dempsey & Sandler Model in which the ultimate goal of parent involvement is student achievement. Hoover-Dempsey & Sandler (1995, 1997, 2005, 2010) describe three main motivations for parent's involvement in their children's schooling: personal motivators, parent's perceptions of invitations to be involved, and life context variables. Within personal motivators, parent's sense of efficacy for being involved in their children's school stems from their own family and academic experiences when they were young, and the recent experiences the parents have had in their child's school system. Due to schools benefiting some students and not others, parent's motivation for involvement in their child's schooling may be understandably low. This study can help continue the ultimate goal of student achievement in the Hoover – Dempsey & Sandler Model by examining how parents can be involved even if they do not understand their child's homework content. Parents want to believe that their involvement will positively influence their child's academic achievement, and this study will reveal more information about the strategies that have the most positive impact. Time is also a factor in the variables that influence

parent involvement because many believe being involved involves a significant time requirement, although home-based strategies are not time-consuming.

Level 1.5 of the Hoover-Dempsey & Sandler Model (1995, 1997, 2005, 2010) describe four various forms of involvement which include:

1. Values, goals, expectations, aspirations.
2. Involvement activities at home.
3. Parent/teacher/school communication.
4. Involvement activities at school.

The values, goals, expectations, and aspirations parents can provide their students with will be addressed in this study. Often in parent involvement literature, so much focus is placed on involvement activities within the physical school campus. In contrast, so much influence can occur within has typically lacked in acknowledging how much parents already do for their children's education, this study also aims to keep parent's efforts at the forefront. Lastly, for involvement activities at school, the Hoover-Dempsey and Sandler Model (1995, 1997, 2005, 2010) strives to help parents and educators be aware that parents who are not present at school-based activities does not mean that they are not involved.

The Hoover-Dempsey and Sandler Model (1995, 1997, 2005, 2010) continues to level 2, arguing that parents can influence student's abilities to be successful through encouragement, modeling, reinforcement, and instruction. This study's instruction component will not be in content instruction from teachers

to students but through parents employing strategies within the home. This model's remaining levels leading to student achievement also contain a student self-regulatory component. This study will examine parent involvement within the home in the hope that the findings can help to inform future practices that can aid with the growth of student self-regulation.

Another theoretical basis of this study comes from the Cultural Proficiency Model. The Cultural Proficiency Model aims to move from viewing students as underperforming to viewing schools as underserving (Cross et al., 1989). Schools are underserving by not recognizing that parents do so much for their children's education. Many policies and school-related goals aim to increase parent involvement at school events. Schools also strive to have parents serve as an audience in trainings where parents are to listen to what they "should be doing." Schools are underserving when parents do not have the space to voice their concerns and be heard loud enough to influence schools to take action on behalf of the concerns. Parents bring a wealth of knowledge and another set of eyes to recognize injustice and the need for change to increase student achievement. Schools are also underserving by focusing on training parents rather than training educators about the asset that parents are. Educator training should also focus on cultural diversity and how educators can challenge and examine their own biases which can impede on a successful teacher-parent relationship. This study will use the model of Cultural Proficiency as a lens for

how schools could approach and challenge the false notion that parents are a deficit.

Definitions of Key Terms

Parental academic socialization practices. *Parental academic socialization practices* (PAS) include values, beliefs, and practices that are home-based and interactions between the parent and the child (Suizzo et al., 2016). Wang and Sheikh-Khalil (2014) define academic socialization as parents relaying the importance and value of education. The term academic socialization is also defined by Taylor et al. (2004) as “parental beliefs that influence children’s school-related development” (p. 163).

Parent involvement. *Parent involvement* consists of the relationship between parent and teacher and typically concentrates on parents volunteering at the school and attending events and meetings (Pavalache-Ilie & Ţîrdia, 2015). Wang (2009) classified parent involvement into three categories: school-based involvement, home-based involvement, and academic socialization. Barwegen et al. (2004) defined parental involvement as parent expectations, perceptions of overall involvement, school relationships, involvement in school, teacher-parent relationships, and teacher relationships with the parents. McNeal (2014) expanded the definition of parent involvement to include a more in-depth analysis of what happens within student's homes.

Frustration intolerance. *Frustration intolerance* is defined as the inability to deal with feelings of frustration which can often arise in mathematics (Filippello et al., 2018).

Direct forms of parental involvement. *Direct forms* of parental involvement are defined as directly assisting children with problems by telling them to “solve it like this” and proceeding to show them the steps to take (Vukovic et al., 2013).

Educators. *Educators* involve not only teachers but administrators, support staff, and school counselors.

Indirect forms of parent involvement. *Indirect forms of parent involvement* support a student by pointing to resources and maintaining high expectations for them and their future (Vukovic et al., 2013). Indirect parent involvement also includes discussing a child’s academics with them and encouraging them (McNeal, 2014; Wang & Sheikh-Khalil, 2014).

Parental self-efficacy. *Parental self-efficacy* is defined as how much influence a parent believes they could have on their child’s development, interest, and value in academics, along with the ability to motivate their children (Bandura et al., 1996).

Self-regulation. *Self-regulation* is a process where learners must set goals for their learning and then regulate and control their thinking, behavior, and motivation through those goals (Pintrich, 2000). Zimmerman (2002) adds that self-regulation is not just the actions one uses to help against the conditions at

hand but is also about being aware of the need to gain the necessary knowledge to perform in the current conditions.

Summary

Parents are an asset to their children's education and need to be treated that way. Instead of institutions thinking about what the parents can do for the school, what the educational system can do for parents must be considered. Parent involvement is multi-faceted and not limited to a school campus's physical space. At home, when parents want to help their children with one of the most challenging subjects, mathematics, they may feel that if they don't know the content, they cannot help. Educators can partner with parents to help foster the truth that parents already positively impact their students without even knowing the mathematics material. In chapter two, a review of the literature will include the history of mathematics in the United States, parent involvement at home including non-subject specific and subject-specific, a review of the barriers to parent involvement, and the theoretical framework of this study.

CHAPTER TWO

LITERATURE REVIEW

The purpose of this study was to investigate the extent to which direct and indirect parent involvement strategies affect high school student's mathematics achievement within a large data sample. Data was collected and analyzed to help inform and enhance future parent-school relationships. In this chapter, the history of mathematics education comes first. This study focuses on math specifically because careers requiring mathematics skills are growing and are projected to continue to grow. With the increase in careers that require mathematics, pressure has accumulated in schools and has become a criterion for the success of schools. Math scores are also considered for college admissions and other future predictors of student success (Borghans et al., 2016). The current Common Core Math Standards has shifted to aim for "fewer, clearer, and higher standards" (Phillips & Wong, 2010). With this change and shift in standards, middle and high school students are likely to have parents who did not experience the Common Core Math Standards in their schooling. Parents are an asset to their child's education, even if parents are unfamiliar with the current mathematics teaching methods or unfamiliar with the steps to solve their children's math problems.

Following the review of mathematics history is the literature review from the non-subject specific domain and relevant literature from the subject-specific domain. The literature review indicates the importance of families while also

detailing a holistic approach to benefiting students through stronger connections between family and their child's education. Within the research, parent involvement has been more beneficial if it is indirect or based on academic socialization practices rather than direct strategies (Wang & Skeikh-Khalil, 2014; Vukovic et al., 2013). Next, the multiple theoretical frameworks that inform this study are reviewed, including the Cultural Proficiency Model, Self-Regulation Theory, and Self-Efficacy Theory.

History of Mathematics in The United States

The Common Core State Standards Initiative was formed in 2009 to provide a guideline of benchmarks for math and English. The new standards involve a shift from focusing on basic procedures and routine memorization to including concentrated efforts to increase student's conceptual understanding of mathematics. The expectations set forth within the Common Core State Standards include having students produce written explanations of their thinking and present multiple ways to solve mathematical problems. The change to the Common Core State Standards has caused teachers and parents to inquire about how they can help their students succeed within this new format (Common Core State Standards Initiative, 2018).

For teachers, there is a plethora of materials, training, and literature readily available that teachers can study in relation to helping students with the new standards. On the other hand, parents do not have access to such materials, which leaves them wondering - often at a loss, what it is they can do to

help? Parents want to help but are often unsure how to help (Deslandes & Barma, 2016). Parents were not taught with the current math framework and may feel unequipped or unprepared to foster their child's mathematics growth through homework. A problem persists here because parents often don't realize just how impactful they already are. Parents already possess skills that they can use to help their children, and the help does not have to revolve around knowing the details of the subject matter their children are working on within their homework. Educators have the opportunity to praise parents and share with them that they already have within them what is needed to help their students without even stepping foot on a school campus.

Students struggling in mathematics have been a continuous challenge since the late 1800s when mathematics was the main reason students did not advance in grade levels (Grouws, 1992). During World War II, the U.S. government began an interest in mathematics education due to many incoming officers lacking mathematics skills. The lack of math skills led the National Council of Teachers of Mathematics (NCTM) to issue mathematics recommendations for all students in their Post-War Plans in 1944 and 1945 (Willoughby, 1967). After the war, there was a rise in technology, and parents began to hope that high schools would prepare students to be more equipped in mathematics before they reached their undergraduate studies. An increase in technology created a job market where mathematics skills were vital for students to be prepared (Barlage, 1982).

The College Entrance Examination Board (CEEB) founded the Commission on Mathematics in 1955. A report in 1959 from the Commission on Mathematics called for a reorganization of the secondary curriculum to include the term ‘modern mathematics’ that referenced linear programming and probability. The Commission on Mathematics report from 1959 may not have received much focus without the first satellite launch, Sputnik 1, in October of 1957 by the Soviet Union. The launch sparked a national interest in the quality of science and mathematics education as it was now a matter of national security (Barlage, 1982). The National Defense Education Act was then passed in 1958 partially based on the rise in national security interest. From the National Defense Education Act, money became available for new programs concerned with mathematics, such as the School Mathematics Study Group. The Mathematics Study Group developed mathematics textbooks for all grades and was created as a model for other publishers to follow (Willoughby, 1967).

Throughout the 1960s, the ‘New Math’ movement aimed at focusing not just on facts, route memory, and isolated skills but on conceptual understanding. The ‘New Math’ movement's effort was to have students understand how mathematics blended and the underlying structure at hand (Fey & Graeber, 2003). In the 1960s, there was a strong backlash to the ‘New Math’ which was documented in the Washington Post when a parent who was also a Ph.D. chemist couldn’t understand his elementary school daughter’s math homework, and he claimed that the homework was unnecessarily complicated (Matthews,

1972). The ‘New Math’ movement's effectiveness showed only small differences between the traditional program and the new wave of teaching (Fey & Graeber, 2003). Following the ‘New Math’ movement was a push to go ‘back to the basics’ in the 1970s and 1980s, focusing on procedural skills, direct instruction, and mastery of objectives. Standardized tests were introduced during the 'back to basics' time frame and were primarily used to test the teaching of lower-level objectives (Fey & Graeber, 2003).

In the 1980s, the NCTM’s Agenda for Action pushed for more inclusion of problem-solving in the curriculum rather than primary and simple skills. The ‘Nation at Risk’ report was published in 1983, urging reform of mathematics education due to a rising level of mediocrity in the school system. The 'Nation at Risk' report pointed out how low American student's performance was on international assessments in not only mathematics but in science as well. International disappointments were not the only disappointments that became evident as students were also declining within the national achievement tests. Following the ‘Nation at Risk’ report, three math courses and three science courses were required for graduation through the Excellence Commission (Rolf & Engler, 1992). By the mid-1990s, 41 states created standards or frameworks consistent with the published NCTM standards, and these new standards of coursework came with their own set of criticism. The criticism of the new NCTM standards were very similar to the criticism from the “New Age” math with claims that there was not enough memorization and not enough direct instruction on

procedural skills. Critics also blamed teachers for not taking the traditional role of inputting knowledge into students, while mathematics reformers urged teachers to encourage students to work towards their own thinking (McLead, 2003).

The pressure continued in 2001 with the intent to reach 100 percent math and reading proficiency levels for all students by 2014. The objective for proficiency was called the 'No Child Left Behind' Act of 2001 (NCLB), in which states were allowed to choose their definition of what proficiency means. Many states decided upon levels that were not as high as those outlined in the National Assessment of Educational Progress (NAEP) (Bandeira de Mello, 2011; Lee, 2008; Linn et al., 2002). With the 'No Child Left Behind' Act, states enacted their own Adequate Yearly Progress (AYP) goals. Many schools failed to meet these goals and were therefore labeled as low-performing or failing which resulted in school sanctions. The inflicted sanctions put pressure on students, teachers, and administrators with the overabundance of test preparation, particularly in reading and math (Koretz, 2008; Linn et al., 2002; Welner, 2005). With the pressure on the education sector, a ‘Race to the Bottom’ phrase was coined which described how some states would lower their standards below those of the NAEP in an effort to save their schools and avoid consistent threats from the NCLB (Lee & Wu, 2017).

The NCLB Act of 2001 created six targeted areas that included accountability through standardized tests, a highly qualified teacher requirement to teach the material, local flexibility, safe schools, scientifically based research,

and parent participation. The NCLB defined parent participation as parents engaging in meaningful two-way communication about student activities and academics. The NCLB Act specifically required schools to create plans to help parents with involvement (NCLB, 2002). Of the NCLB Act's target areas, parent involvement research is one area that still needs more development.

The Common Core State Standards were developed to help remedy the problem of states establishing varying levels of mathematics proficiency. The Common Core State Standards also intended to have states adopt the same high English and mathematics standards to provide uniformity across the nation (Lee & Wu, 2017). Backlash occurred around the new standards, testing, curriculum, and instructional strategies. Parent postings of dismay and outrage went viral just as they did back in 1972 with the Washington Post article (Larson & Kanold, 2016). Unfortunately, evidence shows that typically people get their information about schools and education from friends and family and not from literature, experts, or research. All of the misinformation spreads to create a false reality (West et al., 2011).

Following the NCLB Act came the Every Student Succeeds Act (ESSA), signed by President Barack Obama in 2015 (Saultz et al., 2017). The ESSA promised more rigorous standards, a decrease in the number of assessments, less oversight from the federal level, and more support for special populations. The ESSA also stated that high schools must provide advanced coursework along with college and career counseling to all high school students. Another critical

component of the ESSA is that schools must provide parents with information to help them understand the state standards, assessments, and how to work with educators to improve their children's achievement. Institutions are also called upon to educate teachers and staff about the valuable contributions parents make and how educators can work with parents as equal partners. The ESSA also changed the term parent involvement to parent and family engagement (Every Student Succeeds Act, 2015).

The NCLB and ESSA stress the importance of family engagement although the transition of standards throughout the years has taken families on a confusing path of new approaches. Larson and Kanold (2016) state that parents should get involved at home but helping does not have to include doing their child's homework. Larson and Kanold (2016) point out that when parents tell their students directly what to do, this strategy can cause more harm than good. Regardless of the current educational legislation or the newest iteration of content standards, recommendations from research continue to say that parents can help their children with their academic achievement.

Parent Involvement

Epstein (2001) explained that children learn not just from their teachers but also from their families, relatives, peers, employers, and other adults in their community. Therefore, connections between school, home, and the community are critical. Four main points that Epstein (2001) prioritized are the following:

1. Children’s success is essential to families, but families need more information about how they can be involved.

2. Students learn so much more than academics, whether at school, in the community, or at home.

3. Families, peers, and the organization of school components can either negatively or positively affect students.

4. Community programs that support families and schools might play a part in effectively increasing student's success.

In later research, Epstein (2005) recommends that parents, educators, and community members work together to design activities that create a positive partnership. Decades of research from Epstein (1985, 1987) stem from Bronfenbrenner’s (1977) Social-Ecological Model which states that human development is a process that is influenced by changing environments and their interactions. Epstein (1985, 1987) used Bronfenbrenner’s (1977) model to organize parent involvement into six categories which are: (1) parenting, (2) communicating, (3) volunteering, (4) home learning, (5) decision making, and (6) community collaboration. The following literature review will focus mainly on communication between parents and students.

Non-subject Specific Parent Involvement at Home

Deslandes and Barma (2016) discuss that a common theme in parent's questionnaire or survey responses involve tension between parents and students and a lack of clarity about how to be involved. Although parent involvement is

typically discussed and studied amongst educators and parents, Deslandes and Barma (2016) recommend that students should also be involved in the discussions. Involving students in a study is what Bamaca-Gomez and Plunkett (2003) sought out to accomplish. Bamaca-Gomez and Plunkett (2003) sought to add to the research on youth academics and its relationship with parenting, specifically in Mexican origin families. Questionnaires were given to 273 high school students in three different Los Angeles schools. The questionnaires addressed academic motivation, educational goals, parent's education, parent's capability to help with education, how much parents monitored the student, language spoken in the home, and the student's birth country and the parents birth country.

Bamaca-Gomez and Plunkett (2003) defined parent monitoring in their research as parents knowing about their child's schoolwork and what they are doing after school. In this study, Bamaca-Gomez and Plunkett (2003) found that when parents monitored their students, higher academics were associated. Students who indicated that they spoke more English showed a higher motivation for academics and educational goals. The amount of education the student's mothers had was positively and significantly tied to the youth's motivation for academics and education goals. On the other hand, the father's education level was only positively and significantly tied to education goals rather than motivation for academics.

The study by Bamaca-Gomez and Plunkett (2003) is important because it indicates that when parents monitor their children, they can increase their overall academic achievement. Shockingly, the researchers suggest that families should speak more English at home, and efforts should be made to improve parent's education so that parents can help with their student's education. This is problematic because dictating the language spoken in the home rejects that family's culture and actually harms student success (Walqui & van Lier, 2010). Valenzuela (2005) describes this denial of natural resources such as language and assimilation practices, as subtractive schooling in which schools take from students and families and leaving them prone to failure. Criticizing language spoken at home portrays a deficit perspective that what parents and families bring to the table is detrimental. If this is how published literature points fingers at parents, imagine the unpublished, informal comments thrown at parents. This linguistics acquisition recommendation discredits the core of who a family is and can explain why even if a family can attend on-campus events, they may not feel comfortable doing so.

Another concept to consider is whether the language spoken at home is truly a barrier to student success or if the barrier is socioeconomic status. The socioeconomic status (SES) of Latinx families is significantly lower than those who are white (Morales et al., 2002). Suppose Latinx families who speak primarily Spanish at home live in lower-income households. In that case, the parents and students in lower-income households have less access to resources

than those with more expendable finances who can hire tutors or pay for enrichment courses. Here exists an opportunity gap in which some students have an advantage, and some have less of an advantage. Blaming families for not speaking enough English at home fits into the false notion that parents are a deficit. Alternatively, language could not be the culprit but rather SES and the opportunities a higher SES can provide. Fingers should not be pointed at parents but rather at the hegemonic system from which some benefit from while others do not.

The inclusion of the study by Bamaca-Gomez and Plunkett (2003) is essential to reveal just how uncomfortable and unwelcome many parents may feel when they engage with educators. Bamaca-Gomez and Plunkett (2003) not only indicate language spoken at home as a problem but also add to the deficit mindset by stating that parents need more education so that they can help their children with their academics. An opportunity lies here for institutions to flip this script and make parents feel like the asset that they indeed are to their students, regardless of parental education level and regardless of the language spoken at home. A step in the right direction would be to thank parents for all they do for their child's education and show them how significant their involvement is for their student's academic success.

Yosso (2006) describes how the parents as a deficit model affected Chicana/o families. Yosso (2006) explains that Chicana/o parents have felt intimidated in Parent Teacher Association (PTA) meetings because members

talked down to them. Chicana/o parents also did not appreciate that schools did not provide childcare nor transportation to PTA meetings or notices in Spanish detailing upcoming topics and agenda items. Chicana/o parents were also depended upon to make food for fundraisers although the money raised went to other magnet schools nearby instead of the school their children attend. To express grievances and take action, parents in this community formed a group called Las Madres. About 20 parents joined together in a space that provided childcare, bilingual materials, translators, and English and Spanish meetings. At the meetings, parents could express their concerns and partake in critical pedagogy in which problems were named, analyzed for causes, remedies were discussed, and parents reflected on the whole problem-solving process. The Las Madres group is an excellent example of what institutions should pay attention to if they want to move away from employing the deficit model and move towards an asset model.

Motivation

Suizzo et al. (2016) also studied parental involvement and motivation, focusing specifically on a mother's impact. While using a mixed-methods model, 120 parents and their sixth-grade children participated who were determined as economically disadvantaged because they qualified for free and reduced lunch. Of the parent sample of 120, 105 were mothers, displaying the concentration on maternal involvement. Surveys and interviews were conducted in this study to investigate parent's memories of their school satisfaction and how memories

impacted their children. Student's academic motivation was also examined in relation to their parent's type of school involvement and parental academic socialization practices (PAS). In this study, PAS included values, beliefs, and practices that are home-based and interactions between parents and children.

Suizzo et al. (2016) found that parent's own experiences of school satisfaction were positively related to student's reported level of PAS, emotional autonomy, and value of education. Emotional autonomy is the level of support parents show for their children's interests, such as opinions about what they are learning and attempting to get their children to strengthen their qualities. Parental school satisfaction was not related to the goals parents had for their children in terms of education. The findings are essential because educators should be aware that many parents may have had a less than satisfying school experience of their own. If parents had their own experiences of low school satisfaction when they were in school, then unconsciously avoiding school discussions and displays of interest in their child's navigation of the school system might be evident. Parents do care about their child's schooling, but painful memories could be brought to the forefront when engaging with their child's education.

School systems can help with low parental school satisfaction barriers by acknowledging and calling attention to the fact that schools unfortunately have and continue to benefit some students and not others. This painful history is what Lawrence-Lightfoot (2004) calls 'generational echoes' in which parents are reminded of their past and generational hurts regarding schooling and

oppression, which can be exacerbated with a physical presence on a school campus. Showing compassion on behalf of parent's experiences and recognizing parent's struggles is a good start to developing a school-parent relationship. After calling attention to the injustice parents may have experienced and giving them a chance to be heard, educators could create a place of conversation with parents to discuss ways to foster parental academic socialization practices and emotional autonomy.

Suizzo et al. (2016) also found that the parent's education level was not related to the amount of at-home involvement parents administered, which conflicts with the study by Deslandes and Barma (2016) which found that the higher the mother's education level indicated higher children's motivation for academics and education goals. The study by Suizzo et al. (2016) suggests that parents are involved in their children's education and can do so from the comfort of their home, regardless of education level. Suizzo et al. (2016) also stated that the more parents valued education, the more likely their children would be motivated to achieve for their family in education. What should be considered is that if parents have had a less than positive schooling experience, would they still be inclined to show high levels of educational value? Due to segregation and other injustices, it would be likely that minority groups would report a less than satisfying school experience. A less than satisfying school experience could understandably lead to avoidance in relaying a value on education later in life. Therefore, students of these parents could be at a disadvantage compared to

white students. This disadvantage further validates the school system's need to form honest relationships with parents in which these injustices are acknowledged and discussions can occur about what can be done moving forward.

Another factor to take into consideration is student behavior. Parent involvement can deter adverse long-term outcomes for students who show consistent and extreme academic and behavioral problems (Wagner et al., 2005). In a study by Stormont et al. (2013) 34 elementary teachers rated the parent involvement of 577 of their students. Three categories were created using a 21-item measure called the Parent Involvement Measure-Teacher (Conduct Problems Prevention Research Group, 1991). The results of the 21-item measure were then compared to the student's disruptive behavior, prosocial behavior, emotional regulation, academic competence, and academic achievement. The three categories consisted of high contact and high comfort, meaning the parents had a high level of contact with the teacher and felt the comfortable doing so; low contact and high comfort; and low contact low comfort. For the low contact low comfort group, students were more likely to be identified as having higher levels of disruptive behavior, lower levels of prosocial behavior, lower levels of academic skills particularly in math and reading, and low levels of self-regulation along with concentration problems.

The findings from Stormont et al. (2013) are similar to Wagner et al. (2013) in that behavior, among other factors, can be tied to various levels of parent

involvement. Domina (2005) also found that parents helping and checking their child's homework can help to prevent the child's problem behaviors at school. It is essential to look at the findings without implying that parents who are not involved will have disruptive students with lower prosocial behavior, lower academic skills, lower self-regulation levels, and concentration problems. Alternatively, what should be considered is that parents classified as less involved were also classified to have a lower level of comfort with being involved in the school and contacting the teacher. Lower parental comfort in being involved could result from an unsatisfying school experience that the parents endured, which was studied by Suizzo et al. (2016). An opportunity exists here for educators to listen to parent's voices and hear what makes them uncomfortable and what changes schools can make.

Parent involvement can help to foster positive behaviors through motivation. Parent involvement can motivate children to make more of an effort to learn, be more attentive in class, and can aid in higher student self-esteem where students view themselves as more competent (Izzo et al., 1999; Tusty & Lampe, 1997). Student's intrinsic motivation was examined by Pavalache-Ilie and Ţîrdia (2015) where participants included 231 third and fourth grade Romanian and Rroma students and parents. The parents were given a survey on their involvement, and the students were given a survey on their intrinsic motivation. Correlations between parent involvement and student intrinsic motivation factors were examined in relation to student academics. The definition of parent

involvement in this study is narrow because it only includes physical attendance at school campuses, ignoring all that happens at home in terms of parent involvement. The definition of parent involvement consisted of the relationship between the parent and teacher, and concentrated on parents volunteering at the school, such as attending events and meetings.

The study results by Pavalache-Ilie and Ţîrdia (2015) indicated a significant association between parent involvement, student's intrinsic motivation for math, writing, and reading. The findings are consistent with other research showing that parent involvement can influence student motivation (Shaver & Walls, 1998; Fan & Williams, 2010). Although the findings indicate that parent involvement can foster motivation and academic achievement by attending on-campus events, a wide range of other ways parents can show involvement in their children's education was left out by Pavalache-Ilie and Ţîrdia (2015).

Leaving out in-home parent involvement can depict an incomplete picture of what kind of parents are actively involved with their children's education. A depiction of higher SES parents being the only ones who participate in parent involvement is created when only on-campus parent involvement activities are considered. This incomplete picture leaves out lower SES parents who may not have the flexibility to attend on-campus events. Even if parents can participate in the on-campus events, they may not desire to do so because it could provoke unsatisfying memories from their own schooling. Here lies an opportunity for

school systems to ensure that parent involvement definitions include more than on-campus attendance in an effort to value inclusivity.

Attitudes and Behavior

McNeal (2014) expanded the definition of parent involvement to include what happens within a student's home. In the study, McNeal (2014) looked at parent-school and parent-child involvement and its effect on student's academic achievement, student attitudes, and student behaviors. The National Educational Longitudinal Study (NELS) from 1988 was used to identify 15 different elements of parent involvement focusing on educational support strategies, parent-teacher organization involvement, parent-child discussions, and parent monitoring. The data included 12,101 eighth graders that were surveyed again in 10th grade. Results show that parent-child discussions and monitoring significantly influence achievement, attitudes, and behavior more so than parent-school involvement. Among the findings, parent-child discussions had the most significant effect on achievement, attitudes, and behavior. The findings are valuable because they show that what a parent can do at their own home can positively affect their students more so than physical involvement at the school site. Spreading the knowledge to educators and parents that involvement does not have to include physical attendance at events can show that what parents are already doing at home can impact their child's academics positively.

Another crucial factor in parent involvement is mental health which is what Wang and Sheikh-Khalil (2014) focused on in their study. The purpose of the

study by Wang and Sheikh-Khalil (2014) was to investigate parental involvement and its effects on academic achievement and depression in students. The participants consisted of high school students, which is a key time to discuss mental health because the middle school transition to high school can be very emotionally demanding. During the transition from middle school to high school, children are navigating through the desire to have support from their parents and a need for autonomy (Eccles et al., 1993). Depression can also have consequences emotionally and on academic functioning (Wang, 2009), which further signifies this study's importance to research. Parental involvement in this study was classified into three different categories, which include:

1. School-based involvement such as volunteering, parent-teacher communication, and participation in school events.
2. Home-based involvement, such as parents creating a structure for leisure time versus homework time.
3. Academic socialization which is defined in this study as communicating expectations and the value of education along with providing encouragement and support for the student's future goals.

Ten high schools across the United States were included in this study, with 935 total participating students.

To collect data, Wang and Sheikh-Khalil (2014) collected student's grades and provided students with surveys on emotional and behavioral engagement and depression. Parent data was collected via phone interviews about home-

based, school-based, and academic socialization involvement. Findings show that any parent involvement during a student's 10th grade year contributed to higher academic and emotional functioning levels. The researchers also found that academic socialization, which is parents communicating the importance and value of education, had the most robust negative relationship with depression and the most substantial positive relation among academic achievement. Academic socialization practices help debunk the common belief that parent involvement influencing positive student results should require a parent volunteering at school or attending school events. This study reveals that parents can help their students achieve academically while potentially deterring student depression, all from the comfort of their homes.

Parental involvement can have an unexpected impact on factors other than just student achievement, as seen with mental health in the study by Wang and Sheikh-Khalil (2014). Garbacz et al. (2018) also investigated effects other than achievement by conducting a study examining parent involvement in sixth grade and its contribution to peer affiliations in seventh and eighth grade. The study's participants included 5,802 middle school students in the United States northwest region. Students indicated their parent's involvement levels and their own positive or deviant affiliations with peers through survey responses. In this study, parental involvement was defined as activity involvement at school, communicating with the school, and direct homework involvement. This study did not cover academic socialization practices, also known as indirect parent involvement, and therefore

the definition of parent involvement was narrow. This study's parent involvement definitions yielded results indicating that seventh and eighth grade student-peer affiliations were higher when parents had higher involvement. The findings were consistent regardless of gender and are valuable because it suggests that when students feel supported educationally, they are more likely to have positive peer affiliations.

Self-efficacy and Beliefs

In an earlier study involving academic socialization, researchers Chen and Gregory (2009) looked at student's perspectives of their parent's involvement. The participants included 59 ninth grade students within a southeastern United States high school who were classified as having low academic achievement. Students were given a self-reported classroom behavior survey, a survey on their perceptions of their parent's involvement, and a one-on-one student interview. Parent involvement in this study was assessed by direct parental participation, parental encouragement of success through social and behavioral reinforcement, and parental grade expectations in mathematics, science, English, and history. Student's grade point average and teacher ratings of student classroom engagement were also used as variables.

The study results by Chen and Gregory (2009) showed that students who had parents that held higher academic expectations for them were reported as having higher classroom engagement and higher grades compared to the students who reported that their parents had lower academic expectations. Chen

and Gregory (2009) found that parent involvement through expectations was more beneficial than traditional involvement, such as helping the child directly with homework. The importance of expectations aligns with the findings by Wang and Sheikh-Khalil (2014) regarding academic socialization. The term academic socialization is defined by Taylor et al. (2004) as “parental beliefs that influence children’s school-related development” (p. 163). The findings by Wang and Sheikh-Khalil (2014) are specific to students in high school or those transitioning to high school because this age group has needs for autonomy. Students at this age also need to connect with the adults in their lives (Gregory & Weinstein, 2004), even if they act like they want nothing to do with them. The balance between the connection that students strive for, and the need for autonomy, can be fostered through parent's academic socialization practices and success recognition, which would provide students with the encouragement needed to take on hard tasks while still providing space for them to work it out on their own.

Another study that incorporated homework was conducted by Gonida and Cortina (2014). Homework help from parents can vary from directly assisting the child with their homework content, to providing a space within the home stocked with materials, to developing household rules to aid with concentration. Home-based parent involvement can range from beneficial to detrimental for the student, as seen in this study. The researcher included 282 fifth and eighth grade students and their parents from Northern Greece. Consistent with other studies, most parent participants were mothers (79.4%). Parent participants were given

questionnaires about their homework involvement, their student's goals, and what they thought about their child's efficacy in academics. Questionnaire data was then compared to the student's achievement in terms of grades, student self-reported efficacy in academics, and student achievement goals.

Gonida and Cortina (2014) concluded that if parents expressed a goal for mastery in homework, it negatively predicted interference, and positively predicted autonomy support. A goal for mastery in homework involves the parent focusing on student understanding and developing competence, and interference is the parent doing the task without the child asking for assistance. Autonomy support encourages looking for mistakes and reflecting on answers along with the development of self-regulatory practices. If the parents had a performance goal for their student's homework, it predicted control and a higher level of interference. A performance goal for students in homework is demonstrating competence and higher grades. Parent control in homework is checking mistakes, rereading instructions compared to the student's product, and encouraging memorization. Gonida and Cortina (2014) also found that higher parental belief in student academic efficacy levels in homework translated to higher cognitive engagement levels. Cognitive engagement is empowering the student to search for further information to help with homework. Student's perception of their academic efficacy was negatively predicted if their parents showed interference, and student's perception of their academic efficacy was positively predicted by parents who showed cognitive engagement. Student's

own mastery goals, opposed to performance goals, positively predicted their achievement academically. These results are significant because they show that the way parents think about their child's efficacy affects the parent's type of homework involvement. For example, the higher the belief of efficacy parents had about their students resulted in less parental control and interference, which indicates more successful students. Therefore, when parents focus on mastery, it is beneficial to their students because less direct involvement is provided. When parents were directly involved with homework, this interference negatively affected their children. The findings are consistent with Chen and Gregory (2009) in that directly helping with a child with their homework isn't as beneficial as other parent involvement methods.

Warren et al. (2018) investigated parenting styles categorized by what parents focus on at home. The study's goal was to examine the relationships between student achievement, parenting styles, and parenting beliefs to help school counselors work with parents. Participants included 49 parents of elementary, middle, or high school students in the southeastern United States, of which 96% were mothers. Demographic questionnaires and surveys were used to collect data on race, ethnicity, GPA, homework completion, suspensions, and discipline referrals. The Parental Authority Questionnaire-Revised was administered to inquire about parenting style. The Parent Rational and Irrational Belief Scale assessed parent's beliefs about their child's behavior and their beliefs about their roles as parents. The results showed that GPA could be

predicted by homework completion, parent involvement, and suspensions. Findings also indicated that authoritative parenting, defined as portraying high demands, was not significantly related to student achievement as previous research has stated.

Another study that focused on parenting styles was derived from Fernández-Alonso et al. (2017) in which academic achievement and different types of home-based involvement were examined. The participants included 26,543 students from 933 different schools in Spain with a mean age of 14.4. Tests were administered to students in mathematics, science, Spanish, and citizenship, along with questionnaires about their parent's involvement. The researchers found that parent's controlling style had negative correlations with their student's academic achievement. A controlling style was defined in this study as parents being intrusive through dismissing their student's responsibility and autonomy. The communicative, indirect style of at-home parent involvement on the other hand, was associated with positive academic results. The communicative style was defined in this study as parents encouraging studying, asking about classes, discussions regarding test results, and discussions about relationships that the student has with other students. Fernández-Alonso et al. (2017) reveals that parent involvement at home does not have to be controlling and can yield positive academic results when handled with encouragement and communication by asking the child questions.

The controlling style resulting in negative correlations of student academic achievement discussed in the findings by Fernández-Alonso et al. (2017) is consistent with the Self-Determination Theory (SDT) by Deci and Ryan (2000). Self-Determination Theory reveals that all individual's basic needs include the need for relatedness or connection, competence, and autonomy. When parents are controlling, this can violate the need for competence in terms of mastery over time, and autonomy which is the need to control themselves. According to SDT, a person cannot perform in their optimal state without these basic needs being met.

Similar findings on what parents focused attention on can also be found with children as young as kindergarten. Loughlin-Persnal and Bierman (2017) explored parenting areas to see if the Research-Based Developmentally Informed Parent program (REDI-P) helped parents support their child's transition to kindergarten. The participants included 200 children attending Head Start and their parents. Participants were randomly placed into either a control group, or a 16-session intervention group. The three areas that were examined were parent-child conversations, parent-child reading, and parent academic expectations in relation to student's success in kindergarten. Success in kindergarten was measured by literacy skills, academic performance, social competence, and self-directed learning. The findings indicate that parent academic expectations were the primary predictor of student's literacy skills and student self-directed learning. Loughlin-Persnal and Bierman (2017) suggest a possible reason for the findings

may be that parents increased their academic expectations for their students, and parent feelings of self-efficacy could have been increased through the intervention program. Another possible reason could have derived from a study by Yamamoto and Holloway (2010), who suggested that students internalize their parent's expectations which can direct them to feel capable and more motivated in school. Loughlin-Persnal and Bierman (2017) contribute to the literature by revealing that when parents are shown what they already may be doing is benefiting their students, parent's self-efficacy can be increased. An increase in self-efficacy could aid the parental confidence in expressing their academic expectations, and it is possible that if students internalize their parent's expectations, then higher expressed expectations from the parents could lead the students to believe more in themselves.

Loughlin-Persnal and Bierman (2017) discuss a possible increase in parental self-efficacy can lead to increased expectations for their students. In a study by Cross et al. (2018) the researchers found that the parent's educational expectations were positively associated with student's academic self-efficacy. The participants included 148 Latino families in Michigan, where 83.3% of the eighth or ninth grade students qualified for free or reduced lunch. Various types of parent involvement were examined through surveys related to their student’s self-efficacy. Similar to the studies by Deslandes and Barma (2016), and Suizzo et al. (2016), the majority of the participants were mothers (85.8%). Cross et al. (2018) found that parental education expectations were higher for the parents

who provided a lower level of shaming and pressure towards their student's academic performance. If parents exhibited less shame and pressure, their student's academic self-efficacy was higher than the students of those whose parents showed higher levels of shame and pressure. Parents may feel that adding pressure onto students to do well in school and showing dissatisfaction when grades are low is a way to show care and concern. Perhaps the parents were treated similarly from their parents, and the trait has been passed down from generation to generation. Cross et al. (2018) reveal that other methods may be more beneficial than shaming and pressure.

Self-regulation

Like Cross et al. (2018), O'Donnell and Kirkner (2014) focused on Latino families. In this study, a California YMCA held a weekly family education program, yearly staff training, advice to administrators on how to involve diverse families, and school site monthly socials. The family education program included content on parent education, family literacy, leadership development, and in-home education. The in-home education content provided parents with information on monitoring homework, family literacy, positive communication, discipline, talking to students about education, how to create a home learning environment, and various academic support topics. The participants included 144 Latino families, and similar to the research by Deslandes and Barma (2016), Suizzo et al. (2016), and Cross et al. (2018), the majority of the parents consisted of mothers (97%). The students were kindergarteners through fifth graders, and

76% of the students were English language learners. Parents were given questionnaires at the beginning of the study and again at the end. Other data collected included student's overall grades, Language Arts standardized test scores, social skills, and work habits.

O'Donnell and Kirkner (2014) indicated that after parent participation in the program, significantly more family involvement at the school site occurred along with more family contact with the teacher, and improved relationships between teachers and families. Higher levels of parent attendance at the family education program indicated higher social skills, higher overall grades, and higher standardized Language Arts test scores for their students. Unlike most studies regarding parental involvement, O'Donnell and Kirkner (2014) also dove into other skills, including self-regulation. The other student skills addressed in this study were self-control, getting along with students, rule-following, taking responsibility for behavior, respecting adults, and respecting other's property.

Within parental involvement literature, studies often do not have an intervention program, or a change put into place, such as what was exhibited in the O'Donnell and Kirkner (2014) study with the YMCA. Implementing outreach to parents can show benefits, which is evident in a study by Cheng and Chen (2018). The researchers investigated parent involvement through social networking apps and classroom management. The participants included 382 primary teachers in mid-west Taiwan who were given surveys about parent involvement and classroom management while being utilizing a social networking

app called Line. The Line app communicated with parents about student behavior in class so that parents could then discuss self-regulatory behaviors with their children at home. A group interview was also conducted with six teachers to collect more data. The researchers found that using the Line app did increase parent involvement and was also associated with higher perceived classroom management levels reported by the teachers. As seen through Cheng and Chen (2018), parent involvement can be enhanced in non-traditional ways through technology.

Many family involvement studies focus on school grades, but fewer studies focus on standardized test scores like the study by O'Donnell and Kirkner (2014). Standardized testing is another popular topic in consideration of academic achievement. Barwegen et al. (2004) examined not only ACT scores and parent involvement but also homeschool students in relation to parent involvement. In this study, parent involvement questionnaires were given to 127 full-time senior homeschool students and their parents within a large, suburban high school. This study's parental involvement was defined as parent expectations, perceptions of overall involvement, school relationships, school involvement, teacher-parent relationships, and teacher relationships with the parents. The homeschool student's ACT scores were then compared to the ACT scores for full-time students. Results show that students who reported a higher level of parent involvement had a higher score on the ACT than those who perceived their parents as having a lower level of parent involvement. Some of

the items from the survey correlated with a higher ACT score included: parents asking their students about their schoolwork, parents supporting students in self-regulatory behaviors, parents expecting the students to maintain a 3.0 GPA, and parents assisting students in making decisions about their future after high school. Full-time students who reported a higher level of parent involvement had an equal ACT score compared to the homeschool students. Equivalent scoring between homeschool students and the full-time students who said their parents had higher parental involvement levels is essential because homeschool students typically have a higher ACT score than the average full-time student (Rudner, 1999). In Table 1 below, the study's findings by Barwegen et al. (2004) are summarized along with the other studies mentioned in the above section.

Table 1. Non-subject Specific Parent Involvement at Home

Publication Authors, Date	*Participants*	*Methods*	*Key Findings with parent involvement at home*
Bamaca-Gomez and Plunkett, (2003)	273 high school students	Student questionnaires	Parent monitoring is tied to higher academics
Suizzo et al., (2016)	120 parents and sixth grade students	Surveys and interviews	Parent's own school experience satisfaction was positively related to student's reported level of parental academic satisfaction Parent's education level was not related to amount of home involvement
Stormont et al., (2013)	34 elementary teachers	Surveys	Low parental contact with teachers and low levels of comfort doing so indicated higher levels of disruptive student behavior, lower academic skills, low self-regulation skills, and concentration problems
Pavalache-Ilie and Ţîrdia, (2015)	Third and fourth grade Romamian and Rroma students and parents	Surveys	Significant association amongst student's intrinsic motivation for mathematics, writing and reading, and parental involvement
McNeal, (2014)	12,101 eighth graders surveyed again in tenth grade	Surveys	Parent-child discussions and monitoring have a larger influence on achievement, attitudes, and behavior in comparison to parent-school involvement
Wang and Sheikh-Khalil, (2014)	935 high school students	Surveys for students and phone calls to parents	Academic socialization had a strong negative relationship with depression and a strong positive relationship among academic achievement
Garbacz et al., (2018)	5,802 middle school students	Surveys	Higher levels of parental educational involvement predicted positive seventh and eighth grade peer affiliations

Chen and Gregory, (2009)	59 ninth graders	Surveys and interviews	Students of parents who held higher academic expectations had higher classroom engagement and higher grades Parent involvement through expectations was more beneficial than more traditional involvement such as helping the child directly with homework
Gonida and Cortina, (2014)	282 fifth and eighth graders and their parents from Northern Greece	Surveys for both parents and students	Parents goal for mastery rather than performance predicted positive levels of autonomy support in students The higher the parent's belief of their student's academic efficacy in terms of homework, the higher the level of cognitive engagement
Warren et al., (2018)	49 parents of K-12 students	Questionnaires	Authoritative parenting was not significantly related to student achievement
Fernández-Alonso, et al., (2017)	26,543 students from Spain with an average age of 14.4 and their parents	Tests to students and questionnaires to parents	Controlling styles of parenting had negative correlations with student's academic achievement A communicative, indirect style of at home-parent involvement was associated with positive academic results
Loughlin-Persnal and Bierman, (2017)	200 preschool children and their parents	Participants were in a control group or a 16-session intervention	Parent academic expectations were the main predictor of the student's literacy skills and self-directed learning
Cross et al., (2018)	148 eighth and ninth grade students	Surveys	Educational expectations of the parents were positively associated with student's academic self-efficacy Parents who showed less shame and pressure had students who had higher levels of academic self-efficacy

O'Donnell and Kirkner, (2014)	144 K-5 students and their parents	Family education program, staff training, advice to administrators, and pre and post questionnaires	The more attendance the parents had at the family education program indicated higher social skills, overall grades, and standardized Language Arts test scores for their students
Cheng and Chen, (2018)	382 primary teachers in mid-west Taiwan	Surveys and use of the social networking app called Line	The app increased parent involvement and was also associated with higher teacher perceived levels of classroom management
Barwegen et al., (2004)	127 full-time and homeschool senior students and their parents	Questionnaires	Students who reported a high level of parent involvement had a higher score on the ACT

Parent Involvement in Mathematics

The work mentioned in the previous section by Bamaca-Gomez and Plunkett (2003) found the mother's education level was related to the student's goals and academics. In a similar finding, Filippello et al. (2018) also found that mothers can significantly impact their students. Filippello et al. (2018) investigated the connection between frustration intolerance and giving up on the task in relation to academic performance and parental control. Frustration intolerance is defined as the inability to deal with feelings of frustration which can often arise in mathematics. The subjects and setting included 214 high school students between 17 and 19 years old in Italy's Sicilia and Calabria regions. Participants were given the Italian version of the Psychological Control Scale Youth Self-Report, the Frustration Discomfort Scale, and a Learned Helplessness Questionnaire.

Filippello et al. (2018) indicated that the mother's psychological control, defined as inflicting guilt and withdrawal of affection, would positively influence intolerance of frustration, leading to learned helplessness. Recognition should be given to the idea that when a child does something the parent does not like, it is typical for that parent to show disappointment, which may inflict guilt and may look like a withdrawal of affection. Parents do not intend to harm, and parents displaying disappointment within grades is common in our society. An opportunity exists here for educators to invite parents to share ideas of how to create and foster encouraging parenting styles.

The influential impact parents have shown throughout the literature along with the strategies parents apply are the critical ingredient to furthering student success. O'Shea et al. (2010) decided to look at what characteristics were involved within female students who scored in the 95th percentile of the SAT quantitative section. The participants included 23 high school females from five different rural and suburban high school areas in the United States northeastern region. O'Shea et al. (2010) interviewed participants using open-ended questions in the following areas: school/math-related questions, future plans, learning behaviors, and personal questions. The student's report cards, teacher comments, standardized test scores, and classroom observations were also collected as data. O'Shea et al. (2010) found that the girls who excelled on the quantitative portion of the SAT possessed quantitative skills, leadership skills, were very involved in their schools, obtained certain social-emotional thriving characteristics, and attended a high school where they felt they were taught well. The parents of the students who excelled on the quantitative portion of the SAT reported a home environment that valued education and mathematics while focusing on effort and holding high expectations. O'Shea et al. (2010) also found that confidence and persistence were related to mathematics achievement. The findings also indicate that no matter what type of career the parents have, if they communicate value for math and education while displaying high expectations, it can help with student's test scores. Parents may also help their students by boosting their student's confidence and encouraging persistence.

The type of parent involvement mentioned by O'Shea et al. (2010) was also explored by O'Sullivan et al. (2014). In this study, O'Sullivan et al. (2014) wanted to find ways for low-income families to help their students succeed in math through specific parental involvement strategies correlated with math achievement. The participants included parents and 79 seventh and eighth graders with a low social-economic status (SES) at a large urban public middle school. The parents were given a questionnaire about their quality and quantity of homework help and about parent self-efficacy topics. The teachers were also given a brief survey regarding the student's grades in math. O'Sullivan et al. (2014) found that establishing structure at home caused higher mathematics achievement. Autonomy support followed second and direct involvement came last. In this study, parents who felt they could positively impact their child's math achievement were more likely to be actively involved in their child's homework. The findings indicate that when parents set up a structure for students to complete their homework at home, it helped specifically with math scores. Supporting and encouraging students to work on their own positively impacted mathematics achievement, and direct involvement had the least positive impact. The findings are significant because it shows that if parents think they cannot directly help with their student's homework due to content knowledge barriers, they cannot help at all. These findings state that directly helping students may be the least effective.

Feelings about Math

Many studies show that parent's involvement in homework can bring about positive or negative effects depending on the type of involvement. Van Voorhis (2011) found that parents are willing to be involved with their children's homework but want their interactions to be fruitful and positive. In a two-year study involving 153 third grade students and their parents, Van Voorhis (2011) investigated the emotions and attitudes involved when parents directly helped with their children's math homework. In this study, parents not in the control group participated in a program called Teachers Involve Parents in Schoolwork (TIPS) which involved specific homework directions being sent home with students.

The first section of TIPS provided parents with an example problem of a skill taught in their child's class, along with steps detailing how the teacher taught the skill. A similar problem was also provided for the student to solve with the answer on the back of the page. The following section consisted of more problems for the student to work on, similar to how typical homework is completed. The last section was called "Let's Find Out" in which the parent was directed to discuss how the particular skill could be used in real-world situations. Lastly, parents were asked to send a comment or question back to the teacher along with a signature. The findings indicate that those who participated in the TIPS program compared to the control group revealed higher math levels, as shown through standardized test scores. Van Voorhis (2011) also found that the

participants in the TIPS program showed more positive feelings and attitudes towards math. An interesting fact about this study is that the TIPS assignments took only about 15 to 20 minutes. Educators need to consider that it may not be that more homework helps students, but quality homework paired with clear instructions on how parents can participate and give assistance. It is also important to note that within the study, an exemplar was given with an explanation of how the skill was taught in class, thus derailing parents from showing their children how they would go about solving the problem. Providing parents with an explanation of how to solve the problem stresses the idea that an effective strategy for parents would be to use the procedure or direct the student to the procedure introduced in class rather than showing their alternative way of solving the problems. Although the findings show how direct support can help students, contrary to other study findings, it is vital to reiterate that this study's direct involvement was highly guided by the teacher who sent home-specific instructions.

Vukovic et al. (2013) also examined the effects of parental involvement and its correlation with achievement. The research questions aimed to investigate mathematics anxiety and parental involvement, and mathematic anxiety's role in specific domains of children’s math achievement. The participants included 78 second graders from two Title I urban schools and their parents. An age-appropriate 12 item measure was created and administered to assess children's mathematics anxiety. Various assessments were also

conducted to test whole number arithmetic and word problems. Through analyzing correlations among the variables within the surveys, Vukovic et al. (2013) found that creating a positive environment for children to learn at home, which involves discussing resources available for children to use when stuck on a problem; and maintaining high expectations led to lower levels of math anxiety in children. Mathematical anxiety also proved to be more evident in higher-order problems such as word problems, which is consistent with a study that also proved mathematical anxiety exists not only with children but also with adults (Vukovic et al., 2013). With a higher level of anxiety amongst children and adults, it makes sense that parents may want to avoid helping with math problems. When parents provide the correct type of support, the study indicates that mathematical anxiety can be reduced. Vukovic et al. (2013) also found that lower anxiety levels produced better performance on higher-order mathematical tasks.

Vukovic et al. (2013) found that direct forms of involvement were negatively related to children's math achievement. Direct forms of involvement include directly assisting children with math homework and involves parents telling their child to "solve it like this." Direct involvement is not advised under this study, which seems understandable given that most parents have not received formal teacher training. Even when parents know how to solve the math problem, their explanations may differ from how their child was taught in class. Instructing on different math methods could cause further confusion to the student and add to feelings of math frustration.

High Expectations

Vukovic et al. (2013) made a call for parents to be educated on indirect involvement, which is often called academic socialization. The importance of indirect involvement is consistent with the findings by Fan and Chen (2001) in their meta-analysis of Parent Involvement and Student Achievement. Fan and Chen (2001) found that supervision of schoolwork at home was shown to have a small to moderate relationship with student's academic achievement. Fan and Chen (2001) also found a strong relationship present when parents exhibit high expectations for their child's academic achievement. High expectations are a characteristic of indirect involvement.

The findings valuing high expectations continue in research by Veas et al. (2019). The researchers in the study explored academic achievement in relation to parent involvement and various metacognitive strategies. The Parent Involvement Questionnaire was given to 1,298 high school students in Spain, looking specifically at homework support, perception of support, interest in the student's educational process, parent expectations, organization, and school relationship. End-of-term grades were also examined to look for academic achievement correlations, and metacognition was measured using the Learning Strategies Questionnaire. It was found that the highest prediction of academic achievement was parental expectations. Another finding indicated that parent involvement is positively associated not only with academic achievement but with student metacognition as well. Veas et al. (2019) reinforce how parent's high

expectations can help student's academic achievement and can affect student metacognition.

Yan and Lin (2005) also found that specific parental involvement types could increase mathematics scores. Data from the National Educational Longitudinal Study: 1988 (NELS:88) was examined and focused on several factors compared to 12th grade math achievement. The factors included:

1. Participation in Parent-Teacher Organization activities
2. Parent attendance in school programs
3. Parent’s discussions about school topics with students
4. Parent’s contact with the school about teenager’s performance
5. Knowledge of teenager’s schoolwork
6. Knowledge of teenager's friends
7. Family norms
8. Educational expectations
9. Parent-teenager relationships

Yan and Lin (2005) separated the data into racial groups: Caucasian American, Asian American, Hispanic American, and African American to examine any differences that emerged. Although slight differences arose within each of the groups, the common factor that led to higher achievement scores in math was when their parents expressed “high expectations for school achievement and conduct(ed) warm, nurturing, and frequent interactions with them” (p. 124). The power of high expectations runs consistent with the findings by Vukovic et al.

(2013), which show that it is unnecessary for parents to know how to solve their student's math homework but rather to be involved in other, indirect ways promoting academic socialization.

Motivation

Herges et al. (2017) conducted a Midwestern middle school study to investigate math achievement and parent involvement factors. The 65 students who participated were given a survey created from four other validated surveys that included academic motivation in math, intrinsic and extrinsic motivation, and parent characteristics. Pintrich et al. (1991) defined intrinsic motivation as “the degree to which the student perceives herself to be participating in a task for reasons such as challenge, curiosity and mastery” (p. 9). Extrinsic motivation is defined as “for reasons such as grades, rewards, performance, evaluation by others and competition” (p. 10). The results showed a positive correlation between intrinsic motivation and achievement and that middle school students experience higher enjoyment when they do well in math which then builds confidence. As previous literature has shown, the researchers also found that it can positively affect mathematics achievement when parents set high expectations.

Although the high expectations leading to higher mathematics achievement is a reiterated trend shown in this literature review, the concept of intrinsic motivation is also vital to examine. Educators can create a space where parents can connect and share how they use intrinsic motivation at home by

helping students enjoy math more while at the same time increasing their confidence. Deci and Ryan (1985) reveal that intrinsic motivation can flourish when individuals are given choices and situations to use self-direction. Acknowledgment of feelings has also been found to develop intrinsic motivation, helping in the basic need for autonomy. Using these skills can spark student's motivation to embrace challenges while enhancing curiosity.

Motivation has been a critical factor in studying mathematics (Pintrich & Schunk, 1996). Many studies have shown that attitudes toward math and a child's choice to pursue math are influenced heavily by how difficult parents believe math is for their child and their own attitudes towards the subject (Grolnick & Ryan, 1989; Wigfield & Eccles, 1992). Eccles and Jacobs (1986) also discovered that when mothers told their daughters that they were not good at math when they were in school, their daughter's achievement immediately went down. In one particular study, Chouinard et al. (2007) investigated mathematics involving the factor of motivation and how social agents such as parents play a role. Four public high schools in Canada were involved, where 759 students grades 7 through 11 participated. Survey items presented similar results for females and males and showed that older participants are less motivated than the younger participants. The study was consistent with the aforementioned researchers in the sense that parents have a strong influence on their child's value of math, and teachers and parents were also very impactful on student's self-perception. Therefore, social agents rather than just mathematics skills are

critical to student's success in mathematics, and parents can encourage student effort, goal creation, and beliefs.

A similar study involving motivation was conducted in the United States by Fan et al. (2012). The researchers looked at five distinct areas: self-efficacy and intrinsic motivation in English and math, behavioral engagement, and the impact parents can have in English and math. Students in the 10th grade nationwide were given surveys in 2002, 2004, and 2005 to assess the five areas. The students were grouped into Caucasian, African American, Asian American, and Hispanic. The results indicated that out of the ethnic groups, Caucasian students indicated the lowest numbers on intrinsic motivation and engagement towards English and math. For all ethnic groups, it was found that specific components of parent involvement are related to children's motivation in school, including parent's aspirations for their children. For example, the parents who had higher aspirations had students who showed greater confidence in their schoolwork capabilities in English and math and reported higher school engagement levels. The researchers suggest that a positive learning environment at home is vital and that schools should provide information to the parents about how to communicate with their students. However, telling parents how to communicate operates from a deficit mindset, indicating that parents do not know how to communicate with their children. Instead, educators could create a space where parents can share with other parents how they make a positive learning

environment at home and how they communicate their aspirations for their children.

Self-Efficacy

Parent impact was also investigated by Bandura et al. (1996), where 279 children between the age of 11 and 14 in Rome were studied. The students were given surveys about their perceived self-efficacy in relation to math and their efficacy for perceived academic self-regulated learning. The survey incorporated the following components:

1. Working and motivating themselves to do academics when they don't want to
2. Creating an environment conducive to learning, planning, and organizing their schoolwork
3. Using strategies to help with comprehension of the material in class
4. Knowing when help is needed and where they can get the help

The students were also assessed on social efficacy in leisure and after-school activities; and on perceived self-regulatory efficacy, including peer pressure components. Social and emotional behavior was also examined along with parental academic efficacy, parental and children's educational aspirations, and academic achievement.

The study results by Bandura et al. (1996) show that the level of academic self-efficacy and aspiration parents had is directly related to the child's perceived level of academic efficacy and aspirations. The academic self-efficacy and

aspiration in this study were defined as how much influence parents believed they could have on their child's development, interest, and value in academics; along with the ability to motivate their children. Other correlations between the parent and child existed between problem behaviors, low levels of depression, and academic achievement. The level of parental aspirations for their children was also reported to be correlated with children's efficacy to ignore peer pressure. It is also important to note that the impact is not based on parent's ability to help with student's academic work at home but is attributed to a more indirect model of aspirations and beliefs, also known as academic socialization. A significant effect on parent's efficacy to influence their student's academic achievement in math was not shown in this particular study, although several other studies have revealed that higher beliefs of academic efficacy can enhance performance (Zimmerman & Bandura, 1994; Zimmerman et al., 1992).

To support parents in helping their students with math, Westenskow et al. (2005) unconventionally approached their study by having parents observe their students partaking in tutoring sessions. In this study, 24 students in fifth grade took part in a 10-week summer tutoring program, and the parents observed what transpired. The observation experience also allowed the parents to reflect on how they work with their child on math homework and some key realizations emerged. Parents noticed that their interactions did not always have to be negative as they may have typically been previous to the opportunity and that "math could be fun" (p. 470). Within the study's post-survey, parents expressed

that they had developed confidence that specific changes should be made at home when interacting with their child during math by being more patient and positive.

Another unconventional method to involve parents with math was conducted in a study by Santana et al. (2019) who researched the effects of text messaging, parental involvement, and math achievement. The study took place in Chile, where 56 eighth, ninth, and 10th graders and their parents participated. Student's GPAs were collected in the spring of 2016 and again in 2017 to determine any changes. Parents were randomly placed into a control group or the treatment group. The parents in the control group received information via text message about upcoming dates such as tests, and the treatment group was sent text messages that encouraged parents to partake in nonacademic activities with their students.

Activities texted to the treatment group included questions about an upcoming lesson's subject. An example of the activities delivered via text was asking the parent to share with their child the largest container they have used to hold liquid or a suggestion the parent could use to help encourage their student. Suggestions sent were about growth mindset or about keeping high expectations. Interviews were also conducted after the intervention to collect further data. It was found that the students of parents who received the nonacademic activity text messages significantly improved in mathematics compared to those who received only the administrative text messages. The

findings indicate that parents who are encouraged to discuss growth mindset and high expectations with their students can help their students academically. Parents learning new ways to help with children's homework could have increased parent self-efficacy in this task. The study by Santana et al. (2019) and other studies motioned in this section are summarized in Table 2.

Table 2. Parent Involvement in Mathematics

Publication Authors, Date	*Participants*	*Methods*	*Key Findings with parent involvement at home*
Filippello et al., (2018)	214 high school students between the age of 17 and 19 in the Sicilia and Calabria regions of Italy	Questionnaires	Mother's psychological control would predict positively on intolerance of frustration that would then lead to learned helplessness
O'Shea et al., (2010)	23 high school females	Interviews and class observations	Those who excelled on the quantitative SAT reported a home environment that valued education and mathematics
O'Sullivan et al., (2014)	79 seventh and eighth graders and their parents	Questionnaires	It was found that the provision of structure caused higher mathematics achievement, autonomy support followed second, and direct involvement came last
Van Voorhis, (2011)	153 third grade students and their parents	A program called TIPS directed parents to help with their student's math homework	Students involved in the program showed higher levels of achievement in math standardized test scores and also more positive feelings and attitudes towards math
Vukovic et al., (2013)	78 second graders and their parents	Questionnaires and assessments	Creating a positive environment for children to learn at home, such as discussing resources available for them to use when stuck on a problem; and maintaining high expectations; led to lower levels of math anxiety in children Direct forms of involvement were also negatively related to children's math achievement
Veas et al., (2019)	1,298 high school students in Spain	Questionnaires	The highest prediction of academic achievement was parental expectations, and parental involvement was correlated with student metacognition
Yan and Lin, (2005)	12th grade students	Data from NELS: 1988	Students with higher math scores had parents who held high academic expectations and had warm nurturing interactions

Herges et al., (2017)	65 middle school students	Surveys	High expectations lead to higher math scores Intrinsic motivation can lead to higher math achievement, math enjoyment and confidence
Chouinard et al., (2007)	759 Canadian students grade seven through 11	Surveys	Parent's opinions can have a strong influence on student's value of math
Fan et al., (2012)	10th grade students	Surveys	Parents with higher aspirations had students with greater confidence in English and math and higher levels of engagement
Bandura et al., (1996)	279 children between the age of 11 and 14 in Rome	Surveys	The level of academic self-efficacy and aspiration parents had was directly related to the child's perceived level of academic efficacy and aspirations
Westenskow et al., (2015)	24 students in fifth grade	10-week summer tutoring program where the parents observed what transpired	Parents noted that they should be more patient and positive with their math interactions at home
Santana et al., (2019)	56 ninth and 10th graders from Chile and their parents	Treatment group was encouraged to partake in nonacademic activities with their students and interviews followed	Students of parents in the treatment group that received the nonacademic activity text messages significantly improved in mathematics

Barriers to Parent Involvement

Many parent involvement programs and initiatives focus on what parents are not doing correctly and how they can change to meet the school's agendas or needs (Thompson, 2008). Implying that parents are not equipped just the way they are reflects a deficit model. Parents as a deficit is a viewpoint that must be challenged and changed. The purpose of this review is to shed light that traditional ideas of parent involvement are not all that there is. Educators should recognize parents for all they do for their children's academics, even if it does not involve attending back-to-school nights, volunteering, or joining Parent-Teacher Associations.

Parent involvement can be categorized into many different areas, making the definition of parent involvement complicated. Some parents consider themselves highly involved, but their attributes are not consistent with literature definitions of parent involvement, resulting in a lack of recognition (Auerbach, 2007). For example, being there when school is dismissed, talking to children about relationships with other students, and making sure their student is prepared for their day at school is what some parents define as involvement (Curry & Holter, 2019). There is a need to open up the definition of parent involvement to less visible areas and attempt to normalize the various ways parents can help their students.

It is not that parents do not care or do not want to be involved. Campbell, et al. (2016) state that parents would like to participate in their children's

schooling but are unsure how to get involved or how to begin the process. Ecceles and Harold (1996) go further to suggest a solution by stating that the school system should help parents prepare an environment to learn at home and help parents with the self-confidence they need to assist their children. As for barriers other than knowledge of how to be involved, Erdener and Knoeppel (2018) set out to examine what may affect Turkish parents regarding their involvement in their elementary student's schooling. Epstein's (1995) types of parental involvement was involved in this study which includes: parenting, volunteering, decision-making, collaborating with the community, communicating, and learning at home. The findings show that family income had a significant impact on parent involvement. Other characteristics such as education level, age, and marital status did not have a significant effect. Parents who earn a higher wage are more likely to be involved in their child's schooling, whereas those with lower wages may not participate as much. The definition of parent involvement needs to be examined closely because stating that parents with a lower income are not as involved shows a deficit mindset. When most parent involvement definitions involve on-campus events, those without the luxury of time due to multiple jobs are therefore labeled as uninvolved when they cannot attend. Even if low-income parents can attend, they may not want to because of their own negative schooling experience. It is unfair to label these parents as "less involved" when parent involvement can present itself in a wide range of activities and should not be limited.

Lechuga-Peña et al. (2019) also studied lower family income involvement. The study's focus involved low-income Black and Latina mothers who received a Housing Choice Voucher (HCV) or were living in a public housing project. The study used the Fragile Families and Child Wellbeing Study which sampled 4,498 participants. Interviews were also conducted with parents, children, and teachers. The results revealed that mothers living in a public housing project were more likely to be involved in school activities than mothers who received an HCV. Results also showed that white mothers were less likely to be involved in some school-based activities than Black and Latina mothers, which goes against the misconception that minority parents are generally less involved (Doucet, 2008).

What needs to be considered in the study by Lechuga-Peña et al. (2019) is that the educational system is set up to benefit some students and not others. If white mothers are less involved, it may be because their children benefit from the education system. Another factor to consider is that the parents who received an HCV may be living in an area where the schools have more resources than the schools in the public housing project areas. The parents in the housing project areas may be more involved because of the dire need to fight for what their children deserve and may not be receiving. The discrepancy of resources presents yet another inequity within the educational system. A barrier to parent involvement may not be just low-income but rather how some schools provide more resources dependent on the surrounding area. An area of growth exists here for teachers to be more informed about what schools in high-income areas

provide their students versus schools in low-income schools, and to be aware that minority parents should not be grouped as "un-involved".

Parent's self-efficacy has also been viewed as a barrier to parent involvement (Green et al., 2007). Self-efficacy refers to the belief that one can be successful in whatever one intends to do (Banduara, 1989). Hoover-Dempsey and Sandler (1995, 1997) state that parents will be involved if they feel that they possess the skills to help their students. For example, if the parents feel like they do not have the skills to help with their child's mathematics homework, then their self-efficacy may be low, and they may avoid giving assistance. Here lies the opportunity for educators to form relationships with parents to discuss the various ways parents can be involved. Parents do so much for their children and may not even realize how impactful they already are. Educators forming relationships with parents could also allow parents to network with other parents and share their ways of helping their children. Parents bring a wealth of knowledge to the table and should be provided opportunities to share all that they do. Parents knowing how impactful they already are can hopefully increase their self-efficacy in assisting with their children's education, thus leading to students receiving more support outside of school.

Deslandes and Barma (2016) also sought to study parent's perspective of involvement with their high school student's academics. The participants included 409 secondary-level parents from five public schools in Quebec, Canada. The responses were coded through various categories where the main concepts fell

under home-school relationships and parenting. The findings included that parents believe their role in their child's education is to provide support, reinforcement, encouragement, communication, direction, modeling, overseeing, and teaching. Deslandes and Barma (2016) also found that students often rarely ask for help or show that they want to share their work with their parents. Parents feel as though they are expected to be involved in their child's work at home, but they face pushback from their children, making the process complicated. Parents are unsure if they are to have their children develop their academic responsibility by high school or if parents should strive to maintain oversight of their child's education. Suppose parents know how valuable they already are to their children's academics without knowing the academic content. In that case, they may be more likely to feel confident and less unsure in assisting. A potential parental boost in confidence may increase self-efficacy and allow parents to counteract any student's pushback. As for home and school activities, parents reported that complications emerge when there are too many parents at parent-teacher events, and there is not enough time for parents to talk with their children's teachers. Schedule conflicts also arise, putting a constraint on participation. Parents also mentioned that they typically only receive teacher's contact when problems occur in the classroom. Here lies an opportunity for educators to stop being a barrier to parent involvement and rethink communication with families by actively listening and addressing parent's

feedback. Table 3 summarizes the opportunities available in reaction to the parental involvement barriers presented in this section.

Table 3. Barriers to Parent Involvement

Publication Authors, Date	Barriers to Parent Involvement	Opportunities
Thompson, (2008)	Many programs focus on how parents can participate to meet school agendas or needs with traditional at-school involvement	Developing programs that focus on parent needs and how schools can be of service
Auerbach, (2007); Curry and Holter (2019)	Literature often defines parental involvement inconsistently while limiting with all the ways parents show involvement	Raising awareness of various parent involvement and acknowledging all that parents do
Campbell et al., (2016); Ecceles and Harold, (1996)	Parents are unsure how to get involved	School systems should help parents see how valuable they are and allow opportunities to have parents share tips with other parents
Erdener and Knoeppel, (2018)	Family income has a significant impact on parent involvement	De-bunking the misconception that parent's involvement takes a lot of physical time and must be done out of the home
Green et al., (2007); Hoover-Dempsey and Sandler, (1995, 1997)	Parents low self-efficacy in assisting their children with their schoolwork	Increasing parental self-efficacy in assisting their students by discussing all the ways in which parents are already positively impacting their children's academics
Lechuga-Peña et al., (2019)	White mothers were less likely to be involved in some school-based activities than Black and Latina mothers	Teaching educators about minority parent involvement misconceptions
Deslandes and Barma, (2016)	Parents are unsure how to help and face push back from their children, schedule conflicts with school events, and not enough time with teacher	Partnering with parents to gain feedback, listen to needs, and acknowledge all that they do, thus potentially raising parental self-efficacy and boosting parental confidence to contradict student pushback and resistance

Theoretical Framework

This study's theoretical framework is drawn from multiple models: the Cultural Proficiency Model, Self-Regulation Theory, and Self-Efficacy Theory. The Cultural Proficiency Model (Cross et al., 1989) aims to move away from viewing students as underperforming, to viewing our schools as underserving. Schools are underserving students by not recognizing that parents do so much for their student's education within the context of their own homes. This asset-based approach to parental involvement fosters the notion that parents already contain within them the power to be of great assistance, regardless of their education or background. It is not that students are underachieving because they choose to, but rather that educators fail to serve the communities and families by not recognizing inequities within the school system. It is unjust for a school to offer a single math night or hold parent-teacher conferences, and because the attendance was low, that means parent's do not want to be involved (Hill & Torres, 2010). It is also unjust to say our student's parents choose not to be involved without considering the educator's role in parent involvement. Educators should learn that parents may be hesitant to participate in a school system where they were treated unjustly or in a place where they may not feel welcome.

While teachers play an essential role within parent involvement, so does school leadership (Barr & Saltmarsh, 2014). Leaders in schools can help dismantle the systematic structures and improve cultural proficiency by vocalizing how it is not the parent's sole responsibility to seek involvement in their child's

school. Instead, it is the school's responsibility to lend a welcoming hand to the parents. This welcoming hand should not just be extended once or twice, but repeatedly. It is not what parents can do for educators, but what educators can do for parents, and changing this dynamic is vital for leaders. School leaders should be enticed to strive for parent involvement because when parents are involved, schools succeed. If parents are involved, students feel more encouragement and connectedness to their school, which would also play a role in decreasing discipline. When discipline is decreased, it frees up time for school leaders to focus on other aspects of their job.

Acknowledging parents for what they already do could increase parent's self-efficacy when it comes to assisting their students. The belief that parents must know how to solve the math students bring home is a false presumption, and educators have the opportunity to show parents the contrary. Parents could benefit from discussing with other parents how they hold high expectations and how they use indirect involvement, which helps foster student achievement (Wang & Sheikh-Khalil, 2014; Chen & Gregory, 2009; Fernández-Alonso et al., 2017; Loughlin-Persnal & Bierman, 2017; Barwegen et al., 2004; O'Shea et al., 2010; O'Sullivan et al., 2014; Vukovic et al., 2013; Veas et al., 2019; Yan & Lin, 2005; Herges et al., 2017; Fan et al., 2012; Santana et al., 2019). Positive parent-child communication can be developed through parents sharing resources and ideas. Educators can help to create this space by building two-way relationships with parents. Students internalize their parent's messages, and

these messages form their emotional and cognitive outline (Grolnick & Ryan, 1989; Wigfield & Eccles, 1992; Chouinard et al., 2007; Grusec, 2011). When parents utilize strategies that they already equipped to portray, their student's self-regulation skills could improve. An increase in student self-regulation skills could then also aid with mathematics achievement.

Many studies in this literature review include questionnaires and surveys, with a few that engage in change of practice. An area of growth exists here to focus on training educators on how they can better serve and listen to parents and establish relationships so informative discussions can occur. Parents are often unsure how to be involved but want to be involved (Campbell et al., 2016; Ecceles & Harold, 1996). When educators step back and think involvement is solely on the parents, a significant injustice is created. It is not the parents that need the changing and training, but the school systems.

Often parents cannot attend school meetings due to their schedules (Deslandes & Barma, 2016). Schools setting meetings at inconvenient times for families further perpetuate a system of privilege in which some parents can be present for parent-teacher events while others cannot. Even if parents do have childcare and do have the time to attend, it may be undesirable for parents to enter a space where they may feel uncomfortable because our school systems cater to some groups and provide a disservice to other groups (Faber, 2015). Educators have the opportunity here to listen to what would work best for parents

and work to accommodate them rather than making decisions without parental input.

Self-Regulation

Parent involvement stems from the ultimate goal of helping students. With the notion of providing help to students, Costa (1985) suggests that students need to be taught how to think, which can be accomplished directly through creating an environment that encourages risk-taking with trust, respect, and value of thinking through acceptance of various responses. Teaching students how to think involves self-regulation. Pintrich (2000) states that learners must set goals for their learning and then regulate and control their thinking, behavior, and motivation through those goals. In years to follow, Pintrich (2004) named the stages as: planning, forethought, and activation; monitoring; control; and reflection and reaction. Dweck and Leggett (1988) also noted that a student who is skilled in self-regulation is aware of their strengths and weaknesses and has many strategies that they can use to handle academic task challenges. Zimmerman (2002) adds that self-regulation is not just the actions one uses to help against the task at hand, but also about being aware of the need to gain knowledge to perform in the current conditions. For example, if a student does not understand a specific part of a lesson, the student should then be aware that they should take action to help aid themselves in the path to understanding. Students with self-regulation strategies are also confident about learning new skills and urge themselves to do so. Students can learn how to self-regulate, and

the processes can lead to an increase in achievement and motivation (Schunk & Zimmerman, 1988).

Stormont et al. (2013) found that parents who had a low level of comfortability communicating with their child's teacher and low contact with that teacher had children with low levels of self-regulation skills. When parents do not feel comfortable interacting with their child's teacher, it is not parents who need to change, but teachers. Working towards making parents feeling more comfortable communicating with teachers can be created when a two-way communicative relationship is built between parents and teachers. Once a higher level of comfortability is established, teachers can share with parents how beneficial they already are in helping their students with their academics. An increase in parents knowing how helpful they already are could help aid in parental self-efficacy in helping their students, which may also increase their child's self-regulation skills.

Zimmerman (2008) also focused on self-regulation in three separate phases: the forethought phase, the performance phase, and the self-reflection phase. The forethought phase focuses on the task, what is expected, and includes an interest in the task's value. Goals are also set in this phase, and a plan is formed on how to approach the problem itself. Next comes the performance phase, in which the students will choose a strategy and consider if that particular strategy is working or not. It is here that students should consider if they need help, if adjustments need to take place to their plan, or if they want to continue with the task. The last stage is the self-reflection phase, in which

students should evaluate how much effort they put into the task, what did and didn't work, and if there are other approaches they could have taken.

Self-Efficacy

Self-regulation tied with motivation was also expanded to include the idea of self-efficacy (Bandura, 1997). Self-efficacy is the idea that one's own ability to succeed is dependent on the task or the specific situation. Students are more likely to achieve the goals they have set within the classroom when they see that their teachers believe in them, validate their efforts, and notice their success without applying too much attention to that success. The Expectancy-Value Theory (EVT) explained by Ecceles and Wigfield (2002) also plays a role in the theoretical framework. EVT indicates that parents also affect student's self-efficacy and academic performance through the expectations, communication, and the behavior that parents show. The way the students perceive their parent's messages then impacts their achievement academically.

Self-efficacy also applies to parents in their ability to help their students learn. Parent's low self-efficacy has also been viewed as a barrier to parent involvement (Green et al., 2007). The efficacy positions that parents have will guide their actions regarding how involved they are in their children's education. Research has indicated that the higher level of self-efficacy a parent possesses, the more likely they are to be involved in their children's school (Park & Holloway, 2013). Parents are also more likely to become more involved when they believe

that their specific involvement with their students will make a difference (Bandura, 1977, 1984, 1986).

Yamamoto and Holloway (2010) suggest that when parents are given information on helping their students, their self-efficacy can be increased. If parent's self-efficacy is increased, they would most likely believe that they are capable of helping their students. With an increase in self-efficacy, parents can use indirect involvement, otherwise known as academic socialization; to communicate factors shown in the literature such as high expectations. Academic socialization and high expectations can help students improve their self-regulation skills. With these strategies in place at home, it is possible an increase in math achievement can occur.

Parent involvement becomes a social justice issue when it is found that parents who experienced positive school satisfaction are more likely to be involved in their student's education (Hill & Taylor, 2004). If academic achievement is enhanced by parental involvement, then those parents who experienced low satisfaction in their education may, in turn, have children who are at a disadvantage. In addition, if parents of students were born outside of the U.S., Turney and Kao (2009) indicated that they might not realize that they should be involved in their student's education because parental involvement expectations may differ from their home country. Here lies an opportunity for educators to build relationships with parents, which consider that parents may

not want to be involved with their child's schooling because of their own unsatisfying personal school experience.

Educators should develop relationships with parents in which parents are heard and respected. Discussions could then occur about parent's experience with involvement and their experience with their student's math homework. Parents should also be asked what they want to know and how educators could better support them. Gathering information on what parents want to know and how they feel could create more genuine interactions between parents and educators. Having two-way communication rather than "parent training" can avoid a banking system mentality. A banking system is when educators provide one-way teaching to others without reciprocal exchange. Brookfield (2013) states that adults respond positively and are more likely to be invested when they feel like they share power in a democratic exchange, which is why relationships have to be carefully formed.

Summary

The history of mathematics in the United States has included various efforts to increase the level of understanding so that students will be more equipped for their future. With the importance of mathematics knowledge being stressed repeatedly, parents feel an urgency to help with homework but often do not know the content and delivery to which the mathematics is now being taught in current classrooms. Many barriers confront parent involvement, and the view of parents as a deficit is one that must be changed. Chapter three will discuss the

research and methodology for this study, along with the purpose statement, problem statement, and research questions. A deficiency model of what the current literature is void of will be presented followed by the details of the study participants, variables, and tests.

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

As mathematics curriculum and pedagogy change, the gap between the way parents learned math and how students are currently learning math continues to widen. Parents want to help their children with their homework but are often unsure how they can help (Deslandes & Barma, 2016). Two main categories of parent involvement are present in this dissertation study which include direct and indirect parent involvement. Direct involvement includes explaining steps on how to work out math problems and is less beneficial than indirect strategies such as expressing high expectations (Chen & Gregory, 2009). Indirect strategies, such as expressing expectations, does not involve a need to know how to solve the math problems, which could make the idea of assisting in math more manageable. This study aims to inform parents and educators on direct and indirect parent involvement strategies by exploring longitudinal, nationally represented data.

There have been some notable deficiencies in the indirect subject-specific parent involvement research. For example, there are no known studies in which parents were commended by educators for the work they are already doing in indirect parent involvement. There are also no known studies where parent-school relationships were built upon uplifting parent's voices and listening to their needs with the end goal of helping students academically with math. Additionally, there are no known studies in which this parent-school relationship-building could

be developed using the data from a large U.S. high school student sample size. There are also no known studies in which parental confidence in helping students with homework was compared to confidence in helping with other subjects. Therefore, there is a need to examine a large high school data set to explore further relationships between parental direct and indirect involvement in student math achievement to inform relationship building between the parent and the school.

Purpose Statement

The purpose of this quantitative study is to examine the effect of direct and indirect parent involvement on mathematics achievement within a large data sample of United States high school students and their parents.

Problem Statement

The responsibility lies within schools to make an effort to form relationships with parents so that trust is developed, and two-way discussions can occur. Parents need to be heard, valued, and acknowledged for what they are already bringing to the table. Regardless of knowing how to solve problems from their children's math homework, parents could already be enhancing their student's success effectively by showing high expectations and indirect involvement strategies. Data from a large United States high school longitudinal study on direct and indirect parent involvement can help provide guidance and information for discussions within the parent-school relationship. Narrow

definitions of parent involvement which highlight and value physical attendance at a school, could leave parents feeling inadequate, validating the need for parent and school discussions around home-based involvement.

Research is full of information on how parent involvement can affect a student. Bamaca-Gomez and Plunkett (2003) found that parent's monitoring of their student's work at home was positively and significantly tied to academic outcomes. Wagner et al. (2005) stated that involvement is essential to deter adverse long-term outcomes for students who show consistent and extreme academic and behavior problems. Higher levels of disruptive behavior, lower levels of prosocial behavior, lower academic skills, lower self-regulation, and concentration problems were found in children whose parents showed lower parent involvement levels (Stormont et al., 2013). With higher levels of parent involvement, children can be encouraged to make more of an effort to learn while being more attentive and obtaining higher self-esteem in viewing themselves as more competent (Izzo et al., 1999; Tusty & Lampe, 1997). Parent involvement is also an influencing factor on student's motivation (Shaver & Walls, 1998; Fan & Williams, 2010). Pavalache-Ilie and Ţîrdia (2015) found a significant positive association between student's intrinsic motivation for mathematics, writing and reading, and higher parental involvement levels. Although parent involvement can be defined in many different ways, academic socialization or indirect involvement, which is parents relaying the importance and the value of education, had the most substantial positive relation among academic

achievement (Wang & Skeikh-Khalil, 2014; Vukovic et al., 2013). In using indirect strategies, parents can also teach their children about self-regulation, which Pintrich (2000) defined as a process in which learners must set goals for their learning and then regulate and control their thinking, behavior, and motivation through those goals.

Research Questions

Based on the need for educators to form relationships with parents, the following research questions have been formed to guide parent-school discussions:

RQ1: To what extent if any, does direct and indirect strategies have on student's mathematics grade point average at the end of their high school career?

RQ2: To what extent if any, does the indirect strategies of how far a parent expects their child to go in school, college discussions, and encouragement have on student's mathematics grade point average at the end of their high school career? To what extent if any, do the direct strategies of helping directly with homework, and helping to put together an educational/career plan have on student's mathematics grade point average at the end of their high school career?

RQ3: To what extent if any, does student's mathematics identity have on student's mathematics grade point average at the end of their high school career?

RQ4: To what extent if any, does parent confidence levels in helping with homework vary among English, math, and science?

Study Rationale

In the study by Loughlin-Persnal and Bierman (2017), parents who participated in an intervention program increased their expectations for their students, and the researchers suggest that one possible reason could be that the parent's self-efficacy could have been increased through participation in the intervention program. The parental levels of self-efficacy in helping with homework in various subjects were not accounted for by Loughlin-Persnal and Bierman (2017). In this study, parental self-efficacy will be examined by comparing how parents rated their confidence in helping with math, science, and English homework. Mathematics as a subject matter can be intimidating, and parents should have a space to share with other parents how they feel. The responsibility lies within the school to help form these spaces, but this cannot occur without building trust between educators and parents. The beginning of trust-building comes from educators recognizing parents as assets and not treating them as deficits. One way to start this process is to reveal how impactful parents are by using data from a nationally representative survey, which this study aims to do.

A call for parents to be educated on indirect involvement is made by Vukovic et al. (2013). This call perpetuates the idea that parents need to be educated and are not equipped as they currently are. An alternative way to approach bringing awareness to indirect involvement is to have two-way discussions between parents

and educators on these topics using data as the main conversation point. Parents do not need to be 'talked to' but need opportunities to 'talk with' other parents and educators. The group that should actually be educated, is the educators themselves. The deficit mindsets related to parents is widespread throughout schools. Many teachers believe that parents do not want to help their children with their academics, especially if those parents do not attend on-campus events. Educators themselves should be trained on how valuable parents are and how much of an impact they can have without ever coming to campus. This study aims to examine the effect parents can have at home on student achievement so that the data can be shared with educators.

Thompson (2008) revealed that often parent involvement programs and initiatives focus on how parents can change to meet the school's agendas or needs. For example, to meet a school goal of more parental involvement, educators may encourage parents to attend school events such as back-to-school nights or math game nights. In reality, the school may want increased attendance from parents to benefit and achieve the school's quantitative goals. This study also aims to inform educators about the value home-based parent involvement can have on high school academic achievement. The information from this study can also help open up the parent involvement definition, which is typically contained within physical attendance when in reality, parents do so much at home and do so much that is unseen (Auberbach, 2007; Curry & Holter, 2019).

In the study by Erdener and Knoeppel (2018), family income significantly impacted parent involvement. This study will aim to dismantle the misconception that parent involvement takes a lot of physical time, which families of lower income tend to have less. This study can accomplish this by examining how home-based involvement can impact student mathematics scores.

Deslandes and Barma (2016) discuss how parents are unsure of how to help their students, and when they do help, they face pushback from their children, making it a challenge to be involved. This finding provides educators an opportunity to discuss with parents that they are not alone if they also feel this way. Educators could facilitate groups in which parents can support each other and share their experiences with involvement in their children's academics.

Bandura et al. (1996) showed that the level of academic self-efficacy and aspiration parents had directly related to the child’s perceived level of academic efficacy and aspirations. The study by Bandura et al. (1996) was performed almost twenty years before the data used for this dissertation study was collected. More recent information about parental aspirations and expectations collected from a large United States data sample could help in formulating discussions between educators and schools. The information about indirect parental involvement, such as parental aspirations and expectations, shared within parent-school discussions could increase parental self-efficacy, thus increasing student's self-regulation skills, leading to an increase in math scores. This study could spark leaders to encourage educators to reach out to parents and work on forming relationships

where discussions on at-home parent involvement could occur. This relationship-building between the parent and the school could ultimately lead to a more connected community in which more parents feel included.

Research Design

Domain and Participants

This quantitative study used data derived from the High School Longitudinal Study of 2009 (HSLS: 09), whose purpose was to "explore secondary to postsecondary transition plans and the evolution of those plans, the paths into and out of science, technology, engineering and mathematics; and the educational and social experiences that affect these shifts" (Ingels et al., 2011, p. p. iii). The data from HSLS:09 is a study that is nationally representative and begins with ninth graders and follows them through their high school and post-high school experiences. The HSLS:09 is valuable because, as a nationally representative study, the participants create the ability to generalize information to all of the United States in 2009. The HSLS:09 data set was also selected because there is a recent call for researchers in education to use datasets with a large sample size to inform policy and applied research (AERA, 2014).

HSLS:09 data was conducted in a two-stage stratified sample design for wave one, and a general random sample for wave two. Wave one included 21,444 students, and wave two included a follow-up of those students in their 11th grade year and information from almost 2,000 more students, which overall yields a sample size of 23,415. The 944 schools within this study included public

schools, private schools, and charter schools. The variables within the HSLS:09 focused mainly on mathematics and science education as well as information from parents, school administrators, counselors, and teachers of math and science. Surveys were administered electronically or by phone. The HSLS:09 stratified sample required an analytic sampling weight for each participant equal to the probability of selection inverse (Strayhorn, 2009). Balanced repeated replication (BRR) was also used to conduct variance estimation and was applied before running any statistical tests.

Dependent Variable

This study's dependent variable was coded as X3TGPAMAT and represents the GPA for student's mathematics courses in their senior year (2012). Scores in this variable ranged from 0.2 to 4.0. Of the students in the baseline 2009 data collection, 92% of transcripts were received, as shown in Table 4.

Table 4. Transcripts Received by School Type

School type	Number of transcripts requested	Number of transcripts received	Percent
Total	846	744	87.9
Base-year	754	690	91.5
Transfer	92	54	58.7

SOURCE: U.S. Department of Education, National Center for Education Statistics. High School Longitudinal Study of 2009 (HSLS:09), 2012 Update

Independent Variables

Three types of independent variables were used for this study: direct parent involvement strategies, indirect parent involvement strategies, and a potential student characteristic that parents could work to improve within their students by utilizing indirect strategies. For direct parent involvement, the following variables selected were P1HWOFTEN and S1PLANPRNT. P1HWOFTEN refers to how often the parent stated they helped with their student's math homework. The question asked in the survey was, "during the school year, about how many days in an average week do you or another adult in your household help your ninth grader with homework?" Response options included: never, less than once a week, one or two days a week, three or four days a week, or five or more days a week. The P1HWOFTEN variable of helping the child directly with homework falls into traditional involvement as defined by Chen and Gregory (2009).

The second variable used to classify characteristics of direct parent involvement was S1PLANPRNT. The survey question asked students, "who helped you put your education and career/education/career plan together?" The response options included a counselor, a teacher, or parents. The S1PLANPRNT was asked only if the respondent stated that they had put together an education and or career path. The descriptor word of 'helping' provides the rationale for including this variable as a direct strategy in parent involvement.

The following variables were selected for indirect parent involvement: X1PAREDEXPCT, P2DISCCLGAPP, and S1MPARENT. X1PAREDEXPCT referenced how far in school the parent thinks the ninth grader will go. Response options included: less than high school, high school diploma or GED, start an Associate's degree, start a Bachelor's degree, complete a Bachelor's degree, start a Master's degree, complete a Master's degree, start a Ph.D/M.D./Law of another professional degree, complete a Ph.D/M.D./Law of another professional degree, or do not know. Parent's expectations stem from the definition of indirect involvement (Vukovic et al., 2013) which provides the rationale for inclusion of the variable X1PAREDEXPCT as an indirect involvement characteristic. P2DISCCLGAPP is the variable used to refer to parents discussing with their children applying to college/other schools after high school. The parent survey asked, "since the start of the 2011-2012 school year, how often have you discussed the following with [teenager]?" The responses available for selection were: never, once or twice, three or four times, or more than four times. In addition to parents having high expectations for their students, discussions about the future classify as a characteristic of indirect parent involvement (Vukovic et al., 2013). The last independent variable was S1MPARENT, which indicates why the ninth grader was taking math in fall 2009. Students were asked, "why are you taking your fall 2009 math course?". The responses included: enjoy math, enjoy challenge, had no choice, school requirement, school counselor suggested it, parents encouraged you to take it, no other math courses were offered, it is

needed to get into college or succeed in college, it is needed in your career, it was assigned to you, or it is not known. Parental encouragement is included in the definition of indirect parent involvement (Wang & Sheikh-Khalil, 2014), which justifies the inclusion of the S1MPARENT variable as an indirect parent involvement strategy.

The last independent variable added in this dissertation study was X1MTHID. X1MTHID is the variable name for student's mathematics identity scale. Students who identified with the statements, "I see myself as a math person" or "others see me as a math person" were given higher values on a continuous scale. The reliability coefficient, or Cronbach's alpha, for the scale used in this variable is 0.84. According to Henson (2001), the desired level of internal consistency which helps determine if item responses measure the same construct is >.80. X1MTHID was selected as an indirect parent involvement strategy because studies have shown attitudes toward math, and a child's choice to pursue math, is influenced heavily by how difficult parents believe math is for their child, and by their parental attitudes towards the subject (Grolnick & Ryan, 1989; Wigfield & Eccles, 1992). Eccles and Jacobs (1986) also discovered that when mothers told their daughters that they were not good at math when they were in school, their daughter's achievement immediately went down. Chouinard et al. (2007) discovered that parents have a strong influence on their child's value of math. Yamamoto and Holloway (2010) suggest that students internalize their parent's thoughts. With good intentions, people often try to level with others by

saying, “they were never good at math” or “they never were a math person” which could translate to students internalizing the same ideas about themselves, thus impacting mathematics achievement. The question then remains that if student's mathematics identity is nurtured through indirect parent involvement strategies, could this help with student mathematics achievement?

Data Analysis

Linear regression is a statistical test that was first introduced in 1894 by Sir Francis Galton, which defines and quantifies the considered variable relationship (Chang, 2003). In this study, a multiple linear regression was used to explore the main research question. In linear regression, the equation $y = mx + c$ describes the line of best fit in correspondence to the dependent variable, the y; and the independent variable, the x. The r2 provided is the regression coefficient describes the degree of variability of the dependent variables due to the independent variable (Elezar, 1982). In multiple linear regression, two or more predictor variables are used to predict the dependent variable (Pallant, 2013).

Assumption Testing

Four assumptions need to be examined when using linear regressions: the errors must be normally distributed, the dependent and independent variables create a linear relationship, homoscedasticity is examined, and the residuals remain independent (Osborn & Waters, 2002). Variables need to be examined for distribution, otherwise known as normality, because if they are not

normally distributed, the significance tests and relationships could be inaccurate. Linear relationships between the dependent and independent variables are also important because if the relationship is not linear, the actual relationship could be under-estimated. Homoscedasticity is assurance that the variance of errors remains the same throughout all of the independent variables. Checking for homoscedasticity is important because, without homoscedasticity, the analysis can be weakened by false findings. Residuals also need to be made sure they are independent because if they are not, which is called autocorrelation, then the model's accuracy can be reduced (Osborn & Waters, 2002).

Strengths and Limitations

The strengths of using the HSLS:09 data set are that the sample size is large, and there is confidence to be found in using national collection methods (Carter, 2003). Using a regression is also a strength because it allows for flexibility in selecting the independent variables that can be dichotomous, discrete, or even continuous (Yockey, 2011). The limitations include the reliability of self-reported responses. Perceptions of what the respondent should say could influence their selections, and if the respondent does not fully understand the question or the vocabulary, their answers can also be influenced (Mayer, 1999). The dependent variable can also be viewed as a limitation because GPA can be based off teacher's beliefs making it subjective. Another limitation in this study is that in regression analysis, the underlying casual process can never be genuinely identified (Plano et al., 2010).

Positionality of the Researcher

My first teaching job was in Redondo Beach, CA, where the median income in 2018 was $121,690 (census.gov). My second teaching job was in Compton, CA where the median income in 2018 was $41,500. My current teaching job is in Menifee, CA, where the median income in the city is $74,684. I taught math in all three schools from sixth grade to 12th grade. These settings were very different with varying demographics, but one thing remained constant: parents wanted to help their students in math but felt like they could not. I repeatedly heard that parents did not understand the material or that they were not taught this “common core stuff”. They seemed conflicted, wanting to help their child with the subject most students struggled with, but at the same time, when they looked at the math material, it seemed overwhelming, daunting, and confusing. Parents frequently expressed that they didn’t know what to do or that they just “were not good at math”.

At the time, I jumped right in and told them I’d be the one to help. I would offer extra tutoring, and I would help in any way that I could, which in retrospect, I now regret. I do not regret offering help, but I do regret the image that I was portraying, which told parents they couldn’t help without knowing how to do the math. I wish I knew then, what I know now, from the information I have learned in this literature review so that I could tell the parents that they can help, and they are already helping, even if they feel like they do not know the math. I wish I could go back in time and tell them just how valuable they are and how much of

an asset they are to their child's education regardless of knowing how to solve any of the problems in their child's math homework.

Summary

This quantitative study examined data from the HSLS:09 longitudinal study. The selected variables were used in a multiple linear regression to explore the relationship between indirect and direct parent strategies and student mathematics GPA. The data was also used to explore the self-reported confidence levels parents felt in relation to helping with math homework, science homework, and English homework. Assumption testing was conducted before statistical tests were run. In chapter four, results will be presented and detailed.

CHAPTER FOUR

RESULTS

This chapter presents the data analysis results for the study that investigated direct and indirect parent involvement strategies and their effects on student's mathematics GPA using data from the HSLS:09 nationally representative longitudinal study. The main research question for this study were "what effect, if any, does direct and indirect strategies have on student's mathematics GPA at the end of their high school career?" and, "how does parental confidence in helping with math homework compare to parental confidence in helping with English or science homework?"

Assumption Testing

Tests for Normality

Within R, a Normal Q-Q plot was used to investigate the normality of the residuals that resulted from the model. Following the Normal Q-Q plot analysis, the Shapiro-Wilk and Anderson-Darling significance tests were used to check further into the normality. Figure 1 represents the Normal Q-Q plot.

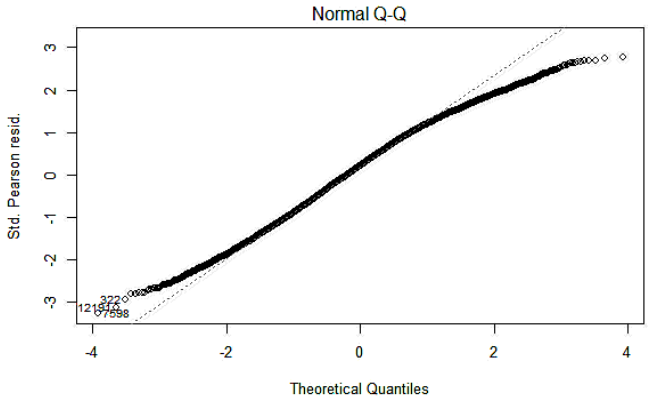

Figure 1. Normal Q-Q Plot

A problem is presented here with the Normal Q-Q Plot due to the fact that if the residuals were normally distributed, the scattered points are expected to follow the dashed line provided (Fields, 2009). If the scattered points deviate from the dashed line, we may conclude that there is deviation from normality. A number of points in this Normal Q-Q Plot do not follow the dashed line and so we can conclude that the residuals do not reflect perfect, normal data. To investigate further, the Shapiro-Wilk Test was performed. The null hypothesis in significance tests for normality is always that the data are normal distributed while the alternative hypothesis is the data are not normally distributed. The Shapiro-Wilk Test can only be used for sample sizes of 5,000 at maximum and so 5,000 values were sampled from the residuals (Oztuna et al., 2006). The Shapiro-Wilk Test for normality resulted in a $p < .001$, which is less than the alpha value of 0.05. As a result, the null hypothesis that the data is normally distributed, is

rejected in favor of the alternate hypothesis. Next the Anderson-Darling Test was performed which yielded a p-value < 0.001 and because the p-value is less than 0.05, we can reject the null hypothesis of normality and conclude again there is statistical evidence the data are not normal (Oztuna et al., 2006).

Within large survey data sets, even if the error distribution is not normal, it is acceptable because of the Central Limit Theorem. The Central Limit Theorem states that as a sample size gets larger and approaches infinity, the distribution of the sample approaches normality no matter what the parent population shape is. The 25,503 observations in this data set classifies as a large sample size and we can conclude that the normality assumption is not an issue (Pallent, 2007).

An examination of the data plots was performed to look at the normality. To test linearity, residual plots were examined. For homoscedasticity, the standardized residuals were compared with the predicted values. The reliability was also examined through the codebook which was provided for the HSLS:09 data (Ingles et al., 2013).

Tests for Independence

Another assumption that must be tested is that the residuals in a linear regression should be independent and not autocorrelated. Serial autocorrelation occurs when values tend to depend on the previous values. In spatial autocorrelation, the dependent variable may at certain locations depend on values that are nearby. To examine autocorrelation, the residuals on the y-axis are plotted against the spatial dimension, or time, on the x-axis. When a pattern

is presented in this plot, then the residuals are not independent. If the sample does have spatial dimension, or time, the residuals can be plotted against the order in which the data was collected. If a pattern is then revealed, we can conclude that the residuals are not in fact independent.

The Durbin Watson Test can also be performed in an effort to check for independence. The Durbin Watson Test statistic will always have a value that ranges from zero to four, and a value of two means there is no autocorrelation found within the sample. If the value ranges from zero to less than two, this would indicate autocorrelation in a positive manner. If the value produced is greater than two or up to a value of four, this would indicate autocorrelation in a negative manner. Typically, a value between 1.5 and 2.5 would be considered to be normal. In this data set there is no spatial dimensions or time used and so the way to check for residual independence would be through a Residuals and Order Plot, or through the Durbin Watson Test. The Residuals and Order Plot provides the residuals on the y-axis, and the order the data was collected on the x-axis. Figure 2 shown below does not reveal any pattern and the residuals are independent.

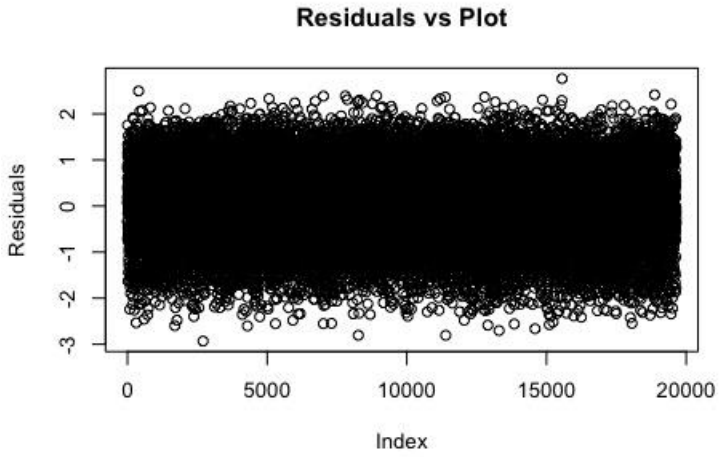

Figure 2. Residuals vs Plot

The Durbin Watson Test was also employed and produced a statistic value of 1.99 which is approximately two, meaning the residuals are independent. The Durbin Watson Test for independence resulted in p = 0.858, which is greater than the alpha value of 0.05, so we fail to reject the null hypothesis that the residuals are not autocorrelated. Checking the Variance Inflation Factor (VIF) can also check on issues such as independence, which is also called multicollinearity. When a variable shows an VIF > 10, multicollinearity is present. When the VIF was checked for this data, the values ranged from 1.01 to 1.78 indicating there is no multicollinearity present.

Tests for Linearity

The Residuals versus Fitted Plot was used to examine the assumption of linearity. The red line indicated in Figure 3 is nearly horizontal which means that there is not a trend and so linearity is not a problem, and the assumption is valid.

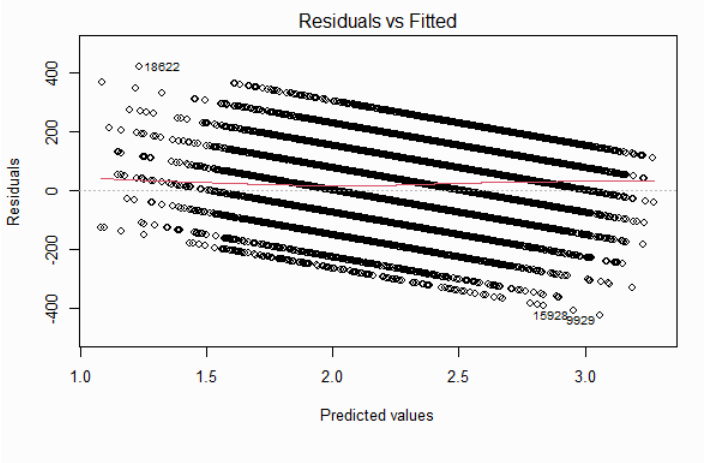

Figure 3. Residuals vs Fitted Plot

Tests for Homoscedacity

The last assumption of a linear regression that needs to be examined is that the residuals have constant variances. If the residuals have constant variance, then the residuals are therefore homoscedastic, and the assumption is valid. A Scale-Location Plot was used to examine the homoscedasticity of this data set. As seen in Figure 4, there is no particular pattern that is shown. The red line is also nearly horizontal and so we can conclude that the residuals are in fact homoscedastic.

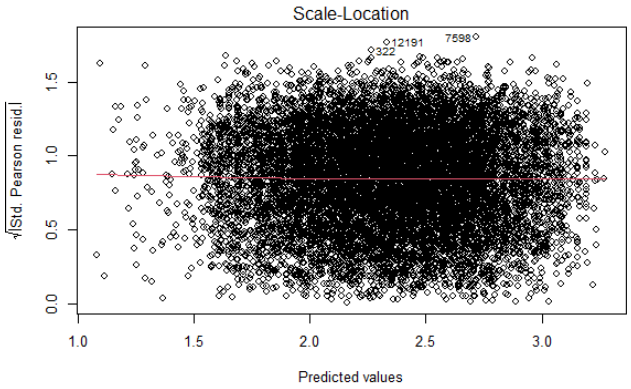

Figure 4. Scale-Location Plot

Tests for Outliers

To check if there are any outliers in the data, a Residuals vs. Leverage plot was created (see Figure 5). As seen in the figure below, all points are within the standardized residuals of -3 and 3 and so we can conclude that this data set does not contain any outliers. The Cook's Distance also does not exceed a value of one and so we do not have influential points.

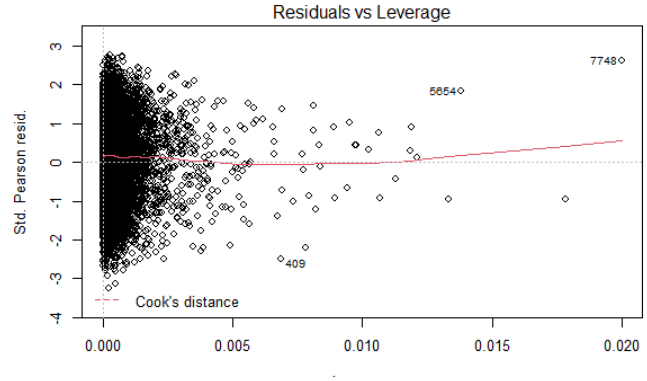

Figure 5. Residuals vs Leverage Plot

Sample Demographics

In the base year of the HSLS:09 study, 0.6% of students identified as American Indian/Alaska Native; 8.7% identified as Asian, non-Hispanic; 10% identified as Black/African American, non-Hispanic; 1.6% identified as Hispanic, no race specified; 13.9% identified as Hispanic, race specified; 8.2% identified as more than one race, non-Hispanic; 0.4% identified as Native Hawaiian/Pacific Islander, non-Hispanic; and 56.6% identified as White, non-Hispanic. The sex make-up consisted of 50.1% of individuals identifying as male and 49.9% identifying as female. The participants came from schools across the Northeast, Midwest, South and West regions of the United States with majority of school being public. All students in the base year were ninth grade students.

Descriptive Data

The descriptive statistics for the independent and dependent variables are presented in Table 5 shown below and are representative of the entire data set. The table shown presents the number of respondents, median, standard deviation when applicable, and minimum and maximum values for each variable. Before the analysis was run, the data was subjected to data cleaning in which numerical values for missing data was set to the scale of missing. The data was also weighted using the variable of W3W1W2STUTR which was used to make estimates from the sample data representative of the target population. Weighting also accounts for differential patterns of nonresponse, and also for differential selection probabilities (Ingles et al., 2013). The replicate weights that

were associated with the sampling weight of W3W1W2STUTR included W3W1W2STUTR001 though W3W1W2STUTR200 and were used to carry out the Balanced Repeated Replication (BRR) method. This standard error calculation using replication technique calculates appropriate standard errors based on differences from the subsamples created through the replicates and compares it to the estimates from the full sample. Although the Taylor-Series Linearization standard error technique is more commonly known, this technique can only be applied with the restricted use data set which provides primary sampling units (PSU) and strata identifiers to calculate the correct standard errors.

Table 5. Descriptive Statistics

Variables	N	Median	SD	Min	Max
INDEPENDENT VARIABLES					
Parent's Expectation of Education Level (X1PAREDEXPCT)	23,503	10		1	14
1: Less than high school	55 (0.23%)				
2: High school diploma or GED	1,293 (5.5%)				
3: Start an Associate's degree	149 (0.63%)				
4: Complete an Associate's degree	1,199 (5.1%)				
5: Start a Bachelor's degree	133 (0.57%)				
6: Complete a Bachelor's degree	4,952 (21.07%)				
7: Start a Master's degree	76 (0.32%)				
8: Complete a Master's degree	3,355 (14.27%)				
9: Start Ph.D/M.D/Law/other prof degree	37 (0.16%)				
10: Complete Ph.D/M.D/Law/other prof degree	3,782 (16.09%)				
11: Don't know	1,725 (7.34%)				
12: Unit non-response	6,715 (28.57%)				
13: Missing	32 (0.14%)				
Discussing Applying to College (P2DISCCLGAPP)	23,503	6		1	9
1: Never	793 (3.37%)				
2: Once or twice	1,360 (5.79%)				
3: Three or four times	1,596 (6.79%)				
4: More than four times	4,303 (18.31%)				
5: Item not administered: abbreviated interview	473 (2.01%)				
6: Component not applicable	12,279 (52.24)				
8: Unit non-response	2,603 (11.08%)				
9: Missing	96 (0.41%)				
Taking fall 2009 math b/c parent(s) encouraged it (S1MPARENT)	23,503	1		1	5
1: No	16,143 (68.6%)				
2: Yes	2,879 (12.25%)				
3: Item legitimate skip/NA	2,113 (8.99%)				
4: Unit non-response	2,059 (8.76%)				
5: Missing	309 (1.31%)				

Helped ninth grader with homework (P1HWOFTEN)	23,503	3		1	8
1: Never	3,507 (14.92%)				
2: Less than once a week	4,612 (19.62%)				
3: One or two days a week	5,130 (21.83%)				
4: Three or four days a week	1,675 (7.13%)				
5: Five or more days a week	787 (3.35%)				
7: Unit non-response	6,715 (28.57%)				
8: Missing	1,077 (4.58%)				
Parent(s) helped put together education/career plan (S1PLANPRNT)	23,503	2		1	5
1: No	5,538 (23.56%)				
2: Yes	7,326 (31.17%)				
3: Item legitimate skip/NA	7,829 (33.27%)				
4: Unit non-response	2,059 (8.8%)				
5: Missing	751 (3.2%)				
Scale of student's mathematics identify (X1MTHID)	23,503	0.038	1.004	-1.73	1.76
DEPENDENT VARIABLE					
GPA: mathematics (X3TGPAMAT)	23,503	2.5		0.25	4
0.25	474 (2.2%)				
0.5	719 (3.3%)				
1	1,868 (8.6%)				
1.5	3,020 (14%)				
2	3,648 (17%)				
2.5	3,793 (17%)				
3	3,621 (17%)				
3.5	2,878 (13%)				
4	1,740 (8.0%)				
NA's	1,742 (7.4%)				

Multiple Linear Regression

Multiple weighted linear regression was used in this study to examine the extent to which the independent variables determined how much variance was evident in student's mathematics GPA. A significant regression equation was found of $F(6, 2755) = 2.0 \times 10^{-15}$. The multiple correlation coefficient (R) is the Pearson correlation coefficient between the independent variables predicted by the regression model and the dependent variable. Evans (1996) referenced that a value of 0.480 for R shows a moderate positive correlation. The R square is the measure of the variance proportion that is explained by the provided independent variables in the model. The R square of 0.19 shown in Table 6 indicates that in this regression the independent variables explained 19% of the variance on student's mathematics GPA.

Table 6. Model Summary

Model	R	R Square	Adjusted R
1	0.44	0.19	0.19

Table 7 reveals a significant relationship between parent's expectation of student's education level and student's math GPA ($p < 0.001$). For parent's expectation of student education level, there was a 0.072717 increase in student math GPA for each increase in parent's expected education level for their child. There was a significant relationship between how often parents discussed

applying to college or other schools after high school and student's math GPA ($p < 0.001$). For how often parents discussed applying to college or other schools after high school, there was a 0.09788 increase in student math GPA for each increase in frequency of discussing applying to college or other schools after high school. There was a significant relationship between if parents encouraged their child to take a math course and student math GPA ($p < 0.001$). If parents encouraged their child to take a math course, then an increase of 0.25809 was found in student math GPA. There was a significant negative relationship between how often a parent helped with math homework and student math GPA ($p < 0.001$). For how often parents helped with math homework, there was a 0.11633 decrease in student math GPA for each increase in frequency of a parent helping with math homework. There was no significant relationship found between a parent helping a student put together their education/career plan and their child's math GPA ($p = 0.554918$). There was a significant relationship found between student's math identity and student math GPA ($p < 0.001$). For student's math identity, there was an 0.22310 increase in math GPA for a higher level of reported math identity from the student.

Table 7. Summary of Weighted Multiple Linear Regression Analysis

Predictor Variables	B	SE B	β	t	p-value
Parent's expectation of education level (X1PAREDEXPCT)	0.07217	0.01	0.17	6.035	< 0.001
Discussing applying to college (P2DISCCLGAPP)	0.09788	0.03	0.10	3.346	< 0.001
Taking fall 2009 math b/c parent(s) encouraged it (S1MPARENT)	0.25809	0.07	0.26	3.557	< 0.001
Helped ninth grader with homework (P1HWOFTEN)	-0.11633	0.03	-0.13	-4.328	< 0.001
Parent(s) helped put together education/career plan (S1PLANPRNT)	-0.03427	0.06	-0.03	-0.591	0.554918
Scale of student's mathematics identity (X1MTHID)	0.22310	0.03	0.22	7.105	< 0.001

B = unstandardized coefficient; SE B = standard error of B; β = Standardized Coefficient; t = t-values.

$\beta_1 = B \times \frac{standard\ deviation(x_1)}{standard\ deviation(y)}$, x_1 *is the first independent variable,* y *is the dependent variable*

In an effort to examine research question four of how parent confidence in helping with math homework compares to parent confidence in helping with English or science homework, an analysis of response selections for each subject within the weighted population was conducted and reported in Table 8. For confidence in helping with English homework, 11% of parents indicated that they were not confident at all at helping, 38% indicated that they were somewhat confident in helping and 51% indicated that they were very confident. For confidence in helping with science homework, 15% indicated that they were not confident at all, 48% indicated that they were somewhat confident, and 37% indicated that they were very confident in helping. For confidence in helping with

math homework, 29% indicated that they were not confident at all in helping, 40% indicated that they were somewhat confident in helping, and 31% indicated that they were very confident in helping with math homework.

Table 8. Weighted Confidence with Math Percentages

Weighted percentages	English	Science	Math
Not at all confident	11%	15%	29%
Somewhat confident	38%	48%	40%
Very confident	51%	37%	31%
	N=15638	N=15629	N=15655

Summary

In this study, assumption testing was administered, and then descriptive statistics were provided for all independent variables and for the dependent variable before a multiple linear regression was run. Positive significant relationships were found between student's mathematics GPA and parent's expectation of student education level, between student's mathematics GPA and how often parents discussed applying to college or other schools after high school, between student's mathematics GPA and if parents encouraged their child to take a math course, and between student's mathematics GPA and student's mathematics identity level. There was significant negative relationship found between student's mathematics GPA and the number of times parents helped with math homework, and there was no significant relationship found

between student mathematics GPA and a parent helping a student put together their education/career plan. In confidence with helping with homework, parents reported to be the least confident in helping with math homework in comparison to helping with English and science homework and were least likely to report feeling very confident in helping with math homework. In chapter five, recommendations for the field of education and recommendations for future research will be presented along with the limitations of this study.

CHAPTER FIVE

RECOMMENDATIONS AND CONCLUSIONS

The purpose of this study was to examine indirect and direct parent involvement strategies in relation to student's mathematics GPA within a set of nationally representative data of ninth graders in the United States. The results showed a significant relationship between mathematics GPA and parent's expectations of student education level. This finding suggests that the higher the educational expectations that parents have for their students will indicate an increase in student's mathematics GPA. Parents employing high expectations is an indirect strategy that has a positive impact on student's achievement and is consistent with previous research (Chen & Gregory, 2009; Loughlin-Persnal & Bierman, 2017; Vukovic et al., 2013; Veas et al., 2019; Yan & Lin, 2005; Herges et al., 2017; Fan et al., 2012; Bandura et al., 1996).

A statistically significant relationship was also found between how often parents discussed applying to college or other schools after high school and student's mathematics GPA. This finding suggests that the more discussions about a student's future indicated a higher mathematics GPA. Parents having academic discussions with their children is consistent with the research that states that this indirect parent involvement strategy is correlated with higher achievement (McNeal, 2014; Vukovic et al., 2013). A statistically significant relationship was also found between parents encouraging their children to take a math course and student mathematics GPA. Encouragement is another indirect

parent involvement strategy that is correlated with higher student academic achievement within research (Hoover-Dempsey & Sandler Model, 1995, 1997, 2005, 2010; McNeal, 2014; Wang & Sheikh-Khalil, 2014; Chen & Gregory, 2009; Fernández-Alonso et al., 2017; Deslandes & Barma, 2016).

There was a significant negative relationship between how often a parent helped with math homework and student math GPA. This finding suggests that the more a parent directly helped with homework translated to a lower student math GPA. This finding is consistent with Vukovic et al. (2013), who stated that directly helping a student with homework can be detrimental to student academic success. The finding in this study is significant because the study by Vukovic et al. (2013) was based on less than 100 second graders, whereas this study is generalizable to all ninth graders across the United States. This finding helps to debunk parent's misconception that they must know how to solve their children's math homework to be able to help their child.

Regarding a parent helping a student put together their education/career plan, there was no significant relationship between this parent involvement action and their child's math GPA. This variable was chosen as a direct parent involvement because of the descriptor word of "helped." If the question in the survey asked parents if they encouraged their child to create an education or career plan or had discussions with them about the education/career plan, this variable would have been classified as an indirect strategy. Regardless of the classification, there was no significant impact on student mathematical GPA if

parents determined that they helped their child put together the education/career plan. Although this variable was not statistically significant, it should be noted that it was found to negatively impact student mathematical GPA, thus coinciding with the idea that direct parent involvement strategies are not beneficial to student's academic achievement.

A significant relationship was also found between student's math identity and student mathematical GPA. This variable was not classified as a direct or indirect parent involvement strategy but was included in this study due to the research indicating that when students believe they are a "math person" and have confidence in their math ability, they have a higher level of academic success (Grolnick & Ryan, 1989; Wigfield & Eccles, 1992; Eccles & Jacobs, 1986; Chouinard et al., 2007). The idea behind the inclusion of this student characteristic was to investigate its impact on student mathematical GPA. The significant relationship between student's math identity and student mathematical GPA suggests that the characteristic of mathematics identity could be an area of focus for parents to develop within their children.

The last research question investigated the confidence level parents felt in helping their students with math homework compared to helping with English and science homework. It was found that the classification of "not at all confident" in helping with homework was the highest for math, and the classification of "very confident" was highest for English, followed by science, with math coming in last. This finding suggests that parents do have apprehension about helping with math

homework which follows the research by Deslandes and Barma (2016), who found that parents want to help but are often unsure how to do so.

Recommendations for Practice and Policy

Parent involvement has historically been viewed in a particular lens in which parents are classified as involved if they show physical involvement at a school. The policies institutions employ that focus on increasing attendance at school events are geared to value white, higher socioeconomic status families that disregard other family backgrounds (Fine, 1993). A step in the right direction of change is for educators to have training and professional development on their own biases and have a space to explore whether they view parents as a deficit or as an asset. Educators should also be given information on the concept of generational echos. Generational echos is the concept that parent's own schooling experience of unfair and unjust treatment lives in the core of their actions, beliefs, and discussions around their child's education (Lawrence-Lightfoot, 2004).

The results generated from this study could further prove that indirect parent involvement strategies such as having high expectations, employing encouragement, and having academic discussions at home with children can positively impact student mathematics achievement. Data taken from the HSLS:09 has now made it possible to generalize the beneficial findings of indirect parent involvement strategies across all ninth grades in the United States. The next step would be for educators to partner with parents and level

the communication playing field. What is meant by leveling the communication playing field is that typically when parents engage with educators, a banking method is employed. Institutions act as the all-knowing entity that contains all the knowledge. The knowledge is fed to the parents without reciprocal communication. Instead, parents should be the ones sharing the bulk of the information. Parents can share their ideas and strategies with other parents on how they carry out involvement such as encouraging their child and how they uphold high expectations. The Cultural Proficiency Model does not look at how to change parents but rather how the institutions can change and so it is the institution's responsibility to create this space for parents to share with one another (Cross et al., 1989).

The majority of teachers are white, and so the experiences and voices of other ethnicities are not adequately portrayed when schools deliver information to parents. A recommendation is that a 'Parent's as a Wealth of Knowledge Group', which could be called PAWK as an abbreviation, could be formed in which parents are treated as the assets they are, and where they can be acknowledged for all their efforts. Parents should be able to bring what works and what doesn't work for them with their children to share with others. Parents should also be able to share what problems and inequities they see in their child's school and a PAWK liaison from the school could help employ a course of action and create equitable changes. These group meetings should also provide transportation,

childcare, translators, various options of meeting times, and a virtual option for attendance to show consideration that all parents should be included.
Due to the lack of confidence found on behalf of parents in helping with math homework, sharing the information found in this study regarding how beneficial indirect strategies are that do not involve directly helping with homework would be beneficial for all to hear.

Mathematics identity was also found to impact student's math GPA significantly. A discussion on how parents could foster this characteristic in their children could be helpful in the PAWK groups. Mathematics identity is the belief that one can do math. Self-regulation is the ability to persevere when tasks are difficult by making a plan and carrying through with that plan (Pintrich, 2000). It is possible that those with higher levels of self-regulatory skills also have a stronger sense of mathematics identity. A recommendation for practice and policy would then be to have parents and educators work together to help develop self-regulatory skills in the classroom and at home which could improve student's mathematics identity.

Limitations of Study

The variables chosen for this study were based on the researcher's classification of what is believed to be direct or indirect parent involvement strategies. The questions within the survey provided wording and the participant's answer choices but did not include a rationale or a more detailed explanation of the intention of the questions. Phrases such as "directly helping

with homework" were interpreted as giving student's the steps to solve their math homework which could be thought of as a direct parent involvement strategy. Alternatively, it could be setting up a quiet environment and directing the child to the resources they have when stuck on a problem, which would be an indirect strategy. Decisions on how to classify the variables as direct or indirect were based on keywords consistent within the research on parent involvement at home which was subjective to the researcher's interpretation.

Mathematics GPA as an indicator of mathematics academic success is also a subjective concept. The grades in which teachers give can be highly biased because grading in general can be influenced by the teacher's perceptions and beliefs about a student or group of students. Another limitation is that parent responses from the survey could also be biased based on the possibility of parents selecting answers that they believe would be the "right" answers. For example, a parent who may have relatively low expectations regarding how far their child may go in school may indicate a higher expected level because they may think it is "better" to believe their child will go further in school. Uncomfortably could also be a limitation. Parents may not have felt comfortable answering questions about their parent involvement at home, and this could have resulted in the low response rates that were present for some survey questions.

Another potential limitation of this study could be not including socioeconomic status (SES) as a control variable. Burney and Beilke (2008)

noted that low socioeconomic status is the most critical factor for student achievement. On average, children from low SES families score one-half standard deviation lower than children who have a higher SES in academic achievement (Duncan & Magnuson, 2005). Possible reasoning for this disparity is that children from lower-income families have less access to rich home learning environments than those who have a higher SES (Bradley et al., 2001). The lack of control for SES in some research caused the results of many studies not to be agreed upon (Herzog & Sudia, 1971). Subsequent studies following comments by Herzog and Sudia (1971) then controlled for SES when researching academic achievement.

On the other hand, some researchers believe it is not necessary to control for SES. The argument of not needing to control for SES stems from the idea that SES is too often defined by only three main components: a parent's occupation, income, and education level. Instead of limiting SES to just a parent's occupation, income, and education level, a family's SES may be attributed to other factors such as parental characteristics like work ethic and emphasizing the value of education. It is the characteristics such as hard work and valuing education that influence a family's SES and a child's academic achievement level (Jeynes, 2002). With this mindset, SES is not solely curated by a parent's occupation, income, and education; but instead, SES can reflect many different parental personality characteristics. The conflict of the make-up of a parent's SES and ultimately a student's academic success is not that easy to define. Most

studies define SES as a parent's occupation, income, and education. The frequent narrow definition attributes SES and student academic success to educational or economic factors, although SES is just not that simple to define. The focus of this study was to examine parent involvement strategies at home to move from a deficit mindset to parents as an asset mindset. The SES variable in the HSLS:09 is comprised of a parent's education, income, and occupation. The inclusion of just these parent factors as the most prominent indicators of student achievement feels as if blame is being placed upon parents. Furthermore, a family's socioeconomic status is not an aspect that educators can attempt to have swift influence over. This study aimed to examine areas of influence in which awareness, support, and praise could be given.

A lack of disaggregated data is also a limitation of this study. Race and ethnicity were not separated in this study, so questions will arise as to if the results were the same for all groups or different for some groups. Having data that breaks down the results into more specific categories could provide valuable information on what type of parent involvement strategies works best for different students.

Limitations also exist in using the term 'parent involvement' opposed to using the term 'family engagement'. In many households, it is an aunt, uncle, grandparent or foster family who cares for a child and so using the phrase 'parent involvement' is limiting and not inclusive of all home situations. The Every Student Succeeds Act of 2015 deliberately changed the term 'parent

involvement' to 'family engagement' which further validates the need to make sure the words we use frequently are not excluding some groups (Every Student Succeeds Act, 2015). In this dissertation study, the phrase 'parent involvement' was chosen only because the HSLS:09 did not use the term 'family engagement'.

Recommendations for Further Research

Many of the studies presented in this literature review focus solely on mothers as participants, so a future recommendation would be to look at differences between father's interactions in comparison to mother's interactions with their children. Examining the strategies used and their effect on their child's academic achievement could give insight into a greater collection of involvement strategies parents use within the home. Another recommendation would be to study what parents want teachers to know about involvement and what parents wish could be changed about the school system regarding parent involvement. Parent's insight could strengthen the school-home bond and ultimately benefit students.

Another recommendation for further research includes the concept of learned helplessness. In this study, it was found that the more frequently parents helped their students with homework, the lower their mathematics GPA would become. Suppose with good intentions, parents are helping directly with homework but presumably telling their children what steps to take next. In that case, a concept worth investigating is whether this direct help from parent to child contributes to learned helplessness within the child. Learned helplessness

creates a mindset that a child has learned they can get help on almost any task without employing much effort on their part (Filippello et al., 2018). Without applying effort, retaining material would seemingly decrease, possibly resulting in a lower GPA.

Including segregated data would be another area for future research. Parent involvement may have varying effects on different groups due to systemic racism and the way our current educational system caters to some groups and not others. Separating out this information would allow researchers to dive deeper into what works best for students. This data could continue to highlight how parents are an asset to their child's education.

Further research could also benefit from examining how counselors could help move a school's mindset from a deficit view of parents to an asset view. Teachers typically do not have formal counseling training. They may not be familiar with examining their own biases critically, and school counselors may be able to help in this area. Counselors also interact with parents at times and could serve as a valuable tool to help strengthen the educator and parent relationship. The HSLS:09 data set involves variables from counselors. Future researchers could look more closely to see if any survey questions would apply to parent involvement and student achievement in math.

Conclusions

This study aimed to explore direct and indirect parent involvement strategies and their effect on mathematics achievement within a large data

sample that is generalizable to all ninth graders in the United States. Results indicated that high expectations, academic discussions, and encouragement are positively statistically significant in relation to mathematics GPA. On the other hand, the more often parents reported that they helped their child with math homework indicated a negative statistically significant impact on mathematics GPA. When comparing help with math homework, science homework, and English homework, parents reported that they were the least confident in helping with math homework.

Parents are a child's first teacher. They teach their children more than anyone else ever will, and they know their children better than any teacher ever could. When educators step in to tell parents what is best for their children, it further perpetuates the false idea that parents are a deficit rather than an asset to their children's educational achievement. Parents do so much for their children and should be recognized for that and for the wealth of knowledge they bring the table. The results from this study indicate the influential impact parents have on their child's academic achievement, and these strategies do not require any attendance at a school event which is contrary to what many parent involvement policies and mandates stress of importance.

Mathematics as a subject is vital to preparing students for college and career readiness which has created a lot of pressure for students to succeed as well as pressure on parents to help their students. Parents want what is best for their children and want to help but are often unsure how they can help. Many

parents do not realize how beneficial they are even without knowing the steps to solve the math content they may be intimidated by. Here lies an opportunity for institutions to show just how valuable parents are and to give them the respect they deserve by letting them share resources with other parents and letting them describe what needs to be changed in the school system.

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