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**Addressing the Math Achievement Gap of Socio-Economic Disadvantage
Students through Intervention**

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Abstract

The achievement gap in mathematics is a widely known issue that has impacted U.S. schools for years. This gap is especially prevalent for those students who are considered socio-economic disadvantaged as research has shown the majority of students falling behind come from high poverty areas. Numerous barriers have been identified through literature that prohibit this demographic group from succeeding academically. Math intervention has been suggested as a deterrent to this gap and many educators have implemented various models and yet, the achievement gap prevails as socio-economic disadvantaged students continue to fall further behind in developing the foundational knowledge and skills needed to achieve upper level course work. This case study analyzes the practices of three intervention teachers who taught a six-week summer math intervention for 8th grade socio-economic disadvantaged students. Results demonstrated through numerical data in the form of pre/post math intervention assessment, revealed the six-week summer math intervention was successful. A correlation was found through qualitative data, collected in the form of intervention teacher surveys and coded for themes and patterns, which revealed specific practices and strategies practiced amongst all three intervention teachers. These specific strategies and practices used during the six-week intervention improved the mathematic achievement of sixty-three 8th grade student of low socio-economic status. Recommendations include utilizing the outlined strategies and practices during intervention to increase the probability of socio-economic disadvantaged students achieving the mathematical knowledge and skills to succeed at upper level course work. Closing the math achievement gap for low socio-economic status students will not be easy, but with these intervention practices, educators have an opportunity to provide instruction that is catered to the needs of this student population.

Chapter 1: Introduction

The effects of socio-economic status on academics has been a long-time issue policy makers, districts, and administrators have wrestled with. Despite efforts to improve education for students of low socio-economic status achievement gaps continue to grow. The No Child Left Behind Act (NCLB) of 2001, mandated all children received a high-quality education regardless of the school the child attends or the neighborhood the child lives in. Districts and site have been tasked with ensuring students receive quality education and resources in order for all students to be academically successful. Yet, research continues to link students of low socio-economic status (SES) to lower academic achievement and slower rates of academic progress. Students of low SES have a lower success rate in areas of math and other STEM areas than students of high SES. (Doerschuk, Bahrim, Daniel, Kruger, Mann, & Martin, 2016). Poverty and socio-economic background directly correlate with high school dropout rates. For example, students of low SES are 10 times more likely to drop out of school than higher SES students (Educationdata.org). Therefore, improving school systems and intervention programs is necessary and increased research on the correlation between SES and academic achievement is crucial. Intervention Programs are designed to help students who are falling behind in school and if implemented with fidelity could help close the achievement gap in math for socio-economic disadvantaged students. Therefore, the research will focus on the following research question, in what ways does an 8th grade summer math intervention program close the achievement gap for socio-economic disadvantaged students?

Purpose of Study

The purpose of this study is to analyze a six-week math intervention to determine the supports and practices used during math intervention to help close the math achievement gap for

students of low socio-economic status. During the study the researcher will look for specific practices and procedures that increased student achievement in math and define the characteristics of a strong and successful intervention program. Math continues to be an area of struggle for students at the local middle school. Many students test below basic and the achievement gap continues to grow for many demographic groups, including students of low socio-economic status despite efforts from the site and district. This research will continue to build upon other literature as it will aim to find relevant practices to improve math intervention and close the achievement gap, specifically for students of low socio-economic status.

Literature

When considering the math achievement gap for low socio-economic students; there were four major themes that arose from the literature: barriers to learning for socio-economic disadvantage students, mental health and meeting social emotional needs of low SES students, teacher-student relationships and how they can contribute to academic success, and instructional strategies can help close the gap.

There are many barriers to learning for students of low socio-economic status. Becker & Luthar (2002) state schools who serve large numbers of disadvantaged students are least likely to provide instruction, materials, and resources that are needed for student success. Teachers at these sites are more likely to be novice and have inadequate preparation and professional development to meet the unique needs of at-risk students. Staff at these schools are also more likely to exhibit lower student expectations regarding academic competence which influences the students' perceptions and goals.

Mental health and social emotional needs of students of socio-economic disadvantaged students are essential to consider when considering how to support this at-risk population.

Psychological distress stemming from home life or poverty can impact student achievement, therefore it is imperative to help students develop self-agency, social emotional skills, and growth mindset (Roeser, Eccles, & Stobel, 1998). Acquiring these skills will help promote positive behavior and improve student motivation and performance (Becker & Luthar, 2002).

Another theme found within the literature was how teacher student relationships encompass positive attitudes and expectations can lead to greater self-efficacy in students. When teacher's get to know their student's socio-economic status, academic needs, learning styles and ethnic backgrounds this can have impact on student achievement (Parker, 2011). Students who perceive respect and support are more likely to feel confident in their capabilities. Supportive feedback leads to social emotional growth and a nurturing classroom environment lessens the effect of stressful home environments (Yu & Singh, 2018).

Instructional strategies and practices are also important to consider when looking to close the achievement gap of low SES students. Teacher preparation and tenure can lead to enhanced academic achievement as these teachers have accumulated experience can lead to the recognition and developmentally appropriate response of at-risk students. The use of higher order thinking focuses on conceptional strategies also enhances mathematical knowledge and student achievement (Yu & Singh, 2018). Additionally, differentiation, remediation, and evidence-based practices can lead to more successful tier 2 interventions (Tomic, 2016, Pool, Carter, & Johnson, 2012).

Although there is a number of barriers students of low socio-economic status experience, there are a number of strategies and practices leading to academic success. It is important for educators to learn about barriers and how to successfully implement these practices and

strategies allowing all students can be successful in an academic setting despite home life circumstances.

Preview Methodology

This study will use a qualitative case study as the research is descriptive and the intent is to provide rich descriptions of intervention (McMillen, 2012). Numerical data in the form of pre and post math intervention scores will be analyzed to determine if there are any connections between the practices the teachers utilize and student achievement. The pre and post numerical data results will demonstrate student growth during the six-week intervention, while the qualitative study of the teacher's survey answers will provide insights and perspectives as to how and why the intervention was successful or not. These are both necessary as it will provide the researcher insight into developing math interventions that address the needs of our low socio-economic students in order to close the achievement gap.

Significance of Study

The purpose of this study is to collect and analyze data from a six-week math intervention in order to develop future math interventions that encompass characteristics, strategies, and practices to promote academic achievement for socio-economic disadvantaged students. There is a vast amount of research on math interventions and practices, but much of it does not focus on the unique needs of socio-economic disadvantaged students. This research will consider how poverty effects this student population, and develop interventions that not only address the gap in math but also address the social-emotional issues that arise from dire circumstance.

There are 78% of students at our local middle school which are considered socio-economic disadvantaged by calculations of free and reduced-price meals (Ed-Source, 2020). With

the majority of our students facing economic hardships, educators will need to consider how this impacts students academically so that we can then work to create interventions and support that will address the needs of this student population and begin the process of closing the achievement gap.

The results of this study could provide educators and administrators with information on teaching practices, strategies, and resources that can help our student population achieve and become resilient citizens that break the cycle of poverty. The results could also lead to potential shifts in leadership focus and practice that will highlight this at-risk student population and address their unique needs. The researcher believes that a greater understanding of this student population coupled with concrete strategies, practices, and attitudes within tier 2 interventions could greatly encourage a closing of the math achievement gap.

Conclusion

In order to address the math achievement gap of socio-economic disadvantaged students, schools must have interventions set in place for those students who fall behind. However, these interventions must also take into consideration the unique needs of this student group. During the study, the researcher will look for specific practices and procedures that increased student math achievement during the study for this student population and will focus on the research question, in what ways does an 8th grade summer math intervention program close the achievement gap for socio-economic disadvantaged students?

Specific themes arose from the literature including; barriers to learning, mental health and meeting social emotional needs of low SES students, teacher-student relationships and how they can contribute to academic success, and instructional strategies that can help close the gap. The methodology used is a convergent parallel mixed method design. Numerical data in the form

of pre/post math scores collected, as well as a qualitative teacher survey will be analyzed holistically. In the next chapter, a review of literature will be used to inform the study.

Definition of Terms

Achievement Gap: Disparity in academic performance between groups of students. For example: whites and minorities or higher income and lower income households.

At-risk Students: Students who need temporary or on-going support in order to achieve academic success.

Case Studies: In-depth qualitative studies of specifically identified programs, activities, people, or groups

Differentiation: Tailoring instruction to fit the student's individual needs.

Intervention: Program that helps students improve at subjects they struggle with.

Instructional Strategies: Techniques or methods that a teacher can adopt to meet various learning objectives.

Open-ended Questions: Survey questions that allow for more individualized responses, since respondents are not limited to selecting from a supplied set of options

Qualitative Research: Research that involves the collection, analysis, and interpretation of data, largely narrative and visual in nature, to gain insights into a particular phenomenon of interest

Self-Efficacy: defines self-efficacy as the belief in one's personal capabilities. (Bandura, 1997).

Social Emotional Learning: Process through which children and adults acquire and apply knowledge, attitudes, and skills necessary to understand and manage emotions.

Socio-economic Status: Socio-economic status (SES) encompasses not just income but also educational attainment, financial security, and subjective perceptions of social status and social class.

Chapter 2: Review of Literature

The achievement gap between low socio-economic students (SES) and high SES students has been extensively researched and examined. The causes of the achievement gap are multidimensional and complex, and research also demonstrates that solutions are also complex and reliant on a number of factors. The academic achievement of low SES students has been a challenge for many teachers, administrators, sites and districts to tackle. Although there is a vast amount of research on the subject, schools continue to struggle with implementing the necessary strategies needed to close the gap. This review of research is necessary to produce insights into achievement patterns and demographic factors that affect student achievement in attempt to answer the following research question, in what ways does an 8th grade summer math intervention program close the achievement gap for socio-economic disadvantaged students? The following themes have been identified in the research: the barriers that low SES students experience, the need to address mental health and social emotional issues, and the identification of factors that can contribute to academic success and closing of the achievement gap within this student population.

Barriers to Learning

There are many barriers to learning for students with low socio-economic status (SES). Inequalities in attitudes towards these students, resources allocated, and quality instruction are some of the barriers to quality educational opportunities that low SES face on an ongoing basis. According to Becker & Luthar (2002) schools that serve large numbers of disadvantaged students are least likely to offer the types of instruction, materials, and qualified teachers that provide students pathways to meeting standards.

Becker & Luthar (2002) expands on the barriers associated with teacher perceptions and relationships, stating that low SES students are more likely to experience lowered future expectation from teachers as well as negative messaging about their academic capacities. This is concerning as it has been found that students' perceptions of teacher support have been linked to achievement, motivation, and academic success.

Roeser, Midgley, & Urdan (1996) provided qualitative data suggesting that teachers who value the honor system will provide special privileges for the more able students, and recognize students for superior performance. However, these recognitions create the perception that the teacher does not value or care for low SES students as individuals. This in turn limits their sense of success and belonging to the school and decreases academic success. The literature goes on to state that the idea of academic success being the overall goal and deciding factor of ability is tied to the students' sense of personal competence and worth. Thus, the implicit and explicit meanings of success that students perceive at school may relate to their own achievement beliefs, feelings, and behaviors. For instance, the literature suggests that school settings that are competitive and ability focused are likely to promote feelings of frustration, disaffection, and self-consciousness for many students, whereas settings that emphasize task mastery and improvement may relate to heighten self-esteem.

Roeser, Midgley, & Urdan (1996) suggest that there is evidence that students' perceptions of the goals emphasized in the school as a whole are related to their personal achievement goals, feelings of academic efficacy, use of effective learning strategies, and in-school behavior. When students perceive their environment to emphasizes personal improvement and task mastery, their personal task goals improve along with an increased use of higher-level cognitive strategies, academic self-efficacy, and positive in-school behavior. When students perceive the school

environment to emphasize ability and competition among peers, this leads to less positive patterns of learning and views of self-efficiency which leads to a decrease in personal relative ability goals, use of surface-level cognitive strategies, and increased incidence of disciplinary problems.

According to Becker & Luthar (2002) another challenge is that a significant number of Title I schools whose student body carries high numbers of low SES students, continue to employ inappropriate staff with inadequate teacher preparation. The study also found that 1/3 of identified schools did not receive any additional professional development or assistance in this area. Title I schools are more likely to employ less competent teachers leading to the inequity of quality education for low SES students. Hock, Pulvers, Deshler, Schmaker (2001) also state that it is important that the tutors are trained. It has been found that novice tutors, including peer and adult tutors, do not automatically engage in the instructional methods that make one-to-one tutoring effective. Novice tutors also are not always familiar with a variety of instructional strategies such as modeling thinking processes, diagnosing errors, providing corrective feedback. In fact, some novice tutors may even engage in detrimental to the student such as completing assignments for the students, showing impatience, ridiculing the students, or providing the answer before the students has time to discover it. This is why it is important for sites to ensure the teaching staff has adequate knowledge and experience to take on an after-school intervention aimed at closing the mathematical achievement gap.

Another inequity found by Crosnoe and Cooper (2010) is that economically disadvantaged children enter school with less developed cognitive skills than their peers which relates to lower grades and test scores. Low SES students are also more likely to take lower level course work and obtain fewer degrees than high SES students. Becker & Luthar (2002) found

that many low SES students believe that hard work in school and academic goals will have relatively low positive outcomes. Research indicated that this is especially true as students transition to middle school in which low SES students experienced lowered teacher expectations, lowered academic attitudes, and lowered self-esteem. Seals (2012) stated that influencing student achievement and motivation without addressing home environments, local politics, racial inequities, and school conditions is incomplete research and tells an incomplete story. Systemic barriers to education need to be considered in order to create solutions.

Mental health and Meeting Social-Emotional Needs of Low SES students

Mental health was another theme found within the research. According to Seals (2012) social environmental conditions influence students psychologically. Therefore, it is important for researchers to explore students' culture and home life that impact achievement. The students' ability to use their own agency (e.g., growth mindset) to reach their goals and the culture and social circumstance which impacts their goals.

Becker & Luthar (2002) found that mental health is a precursor to achievement, performance, and motivation in school. Low SES families may experience a significant amount of emotional distress which lowers students' academic achievement and performance. Becker & Luthar (2002) go on to state that 12–30% of all school-aged children have emotional disorders caused by the distress that these children will eventually suffer severe educational problems. Students who experience risks associated with disadvantaged environments face increased vulnerability to emotional problems.

According to Roeser, Eccles, & Stobel (1998) psychological distress during early adolescence can lead to a decline in educational acquisition in approximately 7.2 million students. Becker & Luthar (2002) conducted a study in which thirty percent of low SES students

were classified in the multiple-risk status group and were characterized as depressed, low achieving, and poorly motivated. These youth were more likely to experience school failure and poor grades, to devalue school, and have frequent symptoms of distress. Roeser, et al (1998) found that emotional difficulties can compromise children's ability to learn, especially if children and their families have limited access to needed services. This results in academic and emotional difficulties among high risk children as they move through the school system.

Research conducted by Crosnoe and Cooper (2010) found that how children were doing socially and emotionally also appeared to have a great impact on academic achievement. Crosnoe & Cooper suggest districts increase mental health services for children and parents in school as a comprehensive school-based program in which education and health becomes a focus. Becker & Luthar (2002) agree stating that school-based interventions aimed at reducing the incidence of mental health problems promote positive behavior and academic change in students. Early adolescent mental health should serve to improve achievement motivation, performance, and emotional competence.

Individuals who believe their talents can be developed, through hard work, practice and input from others, have a growth mindset. Seals (2012) mindset intervention, provided to teachers, can positively impact students. This intervention provided strategies for teachers to use, including praise and promoting challenging tasks. Students with teachers who reinforced ideas of growth mindset were able to self-affirm when faced with challenging math assignments. Student motivation was also influenced as mastery and interest in math increased over time. The beliefs of the teachers helped to shape the practices and influenced the student beliefs in education. Seals (2012) measured how praising students, communicating with students regarding efforts and outcome, and promoting tasks impacted the student's ability and mindset. The results indicated

that teachers who adopt a growth mindset and learn the culture of the school can influence student motivation and achievement.

Teacher-Student Relationships Contribute to Academic Success of Low SES Students

Despite barriers, there are a number of characteristics in which schools can utilize to elicit successful achievement outcomes from students of low SES. These includes a safe climate, supportive adult relationships, positive attitudes and expectations toward students from both teacher and administration, student self- efficacy, and an emphasis on academic achievement.

It was found that teacher student-relationships have an impact on achievement for low SES students. Parker (2011) stated that a teacher's teaching style is an important indicator of academic success. Teachers who develop relationships with their students better understand their students' socio-economic status, academic needs, learning styles, and ethnic background. Teachers are then able to deliver instruction that is sensitive to the students' unique needs. Parker (2011) goes on to state that school environment for low socio-economic students is fundamentally different from the environment at home. Students from low SES often come from homes that are less structured. If they enter into the same environment at school, they are more likely to fail. It is imperative that teachers provide structure and routine that may be lacking in these student's everyday life. Sites will need to ensure teachers are well prepared to deliver quality instruction and have experienced classroom management strategies that this demographic group will respond too. According to Tomic (2016) students will become became comfortable to have constructive discussions when they feel safe enough to make mistakes and take chances with their responses.

When students perceive respect and support in the classroom, they are more likely to feel confident about their capabilities. Becker & Luthar (2002) found that disadvantaged students

benefit greatly from access to supportive teachers within the context of a rich and challenging curriculum. It was found that teachers who develop supportive relationships with students was one of the most commonly identified protective. Research found that students who received and supportive feedback from their teacher, experienced social–emotional growth. It was also found that students experienced a more nurturing classroom environment which lessened the effects of stressful home environments. When teachers are willing to establish caring relationships with students, learn about students' individual needs and strengths, and provide support and encouragement, students are likely to have strong motivation, engage in learning activities, and achieve academic success (Yu & Singh, 2018).

Cone (2012) examined four high schools that closed the achievement gap of low socioeconomic students. Qualitative results indicated that high expectations of the students were articulated and expected by both teachers and administrators. Teachers and administrators who were from the community maintained a vested interest in all students. In one particular school qualitative data revealed that teachers and administration set expectations that were the same for all students, despite SES. This set students up for success as they were motivated and encouraged to succeed. Trust was developed in teachers and administrators; the school increased the percent of students passing all TAKS test by 147%. Low SES students had an increase of 353% increase in passing all TAKS tests. Argyriou & Iordanidis (2014) state that administrators ability to motivate the teaching staff and provide them with all necessary knowledge and skills will contribute to the effective performance of their duties and increase the student success rate.

It was also found that school size can also contribute to low SES student's success. Cone (2012) found that students from a small school size were less likely to fall through the cracks and

relationships were more likely to be developed between staff and students which led to improved student performance.

Teacher support can affect students' achievement in math through self-efficacy. According to Becker & Luther (2002) curriculum and instruction will also need to include approaches that are designed to support feelings of belonging, academic self-efficacy, and mental health as well as build on the cultural knowledge of the students. Becker & Luther (2002) state, "Curriculum and instruction should allow for opportunities of self-exploration and expression and provide learning activities that are meaningful, relevant, and related to students' own interests and goals." This will lead to an increase in academic engagement and reinforce the student's personal efficacy. According to Becker & Luthar (2002) students who believe that they can successfully complete tasks are more likely to have higher aspirations and stronger commitment to their goals. They also will put in a greater effort and show a greater amount of perseverance. Developing self-efficacy also creates the ability to deal with challenging situations. Teachers who help students create goals and provide feedback and strategies can facilitate the development of self-efficacy. Classroom teachers have the ability to increase a student's achievement in math by believing in their students and vocalizing to the student that they are capable. Students who believe that their teachers are caring and helpful will begin to internalize their teacher's values and beliefs, and eventually experience a higher self-efficacy (Becker & Luthar, 20012).

Instructional Strategies Close the Gap of Low SES

There is abundant literature on instructional strategies and practices that enhance an after-school intervention and academic success of at-risk students. Teacher preparation, utilization of conceptual strategies, small group instruction, pre-post assessments strategic strategies,

curriculum and instruction that is targeted, and small school size, are all related to student achievement.

Teachers play a very important role in improving student academic performance. The emphasis teachers place on different goals, the time they allocate to different topics, the tasks they pose to students, the kinds of questions they ask, and the types of discussion they lead, all influence what students learn and how they learn. This than, in turn, affects students' academic achievement. Teacher preparation is also a crucial component of success for low SES students. According to Crosnoe and Cooper (2010) teacher tenure within grade level was found to be an indicator of success. Research found evidence that teachers who accumulate experience in a certain grade level may be more likely to recognize and respond to the special needs of at-risk children in developmentally appropriate ways.

The instructional practices of teachers' also play an important role in improving student achievement. The literature states that traditionally, teachers focus on developing students' procedural skills. Mathematics is usually taught through direct instruction in which teachers review mathematical concepts, present the procedures required to solve tasks, and then have students practice these procedures with traditional problems (Yu & Singh, 2018). Common core has called for math reform in which teachers now need to expose students to real-world problems and challenge students to make sense of new mathematical ideas. According to Yu & Singh (2018), teaching that focuses on higher-order thinking is associated with increased student performance. Standards-based instruction, which places greater emphasis on conceptual understanding, real life situations, and the integration of concepts across subjects, has been shown to have a positive relationship with student achievement. Contrary, procedural teaching has been found to negatively influence mathematic achievement.

Yu & Singh (2018) also state that US teachers use less conceptual teaching strategies than the teachers in the high-achieving countries. An example provide was of how Japanese students spend more time on inventing, analyzing, and proving, and less time on routine procedures. However, U.S. students spend most of their time on routine procedures, making connections between mathematics concepts, and developing problem-solving skills. In addition, U.S. teachers have different instructional strategies for different ability students. It was found that teachers use significantly less computation and more conceptual strategies for higher-achieving students. Yet, for students considered lower achieving, teachers alternatively use more computation and less conceptual strategies. In contrast, it was found that Japanese teachers use similar conceptual and computation strategies for lower-achieving as well as higher-achieving students. Providing students with conceptual strategies in math may be one way to enhance achievement with students of low SES. The socio-economic status of families has also been found to be linked to teacher classroom practices. Specifically, students with higher levels of family SES and prior achievement were more likely to have teachers who use conceptual teaching strategies. Students with higher prior achievement were also more likely to perceive higher levels of teacher support. (Yu & Singh, 2018).

Tomic (2016) states that essential components of intervention programs, include utilizing pre- and post-assessments to determine the students' growth. These assessments help the instructor determine the needs of the students and use it to fill gaps in students' learning. Another essential component is ensuring a consistent schedule is adhered to. High attendance rate is critical to ensuring students have the time to practice and receive the necessary instruction. Student achievement is most accurately measured with consistent and regular attendance can

most accurately be measured when there is consistent and regular attendance in an intervention program.

Additionally, it was found that hiring instructors that are highly qualified and can implement differentiation and remediation strategies is important. Jitendra, Rodriguez, Kanive, Huang, Church, Corroy, & Zaslowsky (2013) discuss how students who receive a variety of strategies that are specific to their skill deficiencies and learning styles are more successful in interventions. Strategies may include teaching small groups in which students are provided more individual attention. Independent work, question and answer sessions and high level of engagement from students and instructors were also noted to be beneficial strategies during after school interventions.

Hock, Pulvers, Deshler, & Schmaker (2001) discuss how strategies should be taught to students during intervention, so they can learn how to learn. This is referred to as strategic learning. The strategic tutoring model helps students acquire skills and strategies that help support their learning on present and future assignments. This form of tutoring can increase academic achievement of at-risk students as they learn to be strategic in their learning, even after intervention has ended. It has been found to be effective in increasing the academic performance for at-risk students. During strategic tutoring, the teacher will guide a student through instructional phases. The teacher will first analyze the student's approach to determine if it is effective, if it isn't then the teacher will need to provide a new strategy. Hock, et al (2001) state that the new strategy ideally should incorporate elements of the student's strategy along with elements of the teacher's strategy. The strategy is then taught to the student while modeling the strategy. The teacher should be checking for understanding and utilizing a variety of instructional

techniques as the students attempts to utilize it on assignments. The final step is a comprised of the teacher helping the student plan for independent application of the strategy during class time

Hock, et al (2001) go on to discuss how strategic tutoring can also incorporate the MATH Strategy. An example of utilizing the MATH strategy, a problem-solving strategy that includes a set of steps to help students solve math problems. The first step the student follows is determining what needs to be solved. The second step has the student analyze the problem by looking at sample problems. The student then attempts to solve the problem and finally the student checks the answer. The teacher should model the steps of the MATH strategy and provide guidance of the steps while the student works. The teacher reminds the student to utilize the strategy during tests, quizzes, independent work. This strategy provides students with the opportunity of not only learning how to solve the math problems, but how to successfully complete work independently.

Pool, Carter, and Johnson (2012) reviewed evidence-based practices helped one school provide a high-quality Tier 2 math intervention. The school successfully implemented a secondary intervention program that encompassed explicit instruction, an emphasis on drill and practice, and a cumulative review as part of the drill and practice. In addition, the school utilized multiple motivational strategies to help students regulate their attention and behavior while in the intervention group. The school ensured consistent progress monitoring, data collection and interpretation, and data-based decision making. Pool, Carter, and Johnson (2012) state the school's success with the intervention was influenced by the strategies to motivate students. The Tier 2 intervention utilized Positive Behavior Support through school pride tickets. Students who were on task, following directions, participating, and/or working hard would earn a ticket. At the end of the intervention time students were able to cash in their tickets for rewards. The school

also utilized immediate verbal and non-verbal feedback. To ensure student success, the instructor made sure that feedback was specific, consistent, and immediate. Expectations were also reviewed daily and referred to throughout the intervention.

There is a number of barriers to academic success that low SES student experience. Teachers and administrators must take these into consideration to ensure they are doing their part in eliminating the achievement gap. This includes acknowledging any potentially harmful practices that contributes to the gap such as; inequalities in attitudes towards these students, limited resources allocated, and instruction that doesn't consider the student's needs. Mental health has also been identified as an important element that should be addressed when considering the impact of poverty on the students' social emotional needs and academic achievement. Despite these barriers, there are factors that contribute to the academic success of low SES students. The research will focus on these specific factors in an attempt to answer the research question, in what ways does an 8th grade summer math intervention program close the achievement gap for socio-economic disadvantaged students? These factors need to be implemented and utilized if districts, policy makers, and educators want to see the achievement gap of this student population decrease.

Chapter 3: Methodology

This study investigated a math intervention program for 8th grade students who are considered socio-economic disadvantaged. Sixty-three underachieving 8th grade students participated in the six-week summer intervention at Public High School. The research was conducted to answer the following question,

In what ways does an 8th grade summer math intervention program close the achievement gap for socio-economic disadvantaged students?

The students who participated in this summer school intervention are considered economically disadvantaged and have little to no access to additional services, such as tutoring, to help close the math achievement gap and boost student achievement. Chapter three of this research thesis will discuss the research methods involved in the study of practices that increased student math achievement during a six-week summer intervention program.

Research Design

This research thesis uses a qualitative case study design to collect the outcomes from a summer math intervention program. Data will be collected from qualitative sources such as student pre/post assessments, class placements, and teacher survey responses. Data was collected from student pre/post math scores from the intervention, and an online semi structured teacher survey. This study relied on a qualitative design to gain knowledge on the teacher's perspectives and experiences while teaching within the intervention program. Mertler (2019) states the case study is the best design due to its bounded singular system, one intervention, one student population and one-time frame (Fraenkel et al., 2012; Gay et al., 2009; McMillan, 2012). This case study will allow a detailed description and understanding of the components, procedures and characteristics of the intervention program. The ultimate goal of the analysis is for the

researcher to attempt to identify and describe aspects of teacher perceptions and the associated meanings to develop characteristics and recommendations regarding successful math intervention programs. The qualitative case study data and narrative will provide insight into how the intervention worked, what barriers occurred, and what characteristics enhanced student achievement. Numerical data from Math 180 Pre and Post scores provided insight into the success of the intervention program and the growth of student achievement during the six weeks math summer intervention program.

Participants

The study was conducted using 63 students in the 8th grade who were identified as below proficient in math at the local middle school. The students had received either a D or F in their math class and had been tested in the Math 180 program to find the equivalent course they would need to take. Students were automatically recommended for the summer program based on their math grades and pre-Math 180 scores. The students were randomly placed in one of three classrooms during summer intervention. Ethnically, the students were representative of the middle school population, with the majority being Hispanic. All students participating in the Math 180 intervention are considered low socio-economic status by free or reduced lunch standards. All students within the selected classes were asked to participate in research by allowing the researcher to analyze their Pre/Post intervention results, but participating was completely voluntary. Three 8th grade intervention teachers participated in the study as well. The three teachers were all relatively new to the Math 180 Intervention Program. Two of them were long term subs while one was a newly hired math teacher. Information on the research and how it would be safeguarded was provided. Participants were provided a list of potential risks and provided opportunities to skip questions if they felt uncomfortable. The survey was provided

online so that participants were able to participate at their convenience. The survey was also anonymous and answers would not be shared with any individuals affiliated at their work or school sites.

Setting

This research took place at a public high school in Monterey County, which will be referred as Public High School for the sake of confidentiality. The class was held Monday through Thursday from 8am-12pm. The students were required to attend six weeks starting June 17th and ending July 7th. Attendance was imperative to the successful completion of the math intervention and students were asked to attend the intervention daily and have not more than 4 absences within the six-week period. This setting was chosen as the middle school students would be starting at this high school in the Fall. This setting provided an opportunity for the students to get to know the new location and staff of the high school before the new academic year with the hopes that it would help set the students up for success. As many students already took the Math 180 course during their current school year and did not pass, the researcher is curious as to how a brand-new setting will impact the results of the study. It was hypothesized that students may take the intervention more seriously being in a high school setting with new staff to teach the intervention.

Instrument

This research study was completed using an online semi-structured teacher survey. Teacher research participants were given the open-ended survey during the 6th week of the intervention. The surveys provided insightful information as to how the intervention worked, the barriers that teachers or students experienced, and the successful strategies that engaged students and promoted math achievement. The open-ended, semi-structured surveys were provided online

to ensure teachers felt comfortable in the reflection of their experience. The research felt a qualitative case study was appropriate as it collects important details, perceptions, and experiences from the teacher population and intervention that can promote success to potential future math interventions. Numerical Pre-Math 180 scores were collected at the beginning of the intervention. Post Math 180 scores were collected at the end of the six-week intervention to determine growth and success of the intervention. This data demonstrated that many students were successful with the intervention, leading to conclusions about the effectiveness of the program.

Research procedures

In order to conduct research, permission from the district leaders would need to be granted. Permission was granted by the Director of Curriculum and Instruction who was the director in charge of carrying out the summer intervention program. Math grades, in the form of a D's and F's list, was obtained from the middle school office. Students identified as needing the summer intervention were sent home a registration form in which parental permission and registration were obtained. Once registration for the summer program had been received, the students were asked to take a Pre-Math 180 Assessment. This data showed the researcher what course the student would need to take and how much they would need to grow in order to exit the intervention and enter into a regular math course in the 9th grade. Students who scored a quantile score of 600 or below would need to be placed in a Math 180 Course 1. This course taught students: multiplicative thinking, distributive property, division, fraction concepts and relationships, multiplying and dividing fractions, decimals and place value, decimal operations, and both sides of zero. In order to exit out of Course 1 and be placed in Course 2, students would need to score a quantile of 750 or higher. Math 180 Course 2 focused on rates on: time, rate, and

ratio, ratio relationships, percent and proportional reasoning and relationships, linear relationships, graphs in the plane, functions, and systems of equations (Zmijewski, Blankman, Blankman, Smith, & Ciesla 2020). In order to test out of Math 180 Course 2 and into a Core Math Class, students would need to have a quantile score of 925 or higher. Teachers received professional development to implement the Math 180 Intervention Program, which included a whole class teaching component, small group teaching component, and an online component. All students were randomly placed in one of three Math 180 classes and began the six-week intervention. The researcher was also the site lead of the summer program, and conducted observations at random during the six weeks. Students took a post math assessment at the end of the six weeks. Scores were analyzed to see the progress students had made in the six weeks. Teachers were provided an open-ended survey electronically. Teachers were provided the option to skip questions if needed. Analysis of the numerical data and qualitative data was then completed.

Data Analysis

Demographics of the participating students were noted and it was found the majority were considered Hispanic and considered economically disadvantaged. The lens of this research is based on the critical race theory. The objective of the study is to coherently bring together a picture of support that combat the systems of oppression. Through the analysis, the researcher will analyze the data to look for system changes that can help close the math achievement gap for students of low socio-economic status. According to Ledesma & Calderon (2015), critical race studies in education could be defined as an evaluation of racism in a system of oppression that explores the historic and contemporary formation and demonstration of race in our society while particularly focusing on how these issues are manifested in schools. Alemán (2007) agrees

that school financing is linked to structural inequalities which is tied to socio-economic status and race. Aleman (2007) goes on to state, “A CRT perspective situates school funding inequity as a political, social, and historical process in which the normalization of inequity, subjugation of marginalized groups, and oppression of communities of color exists via the institution of a racist school finance system” (p. 527).

The researcher will be utilizing a qualitative case study and analyzing it holistically. The collection of qualitative data in a case study will be used to gain a better, more thorough understanding of the intervention (Mertler, 2019). Pre-Math 180 Scores were calculated and analyzed before the six-week intervention took place. This numerical data determined that 41 students had a quantile score that placed them in Course 1, while 22 students had a quantile score that placed them into Course 2. Once the six-week intervention was complete post-scores were assessed to see if students made any growth. Teachers who taught the intervention were provided an online qualitative semi-structured, open-ended survey. The researcher utilized coding when analyzing the qualitative data to determine if patterns or themes arose from the data. The researcher then analyzed the results compared to the numerical data to find themes that will help determine rationale for future practices that can help close the achievement gap for students of low SES status.

To ensure validity of the study, the researcher will use triangulation in the form of open-ended surveys, class placement, and pre/post math data. The researcher will also engage in persistent and prolonged participation at the site during the duration of the six-week summer program, and will also utilize member checking to review the accuracy of the research report.

Summary of Chapter

This qualitative case study aimed to answer the question: in what ways does an 8th grade summer math intervention program close the achievement gap for socio-economic disadvantage students? The lens of this researcher is critical race theory. The goal is to find supports and practices that enhance student achievement and combat the systems of oppression for at risk students due to socio-economic disadvantaged backgrounds. The study was conducted at a local high school, in which 63 eighth grade students who are considered below proficient in the area of math attended a six-week summer intervention program. The study also analyzed the practices and perspectives of three intervention teachers who taught the summer program. The researcher utilized a semi-structured online survey to gain insight into experiences of the teachers during the intervention. The researcher will analyze the data through coding to look for themes and patterns. The researcher will also look at the numerical pre/post math scores to see if there is any relationship to the qualitative data. To ensure validity the researcher will use triangulation in the form of semi-structured online teacher surveys, scores from pre and post data, and class placement. In chapter four of this thesis, readers will find the researcher's detailed analysis of the data collected in the study. Chapter four will also include the researcher's interpretation of the collected data.

Chapter 4: Results

This study sought to provide a specific example as well as corresponding data intended to further analyze characteristics of math intervention increased achievement in socio-economic disadvantaged students. Specifically, this research study focused on exploring the best practices of interventions and how these practices enhanced student learning in an effort to answer the following question, in what ways does an 8th grade summer math intervention program close the achievement gap for socio-economic disadvantaged students?

Although there has been some growth in math for the socio-economic disadvantaged students of Public High School over the years, the progress has been minimal. It is evident many students are lacking the foundational math skills needed to advance to higher levels of math. In an effort to address this gap, Public High School decided to provide a six-week math intervention to identify incoming 9th grade students who were lacking the skills needed to advance to a high school level of math. The math intervention used encompassed an individualized technology-based curriculum paired with small group work. The teachers and staff had to be trained to effectively teach the curriculum.

This chapter will provide the findings to this study, including the perceptions participants have on best practices for supporting students of a socio-economic disadvantaged background during a six- week math intervention. Qualitative data from the open-ended survey describe teachers' experiences while working the intervention. Analysis of this six-week intervention will determine if any of these strategies were used and how, if any, effected student achievement.

The following data presentation was provided as an in-depth analysis of the numerical pre and post student test scores. Qualitative data was used to represent the perspectives of the teachers. This information was then used as the cornerstone of the data analysis and was

displayed as a chart and short commentary. The survey questions were analyzed in a narrative form and coded based on themes and patterns revealed.

Data Presentation Analysis

Table 1.1

Math Pre/Post Summer Intervention Math Scores

8 th Grade Math Scores	Course 1	Course 2	Core Math
Pre-Summer Scores	41	22	0
Post Summer Scores	0	29	34

Table 1.1 demonstrates the pre-scores in which 8th grade students tested into the Math 180 intervention. The Course 1 Intervention provides math help at a 4th-5th grade math level. Students who enter into Course 1 still need to establish the foundational concepts that would enable the students to make connections while learning to think algebraically. This course taught students: multiplicative thinking, distributive property, division, fraction concepts and relationships, multiplying and dividing fractions, decimals and place value, decimal operations, and both sides of zero (Zmijeski, Blankman, Blankman, Smith. & Ciesla 2020).

Students who scored a quantile score of 600 or below on their pre-assessment would be placed in Course 1. It was found that 41 out of the 63 8th grade students had mathematical gaps in learning and would need to take the Course 1 Six Week Summer Intervention. In order to exit out of Course 1, and be placed in Course 2, students would need to score a quantile of 750 or higher. Course 2 Intervention transitions students to pre-algebra with an emphasis on building proportional reasoning with rates, ratios, linear relationships and functions. It can be considered a

6th-7th grade level of math. Of the 63 students, only 22 were ready to enter into this course at the beginning of the six-week intervention. In order to test out of Math 180 Course 2, and into a Core Math Class, students would need to have a quantile score of 925 or higher. Core math is considered algebra ready at a 9th grade level. It was found that none of the 8th grade students at the beginning of the six-week intervention and who were participating in the summer intervention were ready to enter into a high school level of math

The researcher wanted to find what characteristics of the intervention increased student success. In order to develop an understanding as to how and why the intervention worked, the researcher provided a survey to teachers to find their perspectives and practices. The researcher coded the survey answers and found multiple themes and patterns which increased student achievement. It was found in the interviews, professional development, specific teaching strategies and practices, support from admin and others, a positive teacher student relationship and social emotional support, goals for students, class size, rewards and incentives, and attendance, were all factors in the success of the students.

Professional Development

It was determined that two out of the three teachers received professional development on the math intervention. Two of the teachers attended a one-day professional development training, provided by an expert who had experience with the program. Teacher A stated,

During this training, the trainer went through the program using both the books and the software. The trainer also was able to trouble shoot any technical issues that came up with the software and showed the teachers how to track progress and test scores. This provided the teachers a clear process of how the Math 180 intervention worked.

According to Teacher B, “the staff was given the opportunity to attend a PD on the program. We had the opportunity to speak with representative and ask questions. We were given

the time to familiarize ourselves with the program and how our students would be able to use the system. The PD gave me time to ask questions and hear from the expert what techniques in the program would be most beneficial to the students. Training was touched upon in Chapter 2 in which it was found that tutor training increases student success. “The importance of tutor training becomes evident when the nature of traditional tutor interactions is examined. For example, research has shown that novice tutors, including peer and adult tutors, do not automatically engage in the instructional methods that make one-to-one tutoring instructional and effective with a variety of students in a variety of educational contexts” (Fuchs et al., 1994; Hock et al., 1995; Kohler & Greenwood, 1990). Therefore, providing this professional development to these novice teachers allowed for a deeper understanding of the intervention, and specific strategies, such as small group work to be used to increase success. Hock et al. (2001) reported that an integral part of the tutoring program is the need to provide professional development for all tutoring teachers.

Specific Teaching Strategies and Practices

It was found, all three teachers utilized similar teaching strategies and practices with the students during the six-week intervention. All three stated the program had an online component that recognized the individual needs of the students. Each student had the opportunity to go through the program at their own pace. Additionally, all three teachers ensured they provided small group instruction at some point each day. Teacher B stated, “Working in small groups can help fill in missing pieces better than continuing to work as a whole group.” The teachers would place students into groups based on academic levels. They found by doing so, they were able to challenge the higher leveled learners, and re-teach students who were still struggling. Teacher A stated, “teaching in small groups helped greatly as students seemed to be more focused on the

particular lesson since it was catered to their level of learning.” Within Chapter 2 similar findings were discussed. Small group interactions that encourage and prompt students to think aloud as they do mathematics, with peers providing feedback on their strategy use, is known to improve student learning (Jitendra, et al, 2013; Van Luit & Naglieri, 1999).

Additionally, all teachers utilized conceptual and procedural teaching strategies with the students. In Chapter 2, it was found that teaching higher order thinking, with an emphasis on conceptual understanding, increases student performance (Yu & Singh, 2018).

Support from Administration

All three teachers stated they received positive support from their summer site lead. According to Teacher A, the site lead would send out weekly emails which provided the teachers with an overview of what was happening and how the program was progressing. The site lead also consistently checked in via email or in person to see what support could be provided. Furthermore, the site lead would go into the classroom and speak to the class about why they were there and the goals and outcomes of the program. Teacher A stated, “She would speak in an enthusiastic and positive way which gave the students a feel of excitement that they had a second chance to exit out of the Math 180 Program.” It was also noted throughout the surveys that the site lead also provided support with classroom management. Teacher A expressed in the survey,

The site lead would take a student who was distracting the class and provide them with one- on-one help or speak to them about their behavior. By doing so, I would be better able to teach the class with no interruptions, but also the student would come back better able to focus and advance through the program.

Teacher C commented the admin was very helpful in providing materials for the class and provided background information about students that helped the teacher work better with them. The site lead had knowledge and relationships with some of the troubled students which helped the teacher to develop a better understanding of their behavior, plan how they would address

behavior, and helped to create a relationship with those students who needed it the most. This aligns with Chapter 2, in which it was found students who experienced high expectations, motivation, and established trust from both teachers and administrators produced higher success rates (Cone, 21012). Additionally, Argyriou & Iordanidis (2014) found school leaders can increase teachers' motivation with careful decision-making, professional development, and providing them with the knowledge and skills that contribute to the effective performance of their duties.

Positive Teacher Student Relationship and Social Emotional Support

All three teachers provided examples of what would be considered a positive teacher/student relationship. All allowed students the opportunity to safely ask questions and supported individual needs. Teacher A stated she had already developed a previous relationship with some of the students from other school experiences. Similarly, in Chapter 2 it was found through the literature, teachers who develop relationships with their students better understand their students' socio-economic status, academic needs, learning styles, and ethnic background. Teachers are then able to deliver instruction that is sensitive to the students' unique needs (Parker, 2011).

Teacher A provided students respect and freedom to choose certain dynamics of the instruction. For the students who needed extra guidance, all three teachers stated, they were sure to speak to them, one-on-one, outside of the classroom. The three teachers stated they would not just speak to disruptive students regarding their behavior but try to find out if something else bothering them.

Another component of a positive relationship was all three teachers mentioned ensuring the student be welcomed at the start of class every day. Teacher A provided the example, "I

made sure to tell the students that every day was a new start, so even if they had a rough day the day before, the table was wiped clean and they had a new chance to succeed that day and I always also thanked them for their input and participation.” According to Teacher B, social emotional support was imperative. Students needed to understand they were cared for, supported and provided opportunities to open up about struggles and issues they may be experiencing. Teacher B stated, “I started every morning with a quick "check in" with all my students. They give me a thumbs up/down about how they are doing then I call on a couple to talk to me. This can be quick questions like "what did you have for dinner last night?" or "what did you do after you left class?" This allows me to get to know my students more and then be able to follow their situations without making them feel uncomfortable having a one on one conversation alone. I find that when a student feels that you are invested in them, they will do their best in class.” Chapter 2 literature found students who believe they can successfully complete tasks are more likely to have higher aspirations and stronger commitment to their goals. They also will put in a greater effort and show a greater amount of perseverance (Becker & Luthar, 2002).

According to Teacher C, “Being respectful and self-controlled always requires more social emotional learning. Students were redirected towards these goals whenever they made inappropriate choices. There were, however, no extreme problems to address.” This may be due to the positive teacher/student relationships developed during the intervention.

Student Goals

The survey found all three teachers described setting goals with their students. The teachers communicated regularly regarding the exit score the students would need to test out of the intervention and into a Core math class. All teachers wrote the score on the board so students had a daily reminder of what they were working towards. Teacher C stated, “The goal for the

students was clear to them. They needed to work their math scores up to a high enough level to get out of Math Intervention and into a core math class for high school” Teacher A agreed, “One of the main goals of this summer program was to get as many students to exit Math 180 as possible. We also told students our goal was for them to get as close to the passing score as possible that way they would at least get out of Course 1 and be in Course 2 when school started in August, which provided them a higher opportunity of testing out of the Math 180 after fall semester.” Teacher A continued,

Students were able to visually see this goal because I would have the scores they needed to get in order to exit out of Course 1 and Course 2. For some students who struggled, having two different goals allowed for them to not feel overwhelmed. Of course, we wanted all students to exit Math 180, but for some it was pushing them more towards exiting out of Course 1 and getting them into Course 2.

According to all three teachers, students who tested into the next course or tested out of intervention were also celebrated. According to Becker & Luthar (2012) teachers who help students create goals and provide feedback and strategies can facilitate the development of self-efficacy in students.

Class Size

Smaller class size with additional support from aides was also a characteristic found throughout all three classes. Each class had between 20-24 students and two additional aides that would come in at different times of the day to support the teacher and students. Teacher B stated, “With smaller class sizes, students were able to receive more individualized attention and I was able to better identify and address areas of struggle.” Furthermore, Teacher C stated, “Students knew there were 3 individuals ready to help them at any time. Those students who raised their hand or seemed to be confused received as much help as possible.”

Teacher B provided the theory, students knew they were in a safe place where they could mess up and try again, knowing the teachers were there to support. Cone (2012) found students from a small school size were less likely to fall through the cracks because of the relationships developed with staff and teachers. This leads to increased student achievement.

Rewards/Incentives

It was also discovered through the survey, all three teachers utilized rewards or incentives to entice the students and keep them motivated. According to Teacher C, “I used a behavior management system that I developed called RISE, which stands for be Respectful, In the right place, Self-controlled, and Engaged. I kept running point-based scores on student performance adhering to these four expectations and it worked well.” Teacher B would use intrinsic rewards, such as praise and smiles, to motivate students. The teacher also would provide raffles students could participate in at the end of the week. Teacher A also utilized raffles as incentives for students. An interesting characteristic found was all teachers utilized rewards to reinforce positive behavior in the students. Pool, Carter, & Johnson (2012) found academic success to be influenced by motivation through Positive Behavior Supports Intervention (PBIS). This includes both extrinsic and intrinsic rewards.

Attendance

It was found attendance was a huge component of success for the intervention.

According to Teacher A,

If the student did not attend school, they did not benefit. Those that came every day were able to advance both in the software and lessons. Each chapter had about 4 lessons so if the student missed one day then they missed up to 2 lessons would fall behind.

Teacher C agreed,

Many students had good attendance, but a few were frequently absent. General good attendance strongly influenced positive achievement gains, whereas those who were frequently absent did not achieve as much as they could have.

Teacher B also felt attendance was crucial,

I think of the lessons like a puzzle. Each day, the student is given a new piece to complete the puzzle. If they miss a day, then they miss a piece. At the end of the week, their picture won't be complete and may not make any sense at all. If a student is constantly trying to piece together an incomplete puzzle, they are going to get very frustrated.

Attendance incentives were also used to keep students motivated and on track. Every day students attended the intervention, they received a raffle ticket. At the end of the week, students were selected to receive a prize. Chapter 2 found attendance to be an essential component to student success. Students need the time and practice to master new concepts (Tomic, 2016).

Interpretation

According to the numerical data in Table 1.1, there was a significant increase in student math scores during the six-week summer intervention. It was found all students had tested out of the Course 1 Math Intervention. Twenty-nine of the students were able to test into the Course 2 Intervention, allowing them to continue this intervention during their 9th grade year. It was also found thirty-four of the 8th grade students were able to test out of the Math 180 Intervention and would be placed into a 9th Grade Core Math Class that focused on algebra. This demonstrates clear evidence of the intervention working. The researcher went on to survey the teachers to find characteristics and practices during the intervention promoted student success. Multiple themes and patterns were found throughout the surveys. There was a positive correlation between the numerical data and the qualitative data. The qualitative data provided insight into how the intervention was conducted by the three intervention teachers. It was found during the six-week intervention, all three teachers were provided professional development, practiced specific

teaching strategies, were provided support from summer admin, developed a positive teacher student relationship and provided social emotional support to students, set goals with their students, had a low-class size, offered rewards and incentives, and found that high attendance were all factors in the success of the students.

Conclusion

The researcher set out to understand the numerical data demonstrating an increase in math scores and mathematical understanding in incoming 9th grade students. Students participated in a six-week summer math intervention program targeted to students who were not yet performing at a 9th grade level of math. In order to understand the numerical increase in scores the researcher provided a survey to teachers asked open-ended questions. It was found all three teachers had similar practices and characteristics. Chapter 5 will provide the findings of the research and will compare results with ones found in the literature in an attempt to answer the research question, in what ways does an 8th grade summer math intervention program close the achievement gap for socio-economic disadvantaged students? Specific strategies and practices for intervention will be recommended that could enhance student achievement and close the math achievement gap for socio-economic disadvantaged students.

Chapter 5: Conclusion

Mathematics has been a struggle for many students of low socio-economic status at Public High School for a number of years. With the growing number of students whom are not ready to access the math curriculum at the 9th grade level, Public High School decided to implement a six-week summer math intervention course. The students participating had fallen behind by 2-4 grade levels and needed additional support to understand foundational concepts. Students of low socio-economic status do not have the means or transportation to access traditional tutoring services. Therefore, schools will need to creatively consider how to approach this issue and set targeted goals of closing the math achievement gap for this demographic group of students. The rationale of intervention is justifiable, but intervention will need to be carefully rolled out if schools are to be successful in closing this achievement gap. This research thoroughly examined the six-week summer math intervention, that was set in place for students of low socio-economic status, in order to determine how to effectively reinforce intervention practices that will enhance the opportunity of low socio-economic status students' student achievement and successful outcome.

The study aims to answer the research question; in what ways does an 8th grade summer math intervention program close the achievement gap for socio-economic disadvantaged students? Of particular interest are the qualitative results, of the open-ended survey, intervention teachers completed as they relate to the numerical data of pre and post math assessment scores, collected during the six-week summer math intervention. These results are then organized by themes and patterns within the context of the intervention, and recommendations as they pertain to the improved system of successful teaching and practices during math intervention are provided. Limitations are also addressed and explained. This study concludes with

recommendations and lessons learned provided with the desire that these findings can be used to foster the improvement of intervention practice to enhance academic success and close the achievement gap of socio-economic disadvantaged students.

Findings Summary and Interpretation

Upon completion of the research, the results indicate that six-week math summer intervention was successful in increasing the foundational knowledge of 8th grade socio-economic disadvantaged students. The results aimed to answer the research question; in what ways does an 8th grade summer math intervention program close the achievement gap for socio-economic disadvantaged students?

Specifically, best teaching practices and strategies by the intervention teachers were affirmed and a distinct correlation between specific practices and student achievement were established. The district's goal of the intervention was to ensure outgoing socio-economic disadvantaged 8th grade students were ready to enter into a 9th grade core algebra math class. The hypothesis of the research stated that there is a positive correlation between 8th grade students participating in the intervention and academic achievement. The research analyzed the practices and through an open-ended survey provided to the teachers, found themes amongst the practices of the teachers that are hypothesized to have increased the success rate of the intervention.

According to the data, students who participated in the six-week math summer intervention and received the specific teaching practices and strategies that the intervention teachers utilized, were more likely to test out the intervention and be prepared to enter into a 9th grade core math class with the foundational knowledge needed to succeed. In particular, the qualitative data determined specific teaching practices correlated to higher test scores. These strategies and practices included; receiving profession development on the intervention, support

from admin, practice of small group instruction and conceptual teaching strategies, positive teacher/student relationships that enhanced social emotional support, the use of student goals, smaller class size, rewards and incentives, and regular attendance. Each intervention teacher noted in their open-ended survey a variation of each of these strategies and practices.

These practices had a positive correlation with the increase in test scores in all three intervention classes. The post assessment results from the six-week math intervention determined that all students tested out of the Course 1 Math Intervention which was considered at a 4th-5th grade level of math. Twenty-nine of the students were able to test into the Course 2 Intervention which is considered a 6th-7th grade level of math. This intervention will be continued in the fall of their 9th grade level to provide them an additional opportunity to close the gap and test out of the intervention and into a regular 9th grade core algebra class. Lastly, thirty-four of the 8th grade students were able to test out of the Math 180 Intervention and were eligible to be placed into a 9th Grade Core Math Class that focused on algebra.

Findings in Context

In discussing the best practices and strategies to close the achievement gap and boost academic achievement, many of the findings of this researched align with the literature. For example, teachers described in their open-ended surveys what would be considered positive-teacher student relationships. According to the literature, teachers who develop relationships with low SES students by learning about their academic needs, socio-economic status, and backgrounds will have an impact on student achievement (Parker, 2011). Beck & Luthar (2002) agree stating that disadvantaged students who perceive that their teachers support and personally care about their academic success benefit greatly. This can include when teachers provide support and encouragement and provide supportive feedback to students, which boosts social

emotional growth in students (Yu & Singh, 2018) Quality instruction and specific learning strategies can also boost student achievement for this demographic group.

High expectations and goals articulated by the teachers and administrator also enhance student achievement (Cone, 2012). This study found similar results as the teachers and administrator frequently communicated high expectations and the goals of the program for the students. The goals were written in each intervention classroom to remind students daily of what they were working towards. It was also found that all three teachers utilized similar teaching practices such as small group instructional and teaching math conceptual strategies. Small group instruction provides more individualized attention which leads to a higher level of engagement (Jitendra, Rodriguez, Kanive, Huang, Church, Corroy, & Zaslofsky, 2013). Yu & Sing (2018) stated that utilizing conceptual strategies in math will lead to greater student achievement. Additionally, it was found in the literature that incentives and rewards are used to motivate student success. The teacher's utilized their own various ways to motivate students intrinsically as well as extrinsically (Pool, Carter, & Johnson, 2012).

Admin support was also noted as a support that ultimately enhanced student learning in each of the intervention teacher's surveys. Administrative support was also an important finding within the research. Argyriou & Iordanidis (2014) state that administrators' ability to motivate the teaching staff while providing them with the necessary knowledge and skills will contribute to the teacher's effective performance of their duties which in turn will increase the student success rate.

Regular attendance and small class size had a positive influence on student achievement during the six-week math intervention. This was comparable to the literature in which it states high attendance rate is critical to ensure students have the time and practice to master concepts

(Tomic, 2016). Small class size was also described in the literature. Small class size ensures teachers the ability to get to know their student's needs, helping them to plan and develop instruction that will fit the students' unique needs (Cone, 2012).

Recommendations

This research contributed to existing literature that examined best practices of math interventions. It adds to the previous research by including a specific demographic group, socio-economic disadvantaged students, and the ongoing barriers that these students face which hinders district's ability to close the achievement gap. The following recommendations were made based on the qualitative teacher open-ended surveys and numerical data from the pre and post assessments which demonstrate success of the six-week summer math intervention.

Recommendation #1: The utilization of pre/post assessments to gauge student progress.

A huge component of this intervention was the fact that pre and post assessments were utilized to assess student knowledge. The teacher's used these scores to determine instruction, small group placement, and goals for their students. Once the intervention was over, post scores helped determine the success rate of the intervention. Without this knowledge, teachers would not have had a starting point with their students.

Recommendation #2: Admin to support and provide professional development to teachers.

Two out of the three teachers received professional development on the math intervention. It was noted from the surveys that teachers were able to ask questions and troubleshoot components of the program. The trainer also went over how the intervention should look during whole group and small group instruction. This training walked the teachers through the expectations, process, and goals. Without the training, teachers would have lacked the capabilities to implement the intervention with fidelity. With this training, the teachers and

admin were able to then train the third teacher. Admin support was also noted in all three teacher's open-ended survey. It was found that the summer admin provided frequent communication and feedback on the intervention and was available to support teachers with behavior issues or instructional support when needed.

Recommendation #3: Develop positive relationships with students that will enhance social-emotional learning and academic achievement.

The literature extensively suggests developing a relationship with students can enhance academic achievement. During the six-week intervention there were relatively low student issues. This can be connected with the personal support the qualitative data demonstrated through the intervention teacher's open-ended surveys. All teachers noted that they used various strategies such as address concerns away from other students, setting a positive tone for the day, encouraging and motivating students, and getting to know students on a personal level.

Recommendation #4: Small class size, use of aides to support, and small group instruction.

It was found during the intervention each class had between 20-24 students in each class. This allowed for teachers to provide instruction that was catered to the needs of the students. It was also found that there were aides in the classroom to help support the students and teachers. High student engagement was noted in the qualitative data as students had access to adults when they needed help or support. Both teachers and aides provided leveled small group instruction to students. This small group instruction provided students the opportunities to ask additional questions and receive personalized help.

Recommendation #5: High expectations and student goals

Part of the success of the intervention can be attributed to the student goals. Students always knew what they were striving towards. The goals were written on the board and

referenced daily by teachers, aides, and admin. High expectations were also consistently referenced by all adults. All students understood that they were expected to work hard and meet their goals.

Recommendation #6 Rewards and Incentives

Motivation was a key factor of the intervention. All students received were encouraged to meet their goals with intrinsic and extrinsic rewards. Intrinsic rewards were used such as praise, positive feedback, smiles, and high fives, while extrinsic rewards were used such as raffles, field trips, and treats. This increased student attendance and motivation during the intervention.

These six recommendations; the utilization of pre/post assessments, admin support and professional development, developing positive relationships with students, providing a small class size with the use of aides and small group instruction, setting high expectations and goals, and motivating students with rewards and incentives all led to a positive intervention outcome. These recommendations will provide a starting point for districts to begin the process of closing the achievement gap for students of low economic status. When utilizing these recommendations simultaneously, socio-economic disadvantaged students will have a higher chance of succeeding academically.

Limitations and Future Research

The research presented in this thesis encountered a couple limitations, one being the low number of intervention teachers participating in the case study. Ideally, a larger scope of intervention teachers, from different districts, would participate in this study to provide additional evidence as to which practices and strategies enhanced student learning of socio-economical disadvantaged students. Additionally, students were motivated to exit out of the intervention because they were notified, by Public High Administration, that the intervention

class would replace their 9th grade elective if it was not passed during the summer. Future research should focus on a prolonged approach of following these 8th grade students to determine if the intervention strategies presented continued to help this demographic group of students who continued the intervention into their 9th grade year.

Conclusion

Math achievement and its relationship with socio-economic status has been an enduring issue in education. Mathematic skills are increasingly important for everyday life, yet literature confirms that math achievement continues to affect a large proportion of the population, especially students of low SES. Although, the US has adopted many educational policies, such as No Child Left Behind, it has not been effective in eliminating this correlation. Recent research has been dedicated to developing effective interventions to improve math skills and knowledge. This research case study addresses the need to identify practices and strategies that will most benefit the low SES student population. The researcher set out to answer the question: in what ways does an 8th grade summer math intervention program close the achievement gap for socio-economic disadvantaged students? The results indicated that there was a positive correlation between the numerical and qualitative data that revealed students improved their math skills and knowledge by receiving a variety of practices that enhanced their learning experience. Based on the thesis findings from numerical and qualitative data, the results suggest that 8th grade socio-economic disadvantaged students who had teachers who participated in professional development and experienced admin support, built student relationships with students which enhanced their social emotional well-being, utilized teaching practices such as small group instruction and the teachings of conceptual strategies, set student goals, were a part of a small class size, attended regularly, and were motivated by incentives were successful in testing into

the next course of intervention or exiting the program all together. Recommendations include providing low SES students an intervention that encompasses the strategies and practices found from the coded qualitative data to enhance student knowledge of mathematics and begin to close the achievement gap. Although, the math achievement gap for socio-economic disadvantaged students is prevalent, this case study found results that indicate there are strategies and practices that educators can utilize that will strengthen the math skills of this demographic group and begin the process of closing the gap.

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