ABSTRACT

BROCKINGTON, SHARI NICOLE. An Exploratory Qualitative Study on Parent Involvement and Their Perceptions of Students' Mathematical Learning Through a Mathematics Workshop (Under the direction of Dr. Erin Krupa).

Many research studies have established that parental involvement impacts academic achievement, but few have explored how parents' perceptions of their children's math learning are examined after participating in workshops (Cai, 2003; Henderson & Mapp, 2002; Walker et al., 2004; Fan 2001; Driessen et al., 2005; Wright, 2009). Multiple forms of parental involvement are designed to promote students' learning and development (Epstein et al., 2018). The goal of this exploratory qualitative study was to understand how parents engage in a mathematics workshop in a rural high school setting, their perception of mathematics, and how they perceive parental involvement before and after the workshop.

Parents participated in a four-session workshop designed to engage them in understanding mathematics, utilizing various communication tools, creating a home environment that stimulates learning, and supporting the mathematics curriculum. Data were collected through surveys and semi-structured interviews over a period of six weeks. The data were analyzed for descriptive statistics and thematic analysis. Interview data revealed that after attending the math workshops, parents' perceptions of their student's math learning changed in the following ways: they had increased confidence, enjoyed the workshops, and benefited from learning about resources to help their child academically. In addition, parents discussed their perceptions of barriers to being involved in their child's math education, which included transportation, work conflicts, or not feeling comfortable. They also discussed their perceptions of mathematics as a discipline.

Parents also had views about general parental involvement with schools after attending the workshop. Specifically, parents had suggestions to increase parental engagement and on the use of communication tools for use by parents and schools. Parents suggested that the workshops were beneficial for promoting a growth mindset, collaboration and communication with teachers, and creating a supportive home environment. The qualitative analysis revealed that the participants made improvements on how they viewed mathematics and their perceptions of their students' mathematical learning. These findings suggest that overall, the perceptions of the parents who participated in the four-session workshop made slight improvements to their perceptions after attending the workshop on mathematics and students' math learning.

An Exploratory Qualitative Study on Parent Involvement and Their Perceptions of Students' Mathematical Learning Through a Mathematics Workshop

by

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APPROVED BY:

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DEDICATION

For my parents, Clinton and Katie Brockington, who have shown and taught me the true meaning of love in this earthly life. I appreciate you both for instilling the importance of education, learning, and gratitude at an early age. I'm so grateful for your unselfish love, sacrifices, and gratitude throughout my life.

For my sister, Teresa, who has always been there in so many ways, filling in the gap when I was studying, in class, or at work, I am forever grateful for your love and kindness.

For my son, Caleb Isaiah Brockington, my pride and joy, who believed in me and fueled my determination to complete my dissertation. Every sacrifice was worth it as I watched you walk across the stage as your class valedictorian, and now I see you navigating your college journey with enthusiasm and determination. It wasn't an easy walk, but we did it! The powerhouse of success is upon you, and I'm forever grateful and blessed to be your mom!

BIOGRAPHY

Shari Nicole Brockington was born in Lumberton, North Carolina, to Mr. & Mrs. Clinton Brockington. She has one younger sibling, Teresa Joy Brockington, a proud alumna of NC State University. Shari graduated from Red Springs High School in 2002 at the top of her class. After graduation, she attended the illustrious Winston-Salem State University, where she received the NC Teach Grant and was accepted into the NC-LSAMP program. While at WSSU, she served as a research assistant, peer mentor, and math tutor and was a member of Delta Sigma Theta Sorority, Incorporated.

In 2006, directly before graduation, she welcomed the joy of her life, Caleb Isaiah Brockington. After graduating magna cum laude with a Bachelor of Science in Pure Mathematics, she taught mathematics at the Information Technology High School and Red Springs High School. In 2010, Shari pursued a Master of Education in Secondary Education Mathematics and was awarded the HBCU STEM scholarship at Fayetteville State University. This scholarship afforded her free tuition; she has presented at six national, three state, and numerous local conferences. She graduated from Fayetteville State University with a 4.0 GPA.

While at Red Springs High School, she served as a teacher leader for the Robert Noyce Program, which supports undergraduate STEM majors in becoming K-12 STEM teachers, and as a master teacher for the UNCP Teacher Education Program. In 2016, she graduated from Gardner Webb University with a Master of Arts degree in Executive Leadership Studies. In 2017, Shari was a keynote speaker at the NC Scholar Banquet and was selected as the Teacher of the Year for Red Springs High School and a co-finalist for the Teacher of the Year award for the Public Schools of Robeson County.

As a high school student, Shari always dreamed of attending North Carolina State University, which became a reality in 2018. During the fall semester, Shari began her Ph.D. in Learning and Teaching in STEM at North Carolina State University. She prepared and co-taught EMS 480 Teaching Mathematics with Technology at North Carolina State University. She is now an instructor in the Mathematics Department at Richmond Community College, where she continues to serve as a workshop facilitator for the Public Schools of Robeson County, working with high school math teachers. She has a passion for community service and inspiring others. Her hobbies include traveling and spending time with family and friends.

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"I can do all things through Christ, who strengthens me" -Philippians 4:13

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CHAPTER 1: INTRODUCTION

Background of the Problem

The lack of parental involvement is an issue in our educational system (Peressini, 1998). This issue has been a concern for decades, with little research exploring ways parents can support students' mathematics learning in the process. A limited number of research studies examine how parents can support students' mathematics learning (Civil & Bernier, 2006; McDonnall et al., 2012). However, there is growing evidence that parental involvement increases a child's levels of math attainment when parents engage in their child's learning and education (Sheldon & Epstein, 2005; Cai 2003; Henderson & Mapp, 2002; Fan & Chen, 2001). From my observation, the researcher found that most parents are heavily involved when their children are at the elementary level, and this type of involvement decreases as students navigate to higher levels of mathematics. But there is a need for research to focus solely on finding ways for parents to support their child's mathematics learning in secondary education.

Parent involvement in schools goes beyond attending open houses or PTA meetings. A strong relationship between home background variables and effective communication between stakeholders is critical to children's success in education (Ozmen et al., 2016; Cai et al., 1999). According to the report "Strong Families, Strong Schools," research shows that increased parental involvement in students' learning is one of the variables required for a high-quality education (U.S. Department of Education, 1994). Researchers have shown that parents involved in their children's education are more likely to have higher academic performance and improved behavior (Cai, 2003; Henderson & Mapp, 2002; Walker et al., 2004; Fan 2001; Driessen et al., 2005; Wright, 2009). Reading with children, helping with homework, volunteering in

classrooms, attending school activities, and parent-teacher meetings are a few ways for parents to support their children's learning and to be involved.

Research shows that parental involvement in school affects children's educational success in school (Epstein, 1995). In some cases, parents' "misunderstandings" can lead to opposition to school mathematics reform efforts due to insufficient knowledge (Lopez & Donovan, 2009). Those misunderstandings of how to support their children may be due to how parents learned mathematics or their lack of understanding of mathematics. Currently, there is limited research on how to increase parental involvement when their children are in high school, specifically to support students' mathematics learning. How can educators develop a coherent plan to increase parental involvement to support students' mathematics learning? Are teachers communicating effectively with parents of mathematics students? These questions remain unanswered, and the student performance gap in mathematics education continues to widen.

Statement of the Problem

There is limited but growing research on parental involvement that supports mathematics education issues (Civil & Quintos, 2003). A growing number of researchers seek ways to revisit the traditional "school-centric" definition of parental involvement, which overlooks the needs and perceptions of the parents who are being encouraged to become involved (Jackson & Remillard, 2005). Some studies show that positive reinforcement of parental involvement can lead to many rewarding life opportunities for their children, including preparation for college, job readiness, enthusiasm for learning, good attendance, academic performance (Ozmen et al., 2016; Hoover-Dempsey et al., 1995) and better attitudes and confidence in school (Durisic & Bunijevac, 2017; Shumow & Miller, 2001).

As a result, researchers have developed various models, frameworks, and activities to

construct effective partnerships between schools and families. Epstein 's (1995) research supports the critical need for parental involvement, citing the premise that parents can foster partnerships between homes, schools, and communities (Wright, 2009). One of those proposed activities is for parents to actively participate in mathematics workshops which will include: explaining tutoring opportunities for students and providing resources to parents to help their child at home.

Purpose of the Study

The purpose of this research is to examine the impact of a mathematics workshop for parents of students in a high school mathematics course. More specifically, the research questions guiding the study are listed below:

1. What impacts did the workshop have on parents' perceptions of mathematics?
2. How do parents of high school mathematics students view parental involvement/engagement before and after the workshop?

Definition of Terms

In this dissertation study, the following terms are defined as:

- *Communication*: The participation of parents in regular, two-way, and multiple meaningful communication involving student academic learning and other school activities (U.S. Department of Education, 1994, p. 5).
- *Parent*: The mother, father, or legal guardian of a child who has the most contact with the school about the child (Epstein et al., 2002).
- *Parent Engagement:* This involves communication between parents and the school, working together to support and improve learning development while also

informing parents about assignments, activities, and access to school resources (Houri et al., 2019).

- *Parent Involvement:* Being aware and involved in schoolwork activities, consistently communicating with teachers, and understanding the interaction between parents and students (Pate and Andrews, 2006).
- *Perception:* A thought, belief, or opinion (Cambridge Dictionary English, 2025).
- *Self-Efficacy:* A person's belief that they can be successful when carrying out a particular task (Cambridge Dictionary English, 2025).
- *Learning at home*: Provide information and ideas to families about how to help students at home with homework and other curriculum-related activities, decisions, and planning (Epstein, 2001).

Significance of the Study

Parental involvement has been implemented in many schools as a method of increasing student achievement in multiple subject areas. There are many different variations on what defines parental involvement and what types of parental involvement strategies are the most effective and beneficial for supporting student learning. There is little research on how to use parental involvement to support mathematics learning for secondary education.

One method to support mathematics learning is through mathematics workshops for parents. Prior research has shown that mathematics workshops for parents have been successful in helping parents better understand the tools for their children to achieve student success. This study will provide insight on how a parent workshop can change the perceptions of parents as it relates to mathematics instruction and their involvement in the education system. School systems implement many programs throughout the school year to involve parents. Still, we must explore

some of the most effective methods for supporting parental involvement, particularly in mathematics, at the secondary level.

Organization of the Study

Chapter one introduces the background of the study by outlining how inadequate parental involvement has become an issue in our educational system. Research showed that parental involvement decreases as students navigate from elementary school to higher levels of mathematics. The purpose of this study, research questions, and the definition of terms are stated above, and the significance of the study is highlighted at the end of the chapter.

Chapter two emphasizes the review of literature and Epstein's (2001) six types of parental involvement framework, along with its application in previous research. In addition, the Math and Parental Partnership in the Southwest (MAPPS) project (Civil et al., 2003) is explored and described to highlight research-based evidence for the use of parental workshops to support their child's mathematics learning. The literature presented in Chapter two sets up the research design presented in the subsequent chapter.

Chapter three highlights the methods utilized in the study. An exploratory qualitative research design was most suitable for this study, as it seeks to explore how parents perceive their students' mathematics learning after attending a math workshop. Utilizing this research design allowed the researcher to focus on parents' perceptions, and the research questions were well-suited for discovering their attitudes and beliefs towards mathematics. The research setting, recruitment and selection of participants, participant descriptions, and workshop details were discussed. The data collection process utilizes surveys and semi-structured interviews to align the research questions with the data sources. The chapter concludes with a discussion of data analysis, the researcher's positionality, and trustworthiness.

In chapter four, the findings were analyzed by investigating the research questions. Means for survey data were provided, and excerpts from participant interviews are used to support the themes that emerged from the qualitative analysis. The research results are presented by research questions, and claims are supported with evidence from the data.

Chapter five presents a summary of the study and its findings for both research questions. The findings were also in line with the existing literature. The limitations, implications for parents of math students, and implications for principals and schools were also highlighted. The chapter concludes with suggestions for future research.

Summary

This chapter presented the issues involving parents in mathematics, the limitations of their involvement, and the purpose of better understanding how parents can support their children in mathematics. This work lays the foundation for building a collaborative relationship among teachers, community advocates, administrators, and parents to support students' learning in Math 1. In the next section, the literature is reviewed to establish familiarity with past and current research on parents' perceptions and parental involvement.

CHAPTER 2: LITERATURE REVIEW

Introduction

This chapter focuses on literature on the involvement of parents in mathematics education. The literature review related to this research study is organized as follows:

- Defining Parental Involvement
- Epstein's Framework for Involvement
- Using Communication Tools
- Family & School Partnerships
- Parental Involvement and Student Achievement
- Mathematics Learning with Parental Support
- Parent Perceptions of Parental Involvement
- Mathematics Projects/Workshops

Defining Parent Involvement

There are multiple perspectives of parental involvement, making it difficult to define. Consequently, there is a lack of consensus regarding the definition of parental involvement, despite its intuitive meaning, the operational use of parental involvement has not been clear and consistent (Fan & Chen, 2001). The No Child Left Behind (NCLB) Act defines parental involvement as “the participation of parents in regular, two-way, and meaningful communication involving student academic learning and other school activities” (U.S. Department of Education, 1994, p. 5).

Pate and Andrews (2006) define parental involvement as being aware and involved in schoolwork activities, understanding the interaction between parents and students in school, and being consistent by communicating with teachers. Research shows that when parents are actively

involved, their children achieve greater success as learners (Henderson & Mapp 2002; Pate & Andrews, 2006; Fan & Chen, 2001; Epstein, 2001). Specifically, the more involved parents are, will increase student's confidence along with the beneficial effects on their academic achievement (Fan & Chen, 2001).

Epstein's Framework for Parental Involvement

Epstein's typologies are widely used in studies in the United States and worldwide. Epstein (2001) developed a theoretical framework, the Overlapping Spheres of Influence, and the six types of parental involvement that schools can use to guide their attempts to increase parental involvement and build partnership programs. Epstein's six types of involvement include parenting, communicating, volunteering, learning at home, decision-making, and working with the community (Table 1). In the six types of parental involvement, Epstein implied that guardians who were informed and involved in their children's training positively influenced their child's attitude and performance towards their schoolwork (Epstein et al., 2002).

Researchers Catsambis and Garland (1997) from the Center for Research on the Education of Students Placed at Risk (CRESPAR) conducted a study to examine data from changes in parental involvement in the 1988 National Educational Longitudinal Study between eighth and twelfth grade. Although all six types of parental involvement are crucial, Catsambis and Garland investigated two of Epstein's six types of parental involvement, communication, and home-learning. The findings from the study indicate that parents welcome opportunities to communicate with the school, desire participation in the college decision-making process and seek guidance to secure funds for college. (Catsambis & Garland, 1997).

Table 1

Epstein's Six Types of Involvement

Type of Parental Involvement	Description
Type 1: Parenting	Help all families establish home environments to support children as students.
Type 2: Communicating	Design effective forms of school-to-home and home-to-school communications about school programs.
Type 3: Volunteering	Recruit and organize parent help and support.
Type 4: Learning at Home	Provide information and ideas to families about how to help students at home with homework and other curriculum- related activities, decisions, and planning.
Type 5: Decision Making	Include parents in school decisions, developing parent leaders and representatives.
Type 6: Collaborating with the Community	Identify and integrate community resources and services to strengthen school programs, family practices, and student learning and development.

More recently, educational reform efforts have sought to reach children in low-income communities, resulting in a wave of calls for "parental involvement" in education (Mattingly et al., 2002; U.S. Department of Education, 1994; Pressini, 1998; Jackson & Remillard, 2005). This leaves unclear definitions and disagreements among policymakers, practitioners, and researchers of what comprises parental involvement (Jackson & Remillard, 2005), these calls are:

> grounded in notions that parental involvement may improve student achievement, produce lower dropout rates, foster positive attitudes toward learning and school, increase parent-child communication, promote positive student behaviors, enhance the educational experiences of "disadvantaged" students, increase home and community support for schools, and be a basic "right" of all parents in the

process of public education (Pressini, 1998, as cited by Jackson & Remillard, 2005, p.24).

Review of Research

Using Communication Tools

The lack of communication between teachers and parents regarding students' school performance, mathematics learning activities, and school events negatively affect the students. Unfortunately, many teachers lack the training necessary to communicate effectively with parents (Graham-Clay, 2002). Most of this research is based on findings from general learning and not specifically related to parents of math learners (Lopez & Donovan, 2009). There are many types of communication tools educators can use to engage and communicate with parents (Graham-Clay, 2002). Effective communication is essential to create strong school-home partnerships and to increase parental involvement (Graham-Clay, 2002).

Epstein (1995) describes communicating with parents as one of six important types of parental involvement as a key component in building a strong working relationship between teachers and parents. Communication increases the understanding of collaboration between parents and teachers in terms of children's learning in general (Epstein et al., 1997). There are different types of communication tools now available to teachers given the new burst of technological advances since Covid-19. This allows teachers to use multiple types of communication tools to accommodate parents.

Some types of communication include parent-teacher association meetings (PTA), phone meetings, school events, social media, email, and informal visits to schools to share ideas about children's mathematics learning (Epstein et al., 2002). Schools can maximize parental involvement, which will increase positive contributions to enhancing parent-child relationships.

Schools can use school websites and social media to keep parents abreast not only of their child's progress but also of specific activities in which their child is involved. For example, having access to online learning materials can further increase parent involvement at home. Moreover, Epstein shifts the focus from parents to schools by recognizing communication as a bi-directional endeavor and encouraging schools to create a space for parent ownership within the school through joint decision-making, which helps students succeed in mathematics. (Lopez & Donovan, 2009).

Family and school partnerships

Creating a system where families and schools collaborate while working together to help students be successful is valuable. Henderson et al. (2007) discuss ways to develop an effective partnership amongst schools and parents working together to increase communication, such as preparing teachers to work with parents as a collaborative factor in their student's educational journey. The end goal is to navigate students in the right direction that will help them succeed. The research for students in grades K-4 shows that this type of partnership will increase the student's desire to perform well in school when all stakeholders are interested in their education (Henderson et al., 2007).

A common assumption in existing research is that parents, students, and teachers share similar perceptions of parental involvement (Barge & Loges, 2003). Therefore, there is also a consensus among parents, students, and teachers on the appropriate type and form of communication associated with parental involvement, which should be discussed with whom, what, where they are talking, and how they are talking (Barge & Loges, 2003). However, it may be problematic to assume that parents, students, and teachers all share common assumptions about parental engagement and their associated communication forms (Barge & Loges, 2003).

Epstein's typology incorporates the six major components of parental involvement with a significant connection to communication. A parent-teacher communication partnership is a mission for some schools to build relationships and increase academic achievement (Epstein et al., 2001). This parent-teacher communication partnership refers to the contact between parents and schools concerning student progress and the curriculum. To make the parent-teacher relationship effective, communication will provide both parties with a deeper understanding of expectations of children's needs, enabling them to assist the children (Epstein, 2001, Symeou et al., 2012).

Symeou et al. (2012) created, implemented, and examined a teacher in-service training program to determine the communication needs between parents and teachers. They used both qualitative and quantitative methods, and data were collected through questionnaires before and after the training. The purpose of evaluating teachers was to assess the effectiveness of the communication tools used during the school year. Thus, the teacher trainees completed the same questionnaire in the first meeting and again in the last meeting of the course, in a pre-test/post-test experimental design. Overall, the training sessions strengthened teachers' beliefs and provided evidence of the program's effectiveness in developing communication skills.

Barge and Loges' (2003) qualitative study examined teachers' and parents' perceptions of parental involvement. The methods used in this study included focus groups, allowing researchers to interview both parents and teachers to gather their views on involvement. In this study, four themes were identified in interviews with teachers about their perception of parental involvement: (a) participation in school or at home, (b) communication with teachers, (c) parental supervision, and (d) discipline (Barge & Loges, 2003). Communication was labeled as one of the themes that initiate contact with teachers and the availability of communication, which

leads to higher expectations. The concept of open communication in both directions is a crucial aspect of effective parental involvement.

Barge and Loges bring a broader perspective to the communication theme, and Graham-Clay provides specific ideas on how to implement communication tools between parents and teachers. Graham-Clay (2002) investigated multiple ways for teachers to communicate with parents using technology tools such as phones, voicemail, video technology, radio announcements, and school websites. For example, a teacher utilized recorded messages and applications to communicate with parents and students, sending daily reminders about important events and homework assignments. Graham-Clay found that internet technology is the most recent tool used by teachers to convey information. They discovered that interactive tools for individualizing homework and supporting family involvement can also serve as effective communication tools (Graham-Clay, 2002).

Parental Involvement and Student Achievement

Cai (2003) identified five types of parental involvement: resource provider, mathematics content advisor, mathematics learning counselor, monitor, and motivator. The study investigated the role parents play in the mathematics learning of US and Chinese students in the home setting, as well as the relationship between parental involvement and students' mathematical problem-solving performance (Cai, 2003). A Parental Involvement Questionnaire (PIQ) was developed to assess the level of parental involvement in students' learning of mathematics using the five parental roles. The findings of this study support the argument that parental involvement is a statistically significant predictor of their children's mathematics achievement on standardized testing from a national perspective. The roles of monitor and motivator appeared to have the most significant influence on children's problem-solving performance. The results from the

study also revealed that the students with the most supportive parents not only have higher proficiency levels, but also more positive attitudes toward mathematics than those students with the least supportive parents, which is consistent with studies by other researchers (Cai et al., 1999; Sheldon & Epstein, 2005). Degol et al. (2017) examined the impact of parental involvement on the academic performance of students in secondary education. The data from the study was taken from the Longitudinal Study of American Youth (LSAY) that followed youth through their high school education and at various stages beyond high school. The students were also administered standardized math achievement tests and completed questionnaires about parental involvement during the same academic year. Parents and students were surveyed or interviewed each year from the 7th to 12th grade, providing information on parental involvement (Degol et al., 2017). The four dimensions of parental involvement that were examined were academic values, behaviors promoting future academic success, home structure, and school involvement. The findings indicate that parental involvement during middle school predicted a higher grade point average (GPA) and their likelihood of enrolling in college. Parental involvement has a significant impact on predicting a student's performance in secondary education.

Fan and Chen (2001) conducted a meta-analysis to synthesize the quantitative literature regarding the empirical relationship between parental involvement and student achievement. Fan and Chen (2001) selected 25 studies for their analysis from the 2,000 studies found on the ERIC and PsycLIT databases. The definitions for parental involvement were grouped into several broad dimensions, including parent-child communication, home supervision, educational aspirations for children, school contact, and participation. Similarly, the definitions for students'

achievement varied amongst the studies (Fan & Chen, 2001). These definitions were grouped into overall grades, test scores in mathematics and reading, and grade promotion vs retention.

The results of the meta-analysis indicated that "parental involvement and students' academic achievement are positively related, although, in individual studies, there has been considerable inconsistency about the magnitude of such relationship" (Fan & Chen, 2001, p. 26). However, further investigation revealed a stronger relationship between parental involvement and academic achievement, with academic achievement represented by the school's overall GPA rather than a narrower focus on the specific academic areas (e.g., mathematics or reading test scores). The findings also suggest that parental home supervision is likely not a reliable indicator of parental involvement, as students may not be performing well academically overall.

In contrast, Jeynes (2017) conducted a meta-analysis focused on examining the effects of parental involvement on urban secondary school children's academic achievement. Fan and Chen (2001) did not specifically include calculations for urban students or tested components of parental involvement as it relates to this specific group of students. A total of 25 databases such as Psych Info., ERIC, Dissertation Abstracts International, Wilson Periodicals, and Sociological Abstracts were searched to obtain studies used in the meta-analysis. The search yielded more than 5,000 articles that were narrowed down to 52 studies that contained a sufficient degree of quantitative data. For this particular study, Jeynes (2017) defined parental involvement as parental participation in the educational processes and experiences of their children.

The variables Jeynes (2017) considered consisted of parental involvement, parental expectations, attendance, participation, communication, homework, and parental style. The meta-analysis examined a relationship between academic achievement and parental involvement, the association between specific types of parental involvement, and student achievement by race.

The findings indicate that parental involvement has a positive impact on academic achievement regardless of children's ethnicity or race. The overall results hold true for all measures of the academic achievement that were examined for this study.

Jeynes's (2017) meta-analysis identified parental expectations as one of the specific areas with the strongest positive relationship to academic achievement. This correlates with Fan and Chen's (2001) findings, which indicated that parental aspirations and expectations have a stronger relationship with academic achievement compared to other aspects of general parental involvement. For example, family communications about school and enforcing household rules did not yield an impact that was statistically significant.

Many factors influence the level of parental involvement in learning. The literature provides a broad understanding of the positive impact parental involvement has on student achievement. Much evidence acknowledges the involvement of parents as being desirable for student achievement. The findings from the studies facilitate opportunities for parents to be involved in multiple ways, such as assisting with homework, making sure their children are attending school, and communicating with teachers.

Parental Involvement and Mathematics Achievement

Peressini (1998) provides an analysis of the positioning of parents through the lens of the school mathematics reform literature. The researcher argues that the professionalism of teachers can distance parents from schools and affect the ways parents interact with their children's mathematics education. Peressini shares that parents should be included in mathematics education reform and parents should be actively involved to increase mathematics achievement for their children. Furthermore, Peressini's discussion establishes the significance of including parents in school reform and the importance of understanding parents in mathematics education

and describing various ways in which parents have affected school reform. The type of math that their child is learning may be different from how they learned it while they were in school. Parents often become frustrated with the lack of resources provided by the school. The lack of textbooks or unfamiliar grounds can increase the frustration. Thus, educators need to equip parents with the resources required to assist their children if needed.

Math Learning with Parental Support

Many parents feel inadequate in helping their children with mathematics because they are not confident in their mathematical skills, are unaware of the content, or do not have the skills they need to help their children (Lopez & Donovan, 2009). This supports other findings that parental involvement tends to diminish with grade level, which could be attributed to the increasingly complex nature of mathematics as students move through grades, with parents lacking the content knowledge or teaching skills needed to help their children (Sheldon & Epstein, 2005). However, when parents are taught how to work with their children with mathematical concepts, the parents develop a better attitude towards school and the subject area, which could influence students' attitudes towards mathematics (Lopez & Donovan, 2009). Engaging parents in their child's mathematics education could prevent the decline in students' performance in mathematics (Sheldon & Epstein, 2005).

Math Learning in Informal Context

Research on mathematical learning and reasoning has been a primary component of the classroom and formal education literature. (National Research Council, 2005). Much less attention has been given to how adults and children engage with and learn about mathematics outside school, including everyday activities and structured informal learning environments, such as interactive math exhibits (National Research Council, 2005). Given the increased recognition

of the significance of informal STEM Education (National Research Council, 2005), educators, researchers, and policymakers are looking at how these experiences could support mathematical learning. An example of one of the common practices is inviting parents to math workshops (Lopez & Donovan, 2009).

Research conducted by Larocque et al. (2011) found that parental involvement in learning at home during primary ages had a significant impact on educational achievement as students advanced through school. This does not mean that parents are teaching their children or giving them homework to complete; rather, parental involvement at home leads to meaningful engagement and conversations that show the value of education, promote high expectations, and provide shared aspirations between parents, children, and schools collectively (Graham-Clay, 2002).

Similarly, Williams et al. (2016) conducted a qualitative study to investigate how parents support their children's mathematics learning in seventh-grade students through the concept of funds of knowledge. Funds of knowledge sources include skills, ideas, practices, and knowledge bodies necessary to the functioning and well-being of a household (Williams et al., 2016). Williams and colleagues used funds of knowledge as categories such as family history, educational history, labor history, family networks, resources in the home, knowledge transmission, values, and goals.

The results of the study suggest families encourage their children to solve contextual problems as students encounter mathematics through daily activities like shopping, sports, and cooking (Williams et al., 2016). Students had mathematical discussions with their parents, including the analysis of basketball scores or using the metric measurement during cooking. One of the teachers mentioned her difficulties finding time to communicate with parents throughout

the day. Through the interviews, she understood that parents had a preference for communicating, including texting, e-mail, or personal communication.

Parents' Self-Efficacy

Self-efficacy is the belief in one's ability to achieve a goal. Parents' attitudes and beliefs concerning mathematics can also influence children's behavior related to homework (Hoover-Dempsey, 1995; Sheldon & Epstein, 2005). Research shows that parental involvement in children's school learning can increase student achievement (Fan et al., 2012). Parents can find access to math resources online and encourage students to attend tutoring or math-related activities by helping them see the benefits of increasing mathematical knowledge. To increase the impact of the involvement, the parent and student's collaborative efforts must stay consistent. Three critical components of parental involvement that are essential to support students' mathematics learning include: 1) creating a home environment to stimulate mathematics learning, 2) supporting the curriculum, and 3) Motivation.

Liu and Leighton (2021) examine the internal structure of a parent survey to investigate the relationships between different aspects of parental involvement and the prediction of children's mathematics achievement. This particular study involved secondary data from 139 parents and math achievement from approximately 120 elementary children. The study was guided by the Hoover-Dempsey parent involvement process model. Parental self-efficacy was recommended by parental perceptions of school invitations to be involved. The results from the study support the hypothesis that invitations from important stakeholders at the school may contribute significantly to the increase of parental self-efficacy and parent beliefs in children's mathematics achievement (Hoover-Dempsey et al., 2005).

Parent Perceptions of Parental Involvement

Epstein conveys that the organization of the family and school officials is governed by parents and educators, who have separate goals, roles, and responsibilities (Epstein et al., 2002). This statement makes it clear that each stakeholder approaches education differently. All stakeholders, including parents, teachers, and community leaders, want the same positive outcomes related to student achievement. However, when teachers and parents collaborate, it helps the students more (Epstein et al., 2002).

Several research studies have highlighted the negative aspects of parents not being involved in their children's education (Barge & Loges, 2003). In contrast, Barge and Loges (2003) conducted a qualitative study that demonstrated parents who shared similar involvement in their students' education. In this study, four themes emerged regarding the characteristics of parental involvement: a) monitoring student academic progress, b) cultivating personal relationships with teachers, c) utilizing extracurricular school programs, and d) developing community support systems.

The first theme, which was the strongest of all, focuses on parents monitoring their students' academic progress. Monitoring students' progress daily on regular and homework assignments is mentioned in the study. They also stated that it was imperative for them to continually monitor the homework assignments and ensure they were completed (Barge and Loges, 2003). According to Barge and Loges (2003), monitoring students' academic progress helps them become more self-efficient and confident in their ability as student learners. Many schools have advanced technologies to portray students' academic progress, and parents can view their grades and progress reports online. Many schools still use paper copies to send progress reports and report cards home.

The second theme was cultivating personal relationships with teachers. Parents recognize that building a relationship with their child's teachers is beneficial for their children's education. Parents from the focus group stated, "If teachers and faculty know that the parents are involved, they treat the students better. It makes a difference when they know the parents are involved and care" (Barge and Loges, 2003). Additionally, parents made suggestions for building relationships with the children's teachers: a) respond to teacher comments and requests from progress reports, b) attend parent-teacher conferences, and c) use technology to obtain information about students' classes.

Lastly, parents also desired different communication patterns with teachers: a) parents expressed a desire for teachers to contact them when the student's performance was excellent or when they did something well. More positive and less negative. b) parents expressed a different type of setting for communication with teachers. Some of the examples mentioned were having fun interacting with teachers at family night playing games and line dancing, how parents would give out their personal numbers and take time to call parents during their lunch break, and having incentives. All of these examples highlight the significance of teachers and parents interacting in a more informal and relaxed setting to develop more personal relationships (Barge and Loges, 2003).

The third theme that appeared in the study was utilizing extracurricular school programs. It was important for parents to have students participate in extracurricular school programs that allowed parents to feel comfortable with building relationships with members of the agencies that formed partnerships with the schools. Some of the parents thought that it was important for them to locate extracurricular activities in which their children could participate. Three benefits occurred such as: some of the programs provided additional academic support for parents, the

second benefit was locating appropriate extracurricular programs that will bring another mentor or adult role model in the child's life and the third benefit was that extracurricular programs provide opportunities for different forms of communication between the children and parents (Barge and Loges, 2003).

The last theme that emerged from the focus groups was the development of community support systems. This theme focused on collaborative communication in building healthy relationships among parents, school administrators, and parents-to-parents. The parents from the study believed that it takes all stakeholders collaborating to foster student achievement. They also believe that parental involvement includes parents taking the necessary steps to strengthen a sense of community (Barge and Loges, 2003). Most importantly, the goal is to create an atmosphere where all stakeholders come together to improve the child's academic success.

Mohr-Schroeder et al.'s (2017) quantitative study entitled "Parents Toward Mathematics and the Influence on Their Students' Attitudes Toward Mathematics" examined the relationship between parents' and students' attitudes toward mathematics. The study investigated 146 parent-student pairs who participated in district-wide Family Math Nights in a large urban school district in the upper South-Central region of the United States. The findings revealed a positive statistically significant correlation between parents' and students' attitudes towards mathematics. Moreover, the study indicated that their parents' attitudes predicted their children's attitudes toward mathematics. The results from the study further solidify that parents' attitudes influence their children's attitudes toward mathematics.

Recent research focused on allowing parents to observe how their children reason mathematically in ways that differ from how they reason in a traditional school setting (Sun, 2022). This study aligns with other research that learning extends beyond helping children with

homework and building their confidence in mathematics (Barge & Loges, 2003; Williams et al., 2016). Thus, the parents in this study engaged in activities such as cooking and maze building, which allowed them to observe how their children work and apply various mathematical concepts (Sun, 2022). The study's findings align with the notion that parents' perceptions can shift when they observe their children engaging with mathematics in various ways.

Similar studies have also found a connection between children's motivation and achievement and their parents' beliefs about mathematics. Peixoto et al. (2023) investigated the impact of parents' beliefs and involvement on their children's mathematical motivation. During the study, approximately 8,017 students from six European countries found significant relationships between parents' attitudes towards mathematics, their practices, and the child's outcomes, as well as the association between children's mathematics motivation and achievement. These findings align with previous research (Sun, 2022), as they both suggest that parents' perceptions of math learning influence how they engage with their child's math performance.

Math Learning in Formal Context

Research has identified several factors that positively impact student achievement. There is training available for teachers, parents, and community leaders to develop the necessary skills to support an effective partnership (Fan et al., 2012). This partnership is developed when all stakeholders respect each other and can create shared goals that are beneficial for the student (Henderson et al., 2007). New beliefs and attitudes must be formed and adapted by all stakeholders.

Family and Community Activities

Sheldon and Epstein (2005) examine the connections between specific family/ community activities and student achievement in mathematics. The study shows a positive

correlation between the perceived effectiveness of a mathematics partnership between the teacher, parent, and student outcomes and participation in three activities such as (a) giving parents information on how to contact mathematics teachers, (b) scheduling conferences with parents of students who were struggling in mathematics, and (c) providing information about student progress as it relates to mathematics on their report cards (Sheldon & Epstein, 2005). These three practices were rated as the most effective for helping students improve their mathematics achievement.

If schools, families, and community groups work together to support student learning, then students tend to do better in school, stay in school longer, and enjoy school more (Cai, 2003; Henderson & Mapp, 2002; Walker et al., 2004; Fan & Chen, 2001; Driessen et al., 2005; Wright, 2009). Regardless of family income or background, students with involved parents are more likely to earn higher grades and enroll in higher-level school programs (Cai, 2003). They will attend school regularly, develop better social skills, exhibit improved behaviors, and adapt well to the school environment. Many of the students will graduate and pursue higher education.

Project MAPPS (Math and Parent Partnerships in the Southwest)

Project MAPPS (Civil et al., 2003) is a four-year-long project that focuses on parental involvement in mathematics learning. The project currently operates at four sites: Tucson, AZ; Chandler, AZ; San Jose, CA; and Las Vegas, NM. The project began in Tucson in 1999 and subsequently expanded to other sites in 2001. One of the project's goals is to develop leadership teams, comprising parents, administrators, and teachers, that will support the district's mathematics education outreach efforts (Civil et al., 2003). Parents who participate in the program are seeking ways to support their children's mathematics learning. The project looks for ways to promote parents as leaders as they lead different mathematics activities at home and

school through three components: a) leadership development sessions in which parents, teachers, and administrators come together to explore different learning styles, to learn how to facilitate workshops for the larger parent community, and to work on parent recruitment issues; b) Mathematics Awareness Workshops (MAWS) that are open to all the parents in a given district and range over critical topics in mathematics in K-12; and c) Math for Parents (MFP) courses in which parents in Leadership Teams have an opportunity to explore mathematical topics in more depth.

The findings indicate that parents lack a clear understanding of how mathematics is taught (Lehr & Shumow, 1997). The results suggest that providing parents with opportunities to construct their own understanding of mathematical concepts actively lays a critical foundation for their work with their children (Civil et al., 2003). Some of the parents wanted to rely on their understanding of mathematics, for example, rote memorization instead of having a conceptual understanding of the mathematics. Other parents in the study reported that working with their children to develop mathematical understanding was essential. The results of the study showed that parents utilized the activities and strategies implemented throughout the project and workshops to engage themselves as mathematics learners. It also served as a guide to see what their children were learning in the mathematics classroom.

Mathematics Projects/Workshops

The Project MAPPS study provided an opportunity for parents to be involved in their children's mathematics learning by using multiple strategies, such as participating in projects and workshops. The parents gained a deeper understanding of reform-based mathematics practices during the workshop. One of the topics discussed during the workshop was the Common Core Standards, and by attending, participants were informed about some of the reasons why

mathematics is taught differently. Sharing the wealth of knowledge between teachers and parents is imperative and critical to improving parental involvement in children's math learning (Civil & Bernier, 2006). The studies mentioned provided parents with an outlet to be involved in their children's math education (Civil et al., 2006; Fan et al., 2012).

Many school districts have allocated funding specifically for parental involvement programs. This is the driving force for gaining insight, providing programs and initiatives for parental involvement. We find multiple examples of parent involvement intervention programs used to increase involvement in their student's mathematics learning (Civil et al., 2003; Sheldon & Epstein, 2005). The NCTM (2000) emphasizes the importance of collaborating with parents as partners to bring about substantial change in math education for all students. The Project MAPPS (Math and Parent Partnerships in the Southwest) is an excellent way for parents, teachers, and students to learn mathematics with a deeper understanding.

Similarly, Civil et al. (2005) examined the views of three Mexican American mothers as they participated in their children's mathematics education. The methods used in this study are field notes and evaluation protocols from the MAPPS activities such as videotapes, interviews, and focus groups. The parents were chosen based on their interest and commitment to the MAPPS program (Civil et al., 2005). The researchers discovered that the mothers' previous experiences with mathematics impacted their views and beliefs about their children's mathematics education (Civil et al., 2005). This was the driving force behind how they expected their children's mathematics education to continue. This became problematic and caused tension between the parents' traditional mathematics learnings and how their children were learning mathematics.

The study's findings demonstrate that parents have developed greater confidence and a

deeper understanding of new mathematics, as well as a thirst for learning (Civil et al., 2005). Parents were excited to share their learning experiences with their children. In connection with their prior experiences, the mothers in the study possessed mathematical funds of knowledge that informed their mathematics learning (Civil et al., 2005).

Summary

Research studies on parental involvement, both qualitative and quantitative, still show inadequate details on effective methods for parents to support mathematics learning, making it difficult to draw a clearer conclusion about parents and educators working together to support students' mathematical learning in secondary school. Collectively, if both parents and teachers have a clearer understanding of each other's expectations, they can collaborate more effectively. Much of the literature examined various types of parental involvement, ways in which parents can be involved in their child's mathematics education formally and informally, and communication tools teachers can use effectively in and outside the classroom.

The findings emphasize the importance of involving parents in their child's mathematical learning and actively supporting their educational goals by teachers who use effective communication tools to communicate with parents. Many studies show positive results and academic results concerning parents, students, and teacher relationships. In addition, there is a need for parent groups, math workshops, and teacher training. The findings also indicate some barriers of parental involvement in mathematics education.

As such, the results have implications for school policies, practices, and programs that aim to help parents fulfill this critical role. School districts and teachers need to help parents overcome barriers and be actively involved in their children's mathematics education. Much more needs to be done to close the communication gap between parents and teachers.

Research literature indicated that both parental perceptions about mathematics and their involvement in their child's education can influence their academic success (Figure 1). This study will take an in-depth look at the influence of a workshop designed for high school parents on their perceptions of mathematics and involvement in their child's mathematics education.

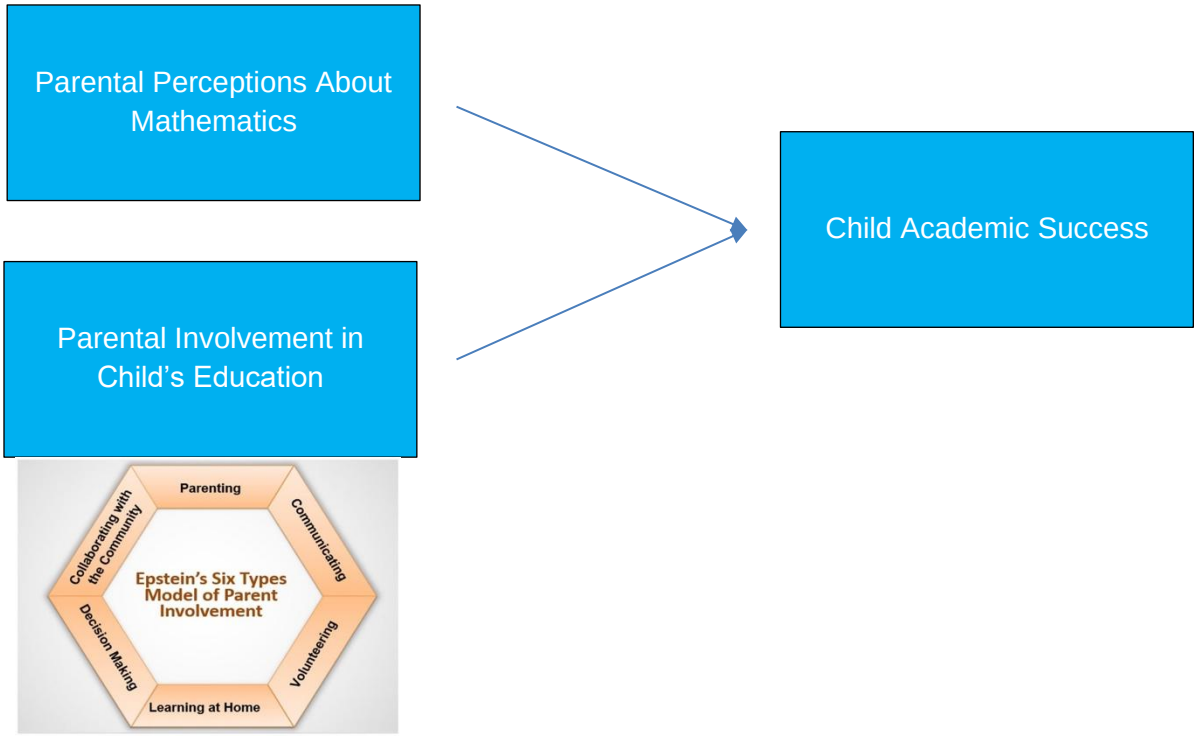


Figure 1. Framework for the Study

CHAPTER 3: RESEARCH METHODS

Introduction

This qualitative research study examines the impact of a series of mathematics workshops for parents of students enrolled in high school mathematics courses. In particular, this study aims to understand how parents engage in a mathematics workshop, their perceptions of mathematics, and how they perceive their involvement before and after the workshop. Understanding how a mathematics workshop can influence parents to support their child's learning in high school mathematics courses is essential. Ultimately, this research provides insights that have implications for future workshops, enabling them to be developed to meet the needs of parents and students. The following research questions served as a guide for this study:

1. What impacts did the workshop have on parents' perceptions of mathematics?
2. How do parents of high school mathematics students view parental involvement/engagement before and after the workshop?

Research Design

Qualitative researchers study phenomena in their natural settings, employing multiple methods to explore a topic of interest (Creswell, 2008). In a qualitative study, one can explore "a real-life system (case), or multiple bound cases over a period of time, through detailed, in-depth data collection involving multiple sources of information" (Creswell, 2008, p.25). A qualitative research design was the best fit to address the research questions of this study.

Exploratory qualitative study designs have been used in multiple disciplines, particularly education, social sciences, and businesses, to address many real-world settings. An exploratory qualitative study was selected for the research design to gain concrete, in-depth knowledge about the population of interest and to explore parent perceptions and involvement

after the intervention of a parental mathematics workshop. This research design is appropriate because the goal was to explore parental involvement in a population that has not been researched in depth. Specifically, this study is an exploratory qualitative study of parents of high school mathematics students who attended a four-session mathematics workshop in a rural high school setting.

Research Context

Setting

The research was conducted during the Spring 2024 semester at Stanley Peak High School (SPHS), a public high school located in a rural area in the eastern region of North Carolina. Stanley Peak High School was given a pseudonym for privacy purposes. The school has experienced a decrease in the number of parents attending school functions. SPHS is a Title I school. A Title I school is characterized by a lower-income student population that receives Title I sponsorship to support students who are at a high risk of academic failure. The Title I program provides financial assistance through state educational agencies to local educational agencies and public schools with high numbers or percentages of disadvantaged children. This is to help ensure that all children meet challenging state academic content and student academic achievement standards (North Carolina Department of Public Instruction, 2024).

This school of interest has a student population of approximately 1,200, with 99% of the students qualifying for free or reduced lunch. The researcher was interested in collaborating with a school within this district, specifically a high school, and had previously worked with numerous teachers throughout the district, including mathematics teachers. After receiving approval from the assistant superintendent, the principal approved the research study at SPHS.

According to the US News & World Report (2024), there were approximately 20,783

students in the school district. There are 36 schools with a student-to-teacher ratio of 16:1. The district's minority enrollment is 90% and 69.1% of the students are economically disadvantaged. The demographics of the students in the district are as follows: 38.8% American Indian or Alaska Native, 23.5% African American or Black, 20.5 % Hispanic or Latino, 10.8% White, 5.7% two or more races, 0.6% Asian or Asian Pacific Islander, and 0.2% Native Hawaiian or Other Pacific Islander. Table 2 shows the demographic information for Stanley Peak High School.

Table 2

Stanley Peak High School Demographic Information

	Hispanic	African American or Black	American Indian or Alaska Native	White	Two or More Races	Asian	Native Hawaiian
School Demographics	42.7 %	21.5%	16.4%	13.9%	5.0%	0.3%	0.2%

Recruitment and Selection of Participants

The administrative staff at the school were looking for ways to improve parental involvement in all subject areas. This aligns with the researcher's goals of conducting a study on the impact of a mathematics workshop for parents. The principal, assistant principal, researcher, and guidance counselors set the workshop dates, designated times, and locations. The principal announced the mathematics workshops for parents at the Professional Learning Communities (PLC) meeting to obtain participants. The webmaster posted the flyer on all social media websites, and a robocall was sent to gauge interest in the workshops. The high school math teachers announced the workshops in their respective classes to gain interest.

Patton (2015) states that there is no straightforward guideline for determining the

number of participants; however, several factors influence the sample size. In an exploratory study, he advocates that fewer participants may be sufficient, and that sampling should focus on depth rather than quantity (Patton, 2015). The participants for the study were selected via a combination of convenience and criterion sampling. The sample was selected for convenience, as the participants were in close proximity to the school where the workshops were conducted. Criterion sampling involves identifying a specific criterion of importance. The eligibility criteria required that the participants be parents residing in a rural area of North Carolina and that their child had taken or was currently taking a secondary mathematics course equivalent to Math 1. The participants in the workshop needed to attend all four sessions. The sampling strategy is highly susceptible to researcher bias, as the views may have influenced the findings. The researcher took deliberate steps to minimize any biases and took the necessary precautions to alleviate this risk.

Participants Attending the Workshops

The researcher intended to have four to eight parents participate in the workshops and was thrilled to have the approximate number of participants. Parents interested in attending the workshops signed up with the school's data manager. The workshop was held in the media center. Six parents participated in the workshop on the first day. Two children attended the workshop on the first day with their parents but decided to leave the room and return after the seminar ended. The workshop began with six parents in attendance, but two were unable to participate in the subsequent sessions due to other commitments.

After the first workshop, it was discovered that a time conflict between multiple parents made it difficult to meet at the designated times set forth by the stakeholders. Thus, the group of parents, along with the researcher, decided to adjust the workshop time so that all interested

parents could attend. The workshop participants provided the researcher with their contact information. Dawn, Linda, Sally, and Jasmine were each given pseudonyms to protect their privacy. Additional information about each participant is provided in Table 3. They attended all four workshop sessions and participated in post-interviews.

Table 3

Participants' Profile

Participant Pseudonym	Racial/Ethnic Identity	# of Children	Occupation
Dawn	Caucasian	2	English Teacher
Linda	African American	6	Factory Worker
Sally	African American	3	PowerSchool
Jasmine	Mixed Race	1	Business Teacher

Dawn is married and the mother of two children, ages seven and fifteen. She has a college degree, is a National Board Certified teacher, and works for SPHS, which her son also attends. It was evident that Dawn was heavily involved in the school and her children's academic studies and extracurricular activities. Dawn shared that her son does the bare minimum of what is required, and mathematics was challenging for him in elementary and middle school. She mentioned that he had shown much improvement in mathematics in high school and praised his success. Dawn also shared that her son is autistic and, has ADHD, ODD, and is very quirky. She said he's not very sociable, but he loves science and everything related to science.

Dawn is an advocate for parental involvement and feels like it is so important for parents to be involved in all aspects of school and life in general. During the interview, she expressed that she attended the workshop to learn more ways to help her son and daughter at home. She

said that she wants to know exactly what her son should be learning at school and how other parents are involved at home and with the school.

Linda is a single mother of six children with ages ranging from seven to nineteen. Two of her children attend SPHS, one is in the 10th grade and the other is in the 12th grade. She shared that one of her children would like to play professional basketball and the other child has no idea what he would like to do after high school. The parent told me that her son who is in the 12th grade has an IEP for his learning disability. Her youngest child attended the workshop with her during two sessions due to not having anyone to watch her after school. She expressed that some of her children grasped the concepts of math more easily than the others. With the ranges of children, the siblings help each other out with mathematics work at home. Most parents in this area who work first shift, meaning working from 8 am to 5 pm have a difficult time getting off from work to attend school events. Linda works first shift but is always available to attend meetings and is active in her children's studies and extracurricular activities. This was worth noting because first shift jobs often hinder parents from attending educational meetings or programs before 5:00 pm.

Linda expressed that she was interested in coming to the workshop because it would help her in the long run, and she wants to know more ways to help all of her children. One of the barriers that she mentioned causes her not to be as active with helping her children with their homework is helping with her 80-year-old mother. During the workshop, the researcher observed different ways that Linda solved problems and tactics that she thought would be helpful for her children at home. She also expressed that she has a schedule set up for her children who are still in school to make sure she is spending time helping them with their homework. Linda was open to share her ideas and expressed her concerns with how the school involves parents and the

mathematics curriculum. This was significant because her concerns were similar to those of the other parents who worked at the school even though she did not work there herself.

Sally is a single mother to three children with ages ranging from five to sixteen. She works at SPHS as the data manager. Her children live outside of the school's district, but she filled out paperwork so her children could be within close proximity to her during the day. One of her boys, who attends the SPHS is enrolled in Math 1 and has a learning disability but performs well in mathematics. Her oldest son is AIG in mathematics and reading and ranked first in his junior class. Her youngest daughter will start kindergarten next school year. Sally reminded the researcher several times that she was academically gifted and loved mathematics when she was in school. She felt like it was a bonus for her to be working at the same school that her children attend, and she ended up serving as a voice for other parents, who came to her to learn more about what was happening at the school.

Jasmine is a single mother who recently moved to the United States approximately two years ago from Jamaica. She is an international teacher at SPHS teaching Social Studies. The school system experienced numerous vacancies and hired many international teachers to fill the void. Her daughter is a freshman in high school enrolled in Math 1. She currently maintains an A/B average. Jasmine's daughter attended the workshop a couple of times with her mom. Jasmine is curious about finding ways to incorporate mathematics more at home so that her daughter can see the relevancy of using mathematics daily.

Workshop

The study implemented the Mathematics and Parent Partnerships of the Southwest (MAPPS) workshop design. The MAPPS project implemented mini courses through an 8-week workshop. In this study, due to time constraints and participant interest, a four-session workshop

(Appendix E) was conducted instead of an 8-week workshop due to time constraints. The four sessions utilized the MAPPS workshop design and were condensed and selected based on the following criteria: prioritizing key content, extending the session length, combining similar topics, and assigning work that could be completed at home. The researcher provided the assistant principal with an outline of the workshop sessions two weeks before the start of the workshop. The assistant principal gave suggestions of some added math concepts from the curriculum such as proportions, linear equations, and statistics. The workshop sessions began with light snacks provided by the researcher for all participants. The intent of providing snacks was to help dissolve any barriers and to foster a climate of being comfortable before the sessions. Each workshop was held in the library. Current and former mathematics teachers served as facilitators for the workshops. The facilitators received the materials for the workshop prior to each of the four sessions.

Data Collection Process

Prior to collecting the data, the IRB was approved, and the researcher gained permission from the assistant superintendent and principal. For this study, the instruments used were surveys and semi-structured interviews. There were multiple forms of data collection, which allowed for the triangulation of the data. Using the triangulation of data helped reduce bias and increase the reliability of the data.

Surveys

The survey was created by the Center on School, Family and Community Partnership Research Team at John Hopkins University (Epstein, 2001) and the researcher made minimal revisions. The parents were instructed to submit a questionnaire to develop their participant profiles. All parents completed a survey before and after the workshop (Appendices B and C).

The researcher focused on interpreting the data collected using the process of inductive analysis, which allowed the researcher to follow a sequential pattern for valid findings. The purpose of using an inductive approach was to condense the raw data into a summary format, establish clear links between the research questions and develop an underlying structure of the experiences evident in the data. The pre-survey serves as a baseline for the perceptions of mathematics and parental involvement, whereas the post-survey will determine how their perceptions changed after the workshop. For the surveys, the researcher collected and recorded the data, identified and developed themes, and translated the themes and concepts into narratives.

Likert scale questions are a form of closed questions and one of the most widely used tools in research (Joshi et al., 2015). They measure beliefs, attitudes and opinions. The questions use statements and responses that indicate how much parents agreed or disagreed with a statement. For the survey, the researcher used a four-point Likert scale. The questions for the Likert scale were based on responses from parents' experiences and the literature related to parents supporting mathematics students.

The individuals who participated in the workshop took the surveys and the results were exported from Google Forms to Google Sheets. The researcher took the average of the responses for each question on the survey.

Semi-Structured Interviews

Semi-structured interviews were used to collect responses from the participants. The interview questions were preselected and designed to elicit open-ended responses, allowing participants to respond without limitations. The participants selected the time and date for interviews at the end of the last workshop. The researcher sent formal invitations for interviews via electronic mail using Google Forms along with sample interview questions. The interview

took place one week after the final workshop session. Each interview was audio recorded and consisted of 20-29 open-ended questions (Appendix D). The interview questions were peer reviewed prior to data collection to screen for any bias, ensuring the significance to the purpose of the study and overall grammatical structure.

The interviews lasted 20-25 minutes. The researcher wrote analytical memos immediately after each interview to summarize the experience. All interviews were transcribed using an electronic transcription service and edited for accuracy. The final interview transcripts were sent to the participants for member checking to increase the validity and trustworthiness of the data. The data was stored in a secure password-protected file. The researcher is the only person with access to all the data. The data from the interview will reflect the perceptions of parent involvement in the workshops.

Data Analysis

Data were collected through surveys and semi-structured interviews. The survey consisted of thirteen Likert scale questions, along with a few open-response questions, to gain insight into the participants' profiles. The survey results were extracted from Google Forms. The interviews were recorded using an audio recorder and transcribed using iTranscribe, with verbatim accuracy ensured by the researcher. The transcripts were carefully edited for clarity and accuracy while preserving the participants' actual spoken words.

Next, the researcher familiarized herself with the collected data and kept a journal to reflect on the research questions. For each survey item, the researcher took the mean averages. After taking the mean average, the survey items were grouped to align with the research questions. The quantitative data were represented as percentages for interpretation. The researcher used inductive coding to analyze the data collected from the surveys and interviews.

Inductive coding was employed to acquire a deeper understanding of the data, allowing themes and patterns to emerge naturally. The researcher initially organized the data in Google Sheets and then reorganized the data according to the research questions.

The researcher then employed thematic analysis to interpret the data. Thematic analysis is a broader approach to data analysis that focuses mainly on identifying, analyzing, and interpreting patterns of themes within qualitative data (Braun & Clarke, 2006). It differs from other qualitative analytic approaches because it is not bound to a specific method of analysis, thus providing more flexibility for the researcher (Braun & Clarke, 2006). In the study, the researcher used Braun & Clarke's (2006) guide to thematic analysis. This guide provides six steps: familiarization, coding, generating themes, reviewing themes, defining and naming themes, and producing the write-up (Braun & Clarke, 2006). Thematic analysis is approached from an exploratory perspective, enabling the discovery of new insights rather than limiting data to a predetermined framework (Creswell, 2012).

Alignment of Research Questions and Data Sources

Table 4 shows the alignment of the research questions and data sources. This includes a link from each of the survey items and interview questions to the data source and which question they helped answer.

Table 4

Alignment of Research Questions and Data Sources

Research Question	Data Source	Specific Items
1. What impacts did the workshop have on parents' perceptions of mathematics?	Survey	A, B, C, D, I, K, L, M
	Interview	Part 1: 1, 6, 10 Part 2: 5, 6, 7
2. How do parents of high school mathematics students view parental involvement/engagement before and after the workshop?	Survey	E, F, G, H, J
	Interview	Part 1: 2, 3, 4, 5, 7, 8, 9 Part 2: 1, 2, 3, 4, 5, 6, 7

Positionality

The author of this dissertation has strong childhood memories that shape her interest in parental involvement. Her parents were actively involved in her sister's and her education from primary school through college. Later, her interest resurfaced when she became a single mother to a son. Parental involvement has shaped her ideas and influenced her commitment to increasing parent engagement.

As a former secondary mathematics education teacher, the researcher believes this study is vital for educators, parents, principals, and schools. While teaching mathematics at the secondary level, she examined the positive effects on students' academic progress when parents were heavily involved or had strong communication skills with their child's school. These ideas continued to resonate with her in finding strategies to impact the parental involvement of parents

of math students. During her time as a secondary mathematics teacher, she was given opportunities to work with parents and involve them in their child's math learning.

The researcher's professional educational background provided her with the advantage of conducting this research at SPHS. The researcher of this study was a former teacher working in the Public Schools of the district in which the study was conducted. Additionally, she served as the PTA vice president and on the Advisory Committee at the local elementary school.

Her roles as both a parent and mathematics teacher could have influenced parts of this research as she began this study with presumptions regarding how parents' perceptions shape their children's mathematics learning. Some of the resources provided were used in previous workshops but revamped to serve the purpose of the current study. Prior experiences may have guided the creation of some of the interview questions. As a researcher, she aspires for this study to bring awareness to parents' perceptions of their child's mathematics learning through mathematics workshops with hopes of improving parental involvement.

To account for her positionality and to reduce bias, the researcher utilized the data to speak for itself. This included reading and re-reading the transcripts to ensure the researchers were staying true to the participants' interview responses. In addition, the researcher was sure to back up claims with evidence from the data during the data analysis phase.

Trustworthiness

In a qualitative study, trustworthiness is pertinent to establishing credibility, transferability, confirmability, and dependability (Lincoln & Guba, 1985). Throughout the study, trustworthiness is employed by using various validation strategies. First, the triangulation of data sources, including surveys, and interviews, while validating to obtain emerging themes. To ensure credibility, member checking was utilized to reduce the researcher's biases and ensure

participants' voices were heard. A description of the study was supplied by the researcher to ensure transferability.

According to Tobin & Begley (2004), the researchers must ensure the process is logical and clearly documented to ensure dependability. The interviews were transcribed immediately. The transcripts from the interviews were analyzed, coded and themes were created. To ensure confirmability, an intercoder agreement was completed by a colleague using one of the interviews.

Summary

This study aims to examine the workshop series for parents and analyze their perceptions of the mathematics curriculum and how they view parental involvement. A qualitative study was conducted to answer the research questions, and the researcher had four parents participate in the study. The data collection included surveys and semi-structured interviews. The data was analyzed using inductive methods to discover themes concerning the research questions.

Chapter 4: FINDINGS

Introduction

In chapter four, the findings of the exploratory qualitative study will be analyzed. The study examined four mathematics workshop sessions for parents and their perceptions of students' mathematical learning. The two research questions that guided the exploratory qualitative study are as follows:

1. What impacts did the workshop have on parents' perceptions of mathematics?
2. How do parents of high school mathematics students view parental involvement/engagement before and after the workshop?

This chapter showcases the findings by investigating the research questions. The analysis of the research questions is based on the conclusions of the data collected through pre-surveys, post-surveys, and interviews with the four participants. The two research questions served as a guide for analysis.

Research Question #1

This section addresses the results related to the first research question: *What impacts did the workshop have on parents' perceptions of mathematics?* This research question was answered through analyzing survey and interview data. The survey results are presented first, followed by results from the interview analysis.

Survey Results

In March 2024, the participants were given a pre-survey before they attended the four-session workshop series. The presurvey included questions about their child's math education, family dynamics, math ability, and information pertinent to areas the participants would like to see discussed at the math workshop. The second survey was given in April 2024, approximately

four weeks after the final workshop. The second survey included the same questions from the pre-survey and two additional questions. These questions pertain to how they felt after attending the workshops. The Likert scale was used to show their feelings, attitudes, and beliefs towards their child's math education. The results from the survey data are presented below.

This section highlights the responses from the four participants who completed both the pre-survey and post-survey. It briefly examines how they view mathematics, their understanding of how the school adapts to improvement and parental involvement. The results are presented in order by the type of questions. The mean averages were calculated for the pre- and post-surveys in the second and third columns. The changes between the pre-survey and post-survey are located in the last column.

Recall, survey items A, B, C, D, I, K, L, M helped answer Research Question #1. Questions A and B focused on the participants' feelings toward their child's mathematics teacher. The results indicate little change between the pre- and post-workshop responses. Question C revealed a 0.75-point increase in regards to feeling like they can help their child with mathematics homework at home. Question D relates to their comfort in finding mathematics resources. A lot of materials were presented to parents during the workshop, and they were given information to search for other resources. The survey results indicate parents were, on average, one Likert point more comfortable finding resources after the workshop than before the workshop.

Table 5 *Pre/Post Survey Results*

How do you feel about your child's math education?

Question	Pre-Survey	Post Survey	Change
A. My child's math teacher makes me feel comfortable when I visit the classroom (PTA, etc.)	2.25	2.75	+0.50
B. I feel like my child's math teacher cares about his/her success in the class.	2.5	2.75	+0.25
C. I feel comfortable helping my child with his or her math homework.	2.5	3.25	+0.75
D. I can find resources to help my child with their homework.	2	3	+1
I. Mathematics is very important.	3.25	3.5	+0.25
K. Mathematics is valuable for making decisions.	2	3.75	+1.75
L. I have a better understanding of the curriculum requirements	n/a	3	
M. I have a better understanding of the strategies students progress through in his/her mathematics course.	n/a	3	

Means of pre- and post-results of survey data. (Likert Scale: 4= Strongly Agree, 1= Do not agree)

Questions I shows little positive change regarding how parents feel about mathematics generally. However, after the workshop, parents increased their feelings towards math being a valuable tool in decision making (Question K). There was a 1.75-point increase in parent responses on Question K from pre- to post-survey. Lastly, L-M showed after the workshop parents agreed the increased their understanding of math after participating in the workshop. These questions highlight a shift in the participants' understanding of mathematics.

Parents' Feelings of Mathematics

The participants in the workshop discussed the many changes they experienced with mathematics. One of the first mentions was how mathematics is not taught the way they learned it while attending school. During the interview, Linda shared that her son is learning how to solve linear equations differently from how she learned it. However, amidst these challenges, there were also positive experiences shared. For instance, some parents found that the new curriculum encouraged their children to think more critically and creatively. The parents shared cases similar to how the curriculum has changed over time, as well as the frustrations and some positive interactions that occurred while enabling help with solving problems.

The workshop provided opportunities for the parents to explore new ways to learn mathematics. Along with ways to overcome math anxiety when trying to help their children become less frustrated with solving math problems. Dawn explained how her son learned how to solve a statistics problem they use in Common Core Mathematics. During the interview, Dawn stated "that mathematics is most challenging for me to be able to help him with because if he's struggling or trying to figure out the answer to something, especially all the different ways, they have you figure out the answer to problems nowadays. This is cool because I'm like, oh well, that makes sense, but in my head, I think it doesn't take all of that to solve the problem." She also said she wanted to tell him a quicker way to solve the problem but did not because she did not want him to become frustrated.

Jasmine also mentioned the frustration of sharing similar ways to solve problems that could be done quickly. However, after meeting with her daughter's teacher, she realized that it was best not to change how she was being taught because the problems are real world, and she will be able to adapt the methods to any type of problem and not just utilize the rote method. All

the parents shared their experiences through their prior knowledge of math experiences. During the recipe lab activity, the researcher noticed how the parents worked together to find connections and recognize relationships amongst the different math representations of how they solved the problems.

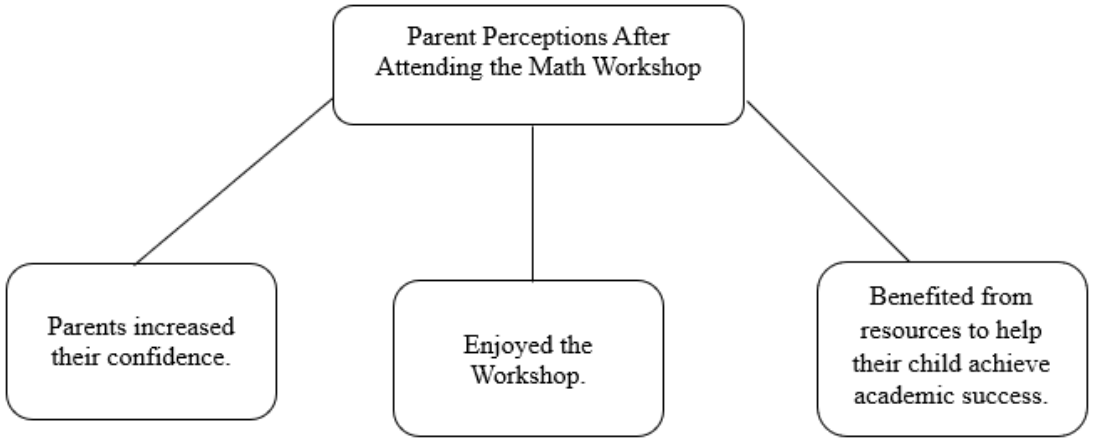
The rich discussion was evident in their conceptual knowledge, which was vital for developing a deeper connection between their prior knowledge of mathematics and new mathematical understanding. The survey results showed that the averages of how parents felt about helping their children with their math homework increased after the survey. The parents felt more comfortable finding a safety net between their way of thinking mathematically and how their child was learning it.

Parent Perceptions After Attending the Math Workshop

Parent perceptions are defined as how parents viewed mathematics and how they felt after attending the math workshop. Interview data showed that after attending the math workshops, parents increased their confidence, enjoyed the workshops, and benefited from learning about resources to help their child achieve academic success. In addition, parents discussed their perceptions related to barriers to being involved in their child's math education. Each of these will be addressed in the section below (See Figure 2).

Figure 2

Parent Perceptions After Attending the Math Workshop



Increased Confidence

Participants reported that attending the seminar enhanced participants' confidence in their math abilities related to the task presented at the workshop. One of the participants stated, "The workshop highlighted the importance of knowing because, you know, we all know that as parents, it's essential, but things fall by the wayside, and so forth. It helps me feel a little more confident to talk, even if I don't know the math stuff." She further mentioned that the hands-on activities, such as the recipe lab and budgeting activity, helped simplify the complexities of the concepts and made math more real world. Activities like this made it more engaging, and when she took the activity home so that her son could complete it, she was happy that she could engage with an at-home activity that they could work on together and problem-solve while completing the budgeting and recipe activities.

All participants mentioned having increased confidence after they left the workshops and felt better prepared to help their sons or daughters find resources for learning mathematics. The participants felt that working with other parents with like minds reduces math anxiety and fosters

a sense of achievement. During the interview, Dawn said that the workshop environment was supportive and encouraging, which led to greater confidence in exploring options while building a foundation to trust reasoning in mathematics. Jasmine also resonated with seeing the other parents struggle with problems while making mistakes, reinforcing the shift of maintaining growth.

Enjoyment

From the interview data, the participants mentioned that they enjoyed themselves at the workshop. The activities were engaging and interactive which made learning math fun. They enjoyed solving complex problems and discovering new ways to solve them amongst other parents. The "ah-ha" moments were fulfilling, allowing them to form connections while enjoying mathematics. During the interviews, Sally mentioned, "I love the workshops; they encouraged creativity and made it much more rewarding." Dawn also reacted similarly: "I love workshops and would be around anyway. I was worried because the workshops were initially scheduled for my son's piano day on Thursdays. But for the ones that ended up being on Thursdays, I had to take off for the piano days anyway because of game duty. But I enjoy being involved as a parent and living in another city. I don't like having to come back if it's late, which is why being earlier in the day was able to help me interact with other people."

Academic Success

The parents revealed that they were able to gain access to resources to improve their child's academic success. As mentioned, improved confidence in supporting their children will also improve performance habits in other subject areas. The participants also learned time management skills to show their children and/or children when they are home. Participants developed a deeper understanding of concepts, which leads to better results. Linda said, "As a parent with multiple daily obligations, she learned to juggle her schedule." She also said, "It

would be great to promote the workshop more so that we can reach five parents, and then if we meet another five, they can promote it too to improve success."

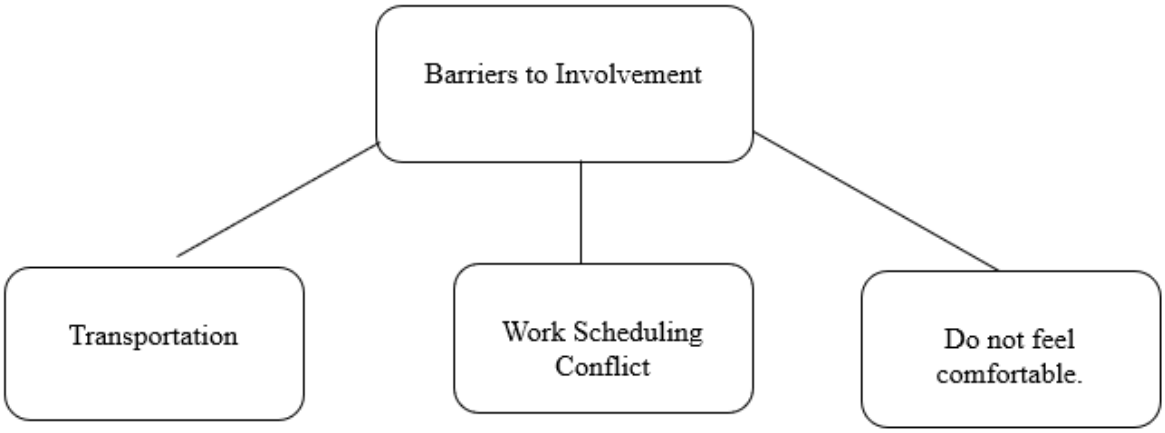
Most importantly, Jasmine stated that it was vital for her to know "Why" something was being done behind the mathematics concepts. As educators, we hear this a lot in the classroom from students who want to know the "why" behind different math concepts, and we know this helps improve retention and reduces memorization. Academic success that was achieved through the workshops led to better opportunities for parents to share with their children.

Barriers to Involvement

In the interviews, parents also discussed their perceptions of why more parents were not involved in the workshops. Understanding these barriers can help support future school programming. All parents in the study mentioned that more parental involvement is needed. Participants noted that some parents face personal barriers, including transportation, work scheduling conflicts, and feeling uncomfortable (See Figure 3).

Figure 3

Barriers to Involvement



Transportation

Lack of transportation is listed as one of the barriers to parental involvement, meaning that a lack of reliable access to transportation prevents parents from being active in school events. Sally mentioned during our workshop discussion that she knows a few parents who would love to attend the sessions. Still, due to the lack of reliable transportation, they can not attend. Sally suggested, “When students are having a half day, can we start having parent meetings during the day and at night on the same day? I feel like more parents who have issues with transportation may find more time and have a longer window of opportunity to visit with teachers. Also, during the discussion, Dawn reiterated the need to incorporate different ways for parents to attend school events if they are having transportation issues. During the workshop, we collectively discussed that it would be great to offer the workshops virtually for upcoming sessions, with transportation being an ongoing issue.

Work Scheduling Conflicts

Many parents have demanding work schedules and other commitments, which causes them to have little time for different activities. During the interview, Linda said, “I work 1st shift, and I take care of my elderly mother, which makes it difficult to take off work and attend school events, but I try my best. She also said she would be unable to visit the school if she did not have anyone to watch her mom. But I must admit it gets complicated when you are juggling multiple things at one time. Dawn stated, “Being a teacher hinders me from doing as much during the school day as possible”. These time constraints, such as work schedules and other commitments, leave little time for different activities. Limiting opportunities for flexibility, such as daytime, evening, and remote options for parents, will also cause conflict.

Do not feel comfortable

Schools that do not foster a welcoming environment for parents may discourage involvement in many ways. Language barriers were also mentioned, but a translator was available if non-English-speaking parents signed up for the workshop. In our discussion, as a group, we collectively decided that lacking confidence in math skills can also cause barriers to parental involvement in math workshops. Creating a comfortable environment and encouraging all groups to attend is helpful. Some parents lack confidence and feel inadequate due to little or no knowledge of the curriculum or may hesitate to engage in school-related activities. Linda mentioned that she didn't feel as bright as the teacher while communicating with her during a parent meeting. Ineffective communication between teachers and parents can leave parents feeling inadequate in knowing when or when not to engage.

In addition, Jasmine, who is also an educator, said that the perception of parents attending math workshops is that they are only for parents of bright students. One of the parents of a child in her class mentioned that to her. She felt like she did not need to participate because her child was struggling, and she could not do anything to help. The parent felt like this is misleading, and there are resources to help all parents. Jasmine also stated that confidence was a hindrance.

These findings suggest that overall, the perceptions of the parents who participated in the four-session workshop made slight improvements to their perceptions after attending the workshop on mathematics and students' math learning.

Research Question #2

This section answers research question two: *How do parents of high school mathematics students view parental involvement/engagement before and after the workshop?* Five of the survey items, E, F, G, H, and J, helped answer Research Question #2. Interviews with four

parents and their participation in the workshop allowed the researcher to analyze and draw conclusions to address the research question. The themes that emerged to answer this research question are presented below.

Survey Results

Questions E-G pertain to the parent's relationship with the teachers and the schools. During the workshop, an activity required the parents to follow up with their child and/or child's progress thus far in their math class. If the child already took the course, they were invited to discuss their interactions in previous semesters. There was little change between the pre-and post-survey for Questions E-G.

Table 6 *Pre/Post Survey Results*

How do you feel about your child's math education?

Question	Pre-Survey	Post Survey	Change
E. My child's math teacher works hard to keep me involved in what is going on in the classroom.	2	3	+1
F. Parents should be involved in their child's math education.	3.75	3.5	-0.25
G. I only hear from my child's math teacher when something is wrong or a problem occurs.	2.25	2.5	+0.25
H. My child talks with me about what is going on at school.	2.5	3.5	+1
J. I want to be more involved than I am now in my child's math education.	2.75	3.5	+0.75

Means of pre- and post-results of survey data. (Likert Scale: 4= Strongly Agree, 1= Do not agree)

Question H relates to how the child talks about mathematics with their parent(s). There were multiple activities that parents could take home and work on with their children. During

one session, we discussed the child's performance and feelings towards the activities. The parents stated that they had positive interactions with their children while working on the activities, which resulted in a one-point increase between the pre-and post-survey on their feelings towards communicating with their child about school.

Questions J shows a slight positive change regarding how parents felt about their involvement with their child's math education. These questions highlight a shift in the participants' involvement in their child's mathematics learning.

Parent Suggestions

The participants were asked to share suggestions for improving the workshops and ways to improve collaboration between stakeholders. The suggestions mentioned were promoting a math mindset, collaborating/communicating with teachers, creating a supportive home environment, making math fun while adapting to real-world situations, and using technology and other online resources. As mentioned earlier, Linda said she would like to see more parents involved and the workshops advertised school wide. The workshops were advertised on the school's Facebook page, telemarketing system, PLC meeting, and throughout the math classroom.

Promoting a Growth Mindset

Some parents suggested promoting a growth mindset at home by helping children view math as a way to persevere while solving math problems. Instead of parents focusing on ensuring that students get the correct answers, parents can celebrate their growth. For instance, Sally highlighted how important it was to assist her son, who has a learning disability, by celebrating small steps. For example, while he was solving equations, she said, "Good job, son, on step 1, and now let's work on step 2 tomorrow". She also shared that he is progressing with little

assistance by completing smaller steps one at a time. Dawn was working with her daughter at the dinner table along with her son and told him, “I see you working hard on that problem, and it will come together.” This is an example of an approach that will help encourage a math mindset along with building up their confidence towards learning mathematics.

Collaborating/Communicating with Teachers

Parents suggested that collaborating and communicating with teachers to better understand the curriculum was beneficial. They advocate for checking emails and grades on PowerSchool often. Sally stated, “Knowing who their teachers are so I can have a great relationship with them and the teachers keep you abreast of how your child is performing in the classroom. As a parent, I make more contact to ask, but they also know me, so because they know who I am, they reach out to me because they know from day one, I always tell them I do not want them to regress that’s one of the things I will not allow them to regress”. The parent also mentioned that many parents use COVID as an excuse for their child not progressing as well in school.

Creating a Supportive Home Environment

During the session, parents wanted to know more about creating a positive environment supporting mathematics learning. They emphasize that mathematics should be fun and valuable, and as parents, they should avoid expressing negative thoughts about mathematics. Sally said, “When I was a substitute teacher for a math class, many students had negative feelings toward mathematics. And when I asked them why, they would talk about it not being useful in the higher-level math courses.” Sally said that she felt the students might have been influenced by their parents or other students. Avoiding negative feelings about mathematics can affect a child’s mindset about learning, changing that negative aspect and substituting those feelings for

celebrating efforts and not accuracy. Dawn stated, “My son came home from school and was upset about a grade he made on an assignment.” She said, “I could have made the situation worse by getting upset with him, but instead, ‘I celebrated the small gains.” Praise your child and help them see these challenges as opportunities to manifest growth. Let them know it's okay to make mistakes, but learning from them will help them in the long run. Integrating mathematics daily using real-world examples, such as the recipe lab and budgeting activities, is essential. We also incorporated math games during the workshop that could be used for children in grades K-12.

Jasmine shared that the recipe lab was a hit with her daughter. She said, “My daughter enjoyed using an old recipe and changing it to fit fewer people in serving size, and being able to do this with her made math fun.”. Ultimately, creating an environment that encourages a positive mindset towards mathematics, incorporating math daily, celebrating success and not accuracy, and encouraging open communication are all ways to make a supportive home environment.

Using Communication Tools between the School and Parents for Involvement

The parents felt welcome at their child’s school and could communicate with them if needed. Dawn, who taught at the local high school, indicated that a few communication tools were not utilized at her son’s middle school, which she felt could benefit the high school community.

The parents discussed how they communicated with the school through phone conversations, electronic mail, or attending Open House or PTA events. They expressed interest in knowing about events a little more in advance and wished the school had used apps like the Remind app to send push notifications. One parent was already using the PowerSchool app to see her son’s grades, but the other parents did not have the app downloaded before attending the workshops.

Parents described parental involvement with their child's school as attending school events, contacting the child's teacher, and finding ways to help them at home with homework. These were consistent emerging themes described by all parents. Linda mentioned that it was essential to communicate consistently with her child's teachers via email throughout the school year. Linda shared:

> I always use email because it's a document; it's traceable. Teachers have about ninety-some students a semester, and they may forget. I don't want them to think they can't send me emails because I work in the school. It's a paper trail, so if I look back a year later, I will know what we discussed.

Linda indicated that the teacher gives her children a syllabus at the beginning of the school year with teacher information for each student. All parents stated that the school sends home report cards, PowerSchool updates regarding grades and absences, and call system notifications about events and school cancellations. Sally also mentioned that the school communicates with parents through social media sites like Facebook. During the interview, Linda added that she wanted the school to send push notifications through their phones that alert them of events. The parents also wanted the teachers to communicate with them through the Remind App. Two parents indicated that the Remind app is available, but some teachers do not use this as a resource to communicate with parents.

Linda stated that if you consistently communicate about academics, your child will perform better in school. She said that she has a daughter in college, and her son is doing well in school because she has been actively involved with the school, communicating with them regularly. Dawn mentioned that her son would succeed in school without misconduct if she stayed involved. She also said that she wanted him to go to college. Lastly, Dawn mentioned that

solid communication will help her son be successful in school because he will know how much it means to her as a parent.

Benefits of Attending the Math Workshop

Some benefits of attending the math workshops are understanding some teaching methods, such as improved parent-child interaction, awareness of available resources, and stronger parent-teacher relationships. Our first workshop started with an open discussion on "Why are teacher-parent relationships important?" The parents collectively created a list of ways to build teacher-parent relationships, which include communicating effectively, being knowledgeable and well-informed, setting realistic expectations, encouraging student accountability, addressing emotional concerns, fostering collaboration, and sharing success stories. The parents instantly gravitated to knowing how their child/children were learning mathematics.

The second workshop session was tailored to provide resources for parents to use at home. One of the math activities, "Recipe Lab," allows children to take an original recipe and change it depending on how many people they serve. Jasmine said, "I went home and found some of my old recipes, and my daughter and I revised the recipe to feed two people. It was a hit, and she enjoyed working on this activity at home. Sally also mentioned, "I was able to help my son change the ingredients' measurements for baking a cake. He was not fascinated with fractions, but working on them made it easier.

The parents found the resources beneficial to use at home, such as the recipe lab and budgeting activity. Fostering these activities will enhance their understanding of how mathematics is taught today. Parents gaining the necessary tools to assist with math-related activities will help build their confidence. Parents were also given tools and apps to use at home.

Ultimately, the workshop created a platform for the parents and educators to foster a collaborative environment.

Summary

This chapter presented results from a four-session workshop with parents of math students at their local school. The data highlights how through their engagement with the workshop, they had new insights that influenced their perceptions of students' mathematical learning.

For Research Question One, survey data were analyzed, and two categories were revealed. These categories were: Parent Perceptions After Attending the Math Workshop and Barriers to Improvement. Within each of these categories, findings were revealed that emphasize the perceptions of parents who attended the workshop. The findings show that after attending the math workshop, parents had: increased confidence, enjoyment, and more strategies to help their child succeed academically. Findings highlight the following barriers parents face when trying to support their child/children in mathematics: transportation, work scheduling conflicts, and that they do not feel comfortable. These findings played a significant role in the lack of parental involvement in their child's mathematics education. Further, the survey showed parents had increased perceptions on every survey item, with the largest gains in parents' understanding of mathematics education and student learning after participating in the workshop.

Research Question Two was answered through two main themes: Parent Suggestions and Using Communication Tools between the school and parents for involvement and engagement. Further, parents noted some additional benefits to attending the workshops. Parents suggested the workshops were beneficial for: promoting a growth mindset, collaborating/communication with teachers, creating a supportive home environment and lastly the benefits of attending the

math workshop. The qualitative analysis revealed that the participants made improvements on how they viewed mathematics and their perceptions of their students' mathematical learning.

These findings suggest that overall, the perceptions of the parents who participated in the four-session workshop made slight improvements to their perceptions after attending the workshop on mathematics and students' math learning.

CHAPTER 5: SUMMARY, IMPLICATIONS AND DISCUSSIONS

Introduction

In this chapter, I will provide an overview for the purpose of the study and summarize the main findings and themes. I will also address some limitations for this study. The findings are discussed by themes and highlight the analysis of the exploratory qualitative study. Finally, I will present implications, directives for future research, and a conclusion.

Summary of the Study

This exploratory qualitative study aimed to understand how parents support their children's mathematics learning. In the study, semi-structured interviews and survey data were used to analyze the impact of a mathematics workshop for parents of students in high school mathematics courses. Considerably, studies on parental involvement often focus on parents of elementary and middle school students' learning. There is a lack of research on parental involvement that supports mathematics in secondary education (Civil et al., 2003). Specifically, this exploratory qualitative study analyzed how high school parents view parental involvement in mathematics education.

Discussion of Findings

In this study, I examined parental involvement and their perception of students' mathematical learning through a mathematics workshop. In an attempt to provide awareness of the perceptions of parents to promote parental involvement in high school mathematics, my exploratory qualitative study examined the following research questions:

1. What impacts did the workshop have on parents' perceptions of mathematics?
2. How do parents of high school mathematics students view parental involvement/engagement before and after the workshop?

Surveys and interviews were collected over six weeks during Spring 2024. The survey data examine how parents viewed mathematics, their understanding of how the school adapts to improvement, and parental involvement. The interviews were conducted within two weeks of attending the last workshop session. The interviews offered insights that would allow me to analyze how parents of high school math students view parental participation before and after the workshop.

Summary of Findings for Research Question One

The first research question of my study is: What impacts did the workshop have on parents' perceptions of mathematics?

In this exploratory qualitative study, the first question examined the impact that the workshop has on parents' perceptions of mathematics changes resulting from their attendance at the parent workshop. The study employed thematic analysis to interpret the data from the semi-structured interviews. As stated in Chapter 3, the interview questions were preselected and designed for open-ended responses. Selecting the codes produced the information needed to define the perspectives of how the parents felt about parental involvement and mathematics after attending the workshop. Data revealed the parents' perceptions after attending the math workshop and barriers to involvement. The parents felt they had increased confidence, enjoyment, and academic success after attending the math workshops. Some barriers to parental involvement are transportation, work scheduling conflicts and not feeling comfortable.

The participants demonstrated increased confidence in assisting their children in informal settings both during and after the workshop. Similarly, developing more confidence and a better understanding of new mathematics created an avenue of enjoyment (Civil et al., 2005). The literature review reported on a study of mothers with mathematics funds of knowledge that

enhanced their mathematics learning. It also developed a similar experience for the parents in their research (Civil et al., 2005).

Similarly, the findings from this study corroborate those of Civil et al. (2005) and demonstrate how parents have developed greater confidence and a deeper understanding of the new mathematics, as well as a thirst for learning. Parents were excited to share their learning experiences with their children. In connection with their prior experiences, the mothers in the study possessed mathematical funds of knowledge that informed their mathematics learning (Civil et al., 2005). Mathematical funds of knowledge refer to the mathematical skills and knowledge gained from everyday life and experiences (Civil et al., 2005).

This research highlights how parents' perceptions of mathematics can change through engaging in a workshop. This is important because, as Mohr-Schroeder et al.'s (2017) research indicates, parents' perceptions of mathematics influences students' perceptions of mathematics. Also, Sun (2022) showed parents' perceptions also change when they observe their child engage in math learning. Parents in this study learned strategic ways to help their child in mathematics and activities they can do with their children at home.

As indicated in Chapter 2, research confirms that parental involvement is associated with academic success (Degol et al., 2017; Fan & Chen, 2001). The participants in this study were able to identify resources relevant to the math courses their students were currently taking or had recently completed. Most parents appreciated how the mathematics curriculum had changed and the different ways of doing mathematics, which they did not experience when they were students in high school. The parents found the workshops interactive, enjoyable and felt they promoted academic success. This also aligns with parents' confidence in having a positive attitude that ultimately affects student achievement (Fan & Chen, 2001; Henderson et al., 2007).

The data analysis revealed transportation, work scheduling conflicts, and feeling uncomfortable as barriers to their involvement prior to the workshops. There were two cases in which the participants mentioned having trouble finding transportation to events and felt like more parents who wanted to attend the workshops did not have reliable transportation. The participants also wanted flexibility in attending workshops virtually and, at times, throughout the day. Some of the parents did not feel comfortable assisting with mathematics, and their experiences from their childhood or other conflicts shaped their perceptions of wanting to be more involved in their child's education. Parents' misunderstanding of the higher-level mathematics courses created issues, and they were unaware of how the teacher taught the math concepts (Lopez & Donovan, 2009). This ideally led to conflict between the parent and student. These experiences affected the participants' fear of mathematics and wanting to assist at home.

Summary of Findings for Research Question Two

The second research question was: How do parents of high school mathematics students view parental involvement/engagement before and after the workshop? Parents mentioned various strategies that assisted with their involvement before and after the workshop. The data supports that the communication tools between parents and school were beneficial for promoting a growth mindset, collaboration, and communication with teachers. These forms of communication contribute to and align with one of Epstein's six types of parental involvement for building a strong relationship with teachers and parents (Epstein, 1995). As I further investigated parents' perceptions throughout the study, the participants found that using various communication tools such as emails, parent conferences, phone calls, the remind app, and attending school events made it beneficial for maintaining a healthy relationship with their child's teacher (Epstein et al., 1997). Out of all the different types of tools mentioned, each

participant stated that email was the most convenient method, as they could also track their conversations with the teacher.

The parents in the study demonstrated a strong desire to promote a growth mindset. They wanted their children to develop skills that they perceived as necessary and not dwell on the technicalities of solving problems. Instead, they wanted their children to make progress in taking smaller steps to achieve mastery on the math problems they were solving. The parents desired to celebrate success and growth while working on math problems.

In addition, findings from Chapter 4 support creating a supportive home environment for students to have mathematical discussions with their parents through funds of knowledge (Graham-Clay, 2002). Similarly, the activities presented during the workshop aligned with integrating mathematics daily by using real-world examples (Graham-Clay, 2002). During the workshop, one of the parents mentioned how she could take a recipe, and she and her daughter changed the amount for the ingredients based on using a different serving size. Finding adaptable resources aligned with the curriculum and functional for everyday living benefited the workshop participants.

Overall, this dissertation research study highlights the influence a workshop for parents of high school math students can have on parents' perceptions of mathematics and their involvement in their child's education. Specifically, data revealed that the intervention helped parents directly in four of the types of parental involvement: parenting, learning at home, communicating and volunteering, and decision-making. First, for parenting, the workshop assisted parents with creating a more supportive math learning environment at home and school. Second, for learning at home, data highlighted that parents felt the workshops equipped them with resources and strategies to help their child/children at home. Parents had increased

confidence because, through the workshops, they learned how to search for resources online. Third, for communicating, parents became familiar with different ways to communicate with teachers and the school using various tools. Finally, for volunteering & decision-making, after the workshop, parents expressed increased interest in being involved in the school communities and wanting to take the initiative to contact their child's teacher.

Limitations and Delimitations of the Study

The scope of this study was limited to an exploratory qualitative study of parents at a local high school. The study focused on parents of students who are currently enrolled in or have recently completed Math 1 in the eastern region of Norh Carolina. The participants in the study were from a specific location, and the results may not apply to other geographical areas of North Carolina. The researcher had prior connections with the district where the study took place, which could create a limitation to the study. The researcher alleviated researcher bias by employing triangulation of data sources, member checking, inducting coding, and acknowledging personal bias. The number of participants was minimal, which could potentially limit the generalizability of the findings. Therefore, qualitative responses from the parents who did participate may not hold to the perceptions of the larger community of parents. The small number of participants may not be a good representation of the overall population of the parents of students at the school. The researcher recognized that the specific location and number of participants highlighted the limitations of the study.

A delimitation of the study was the selection of parents of students enrolled in Math 1 at the secondary level. The researcher purposely selected parents of students in this course as it would align more closely with the MAPPS workshop model. The study's time frame focused on

a specific period and may have missed the potential for long-term findings related to parental involvement.

Implications

The research highlights the impact that workshops have on enhancing parent involvement. However, designing a study to provide a comprehensive understanding of parental involvement and its implications can be challenging. Strengthening parent involvement can be necessary to improve student achievement at the secondary level of education (Epstein, 2001) and include all community members in educating our children. We will dive deeper into the implications for parents of math students, principals, and schools and future research.

Implications for Parents of Math Students

The parents in this study indicated a need for two primary things: (1) resources they could use to help their children understand higher-level mathematics and (2) improved communication with teachers. The study highlights a need for parents to provide support at home, address their students' difficulties in mathematics, foster a positive attitude towards math, and be actively involved in school and during events. Chapter 2 highlighted the research exhibiting a more substantial connection between teachers and parents when parents support the school and are involved in activities and when the school reciprocates parents' expectations. During the workshop, parents realized the way students learn mathematics has changed significantly since they were in school, and if they help their child at home, it will help to increase their child’s academic success.

Communication between Teachers and Parents

The parents expressed concerns about the communication between teachers and parents. Some of the parents in the workshop stated that they rarely hear from their child’s math teacher

unless it is about something negative. In this exploratory qualitative study, the parents wanted to find ways to increase communication, to allow for collaborative approaches to understand how their child understands mathematics. The results suggest that parents want teachers to spend more time contacting them using different communication tools during the semester. The findings also indicated that parents and teachers need to improve their communication skills. They want to foster a positive attitude towards mathematics while communicating with their child's teacher. The results indicated that parents want to be actively involved and encourage communication with the teacher.

Resources for Higher-Level Mathematics

During the workshop, the parents were grateful for resources adaptable to students of different ages. The resources were helpful, and the parents could engage in the activities and share them with their children at home. The parents worked on the recipe lab and budgeting lab during the workshop and took the activities home with their children to work on. The parents presented their findings during the next workshop session and discussed the pros and cons of both activities. Also, the researcher provided parents with websites and other ways to find resources that could assist them at home. There is a need for resources for higher-level mathematics.

Implications for Principals and Schools

When children first start school, there is considerable effort to get parents involved in school activities through attending PTA meetings and advisory councils, participating in fundraisers and awards programs, and meeting with teachers regularly, just to name a few. As students progress to secondary school, there is less emphasis and effort into getting parents

involved in similar activities, and schools do not advocate for parental involvement. The teachers and parents must know what to expect from the schools.

The principal and schools need to acknowledge that building a healthy relationship with parents is vital for a student's academic success (Epstein, 2001). The principals must advocate for parental involvement and create more workshops and events for teachers and parents. The workshops should be tailored to focus on different types of communications, such as emails, phone calls, progress/report cards, open houses, and math nights. Principals and schools need to initiate more parent/teacher workshops, making parents feel comfortable with virtual and face-to-face workshops. Creating an atmosphere to employ parental involvement strategies will improve communication and how parents and teachers interact with each other while building relationships to increase student academic achievement. Administrators and community leaders must continue to support and advocate for parents to be involved in their students' education, no matter what grade the child may be in. It is essential to communicate with parents about what is happening at the school and involve them using various communication strategies. Creating strategies will assist with making schools a more inviting and welcoming environment for parents.

Future Research

The results of this study highlight three implications for future research. Through a math workshop, they would provide even more understanding of parental involvement and their perceptions of students' mathematical learning. These three implications are increasing the number of parents attending the workshop, a longitudinal study, and involving students.

Stanley Peak High School was used for this study. Future research should broaden the selection to multiple schools within the district to provide more parent participants. Since the

source of participants was limited to one school, the researcher garnered perceptions of how parental involvement changed at a single school. From this study, the parents' perceptions changed on a small margin, so future research should include more parents to provide a broader perspective of the overall change in their perceptions. It will make the findings more widespread and adaptable to other school districts and statewide.

Future research should also consider the longitudinal study of the involvement of parents. Such research would give more insight into how their engagement changes throughout the years or months. While analyzing the current study's findings, it was apparent that multiple parents wanted to be heavily involved and come together more often to understand the curriculum and find resources to help their children. The study was limited to four sessions centered on broadening the researcher's understanding of how parents perceive mathematics and their child's mathematical learning. More research is needed to examine if parents' attendance at these workshops influences the change in their perceptions over a more extended period of time.

During the workshop, one of the parents brought her daughter to one of the sessions, and while working on an activity, her daughter was engaged. After doing the activity, we discussed the possibility of having both the parents and the student at the math workshop, similar to parent STEM night, which is held quarterly district wide. Collecting data and analyzing this type of collaboration between parents, educators, and students would be a fruitful area of future research. It will also provide insights into why each stakeholder's perceptions play a significant role in parental involvement. Ultimately, there is a need for more research at the high school level on parental involvement that involves parents of students in mathematics. These types of programs or strategies will be effective for parents and teachers.

Conclusion

In this exploratory qualitative study, I examined the parents' perceptions and understanding of mathematics through a four-session workshop. The qualitative data revealed that the parents' engagement within the workshop influenced their perceptions of students' mathematics learning. Henry Ford's quote**,** "Coming together is a beginning, keeping together is progress; working together is a success," resonates with the aims of this study. Parents, teachers, schools, and principals must unite for a child's academic success. Schools must step towards finding resources to build partnerships with parents to support their child's educational success. Adapting improvements while including parents in their students' mathematical learning at the secondary level is essential, and all stakeholders need to advocate more so that students will be more successful.

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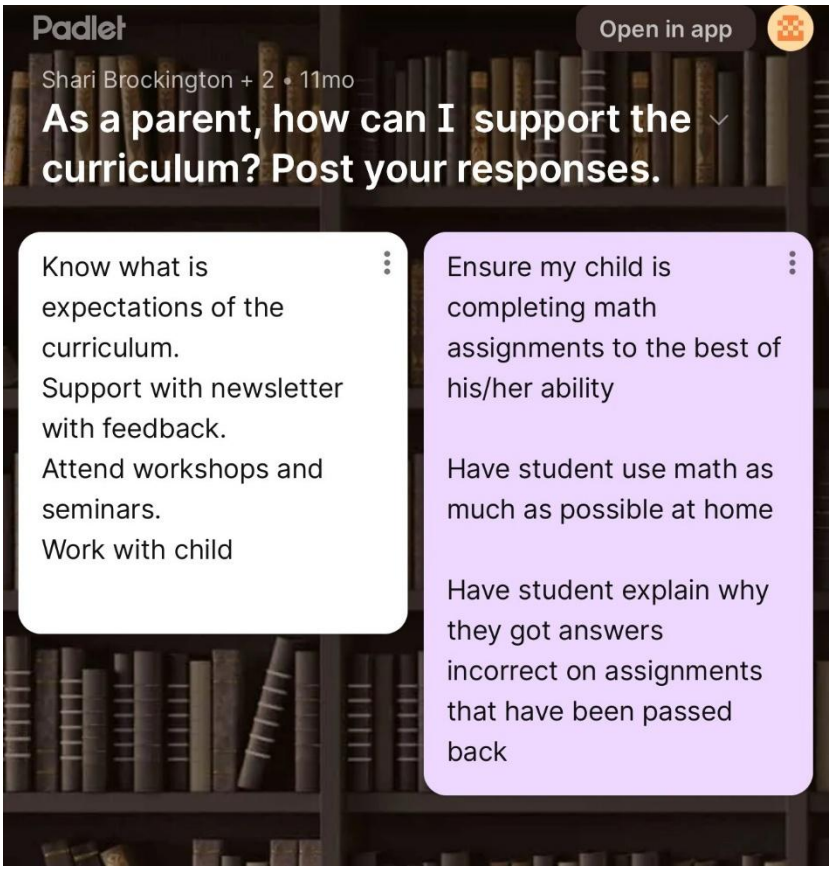
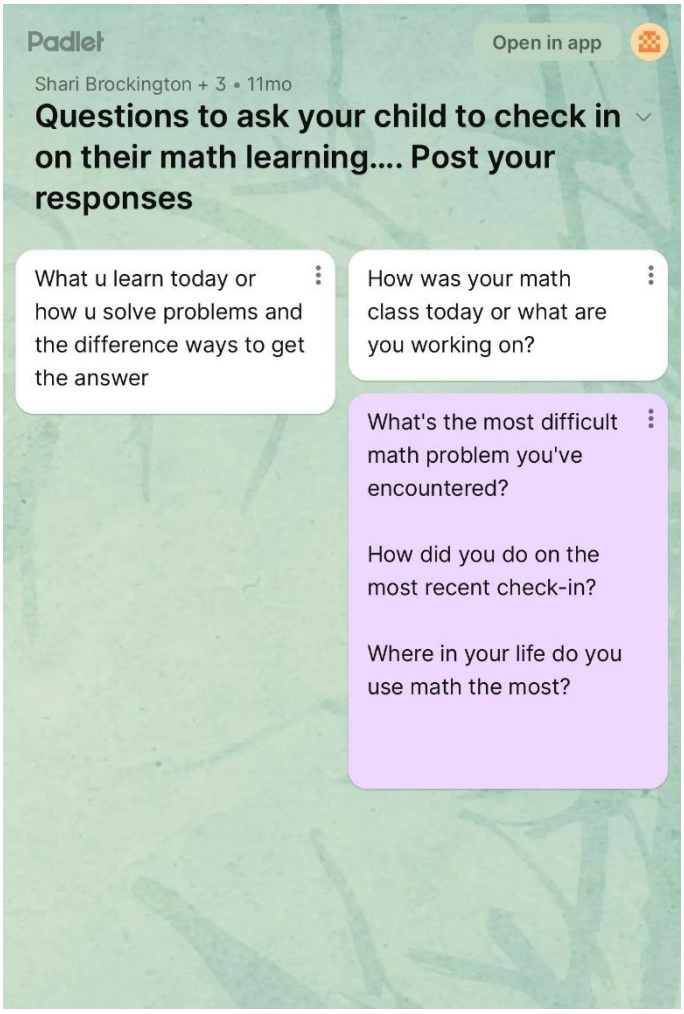
APPENDICES

Appendix A
Padlet Activity





Appendix B

Parent Pre-Survey

Adapted from the Parental Involvement Workshop Series

Pre- Survey				
Q1: How do you feel about your child's math education? Please circle one choice for each item that best represents your opinion and experience.				
	Strongly Disagree	Disagree	Agree	Strongly Agree
a. My child's math teacher makes me feel comfortable when I visit the classroom (PTA,etc)	SD	D	A	SA
b. I feel like my child's math teacher cares about his/her success in the class.	SD	D	A	SA
c. I feel comfortable helping my child with his or her math homework.	SD	D	A	SA
d. I can find resources to help my child with his or her homework.	SD	D	A	SA
e. My child's math teacher works hard to keep me involved in what is going on in the classroom.	SD	D	A	SA
f. Parents should be involved in their child's math education.	SD	D	A	SA
g. I only hear from my child's math teacher Twhen something is wrong or a problem occurs.	SD	D	A	SA
h. My child talks with me about what is going on at school.	SD	D	A	SA
i. Mathematics is very important.	SD	D	A	SA
j. I want to be more involved than I am now in my child's math	SD	D	A	SA

education.				
k. Mathematics is valuable for making decisions.	SD	D	A	SA
l. I have a better understanding of the curriculum requirements	SD	D	A	SA
m. I have a better understanding of the strategies students progress through in hiss/her mathematics course.	SD	D	A	SA

Please tell us a little bit about your family.

1. How many adults live in the home (please include yourself)?_____
2. How many children live in the home? _____
3. What is your education level? (Circle One)
   Did not complete high school.
   High School Diploma
   Other training or education
   Some college
   College Degree
   Advanced College Degree

4. How did you like mathematics when you were a teen?
5. Are you employed now?
6. Do you have any questions that were not addressed in the mathematics workshop?
7. Do you have any suggestions for improving the mathematics workshop?

Appendix C

Parent Post-Survey

Adapted from the Parental Involvement Workshop Series

Post- Survey				
Q1: How do you feel about your child's math education? Please circle one choice for each item that best represents your opinion and experience.				
	Strongly Disagree	Disagree	Agree	Strongly Agree
a. My child's math teacher makes me feel comfortable when I visit the classroom (PTA,etc)	SD	D	A	SA
b. I feel like my child's math teacher cares about his/her success in the class.	SD	D	A	SA
c. I feel comfortable helping my child with his or her math homework.	SD	D	A	SA
d. I can find resources to help my child with his or her homework.	SD	D	A	SA
e. My child's math teacher works hard to keep me involved in what is going on in the classroom.	SD	D	A	SA
f. Parents should be involved in their child's math education.	SD	D	A	SA
g. I only hear from my child's math teacher when something is wrong or a problem occurs.	SD	D	A	SA
h. My child talks with me about what is going on at school.	SD	D	A	SA
i. Mathematics is very important.	SD	D	A	SA
j. I want to be more involved than I am now in my child's math education.	SD	D	A	SA

k. Mathematics is valuable for making decisions.	SD	D	A	SA
l. I have a better understanding of the curriculum requirements	SD	D	A	SA
m. I have a better understanding of the strategies students progress through in hiss/her mathematics course.	SD	D	A	SA

Appendix D

Post Interview Questions

Part 1 of Interview Questions

1. Tell me a little bit about your child/and or children that attend this school? What are his/her/their ages and what level of mathematics are they currently taking or the last math class they have taken.

2. Do you know your child's plans after high school?

3. How well does your child perform in their high school mathematics courses?

4. Do you feel comfortable discussing your child's performance with their math teacher?

5. Did the teacher keep you abreast of how your child was performing in the classroom?

6. How do you feel about mathematics in general? And the math that is currently being taught?

7. How would you like for the math teacher to communicate with you concerning your child's performance in the classroom?

8. Do you feel like you will be more involved with your child in mathematics after attending the workshop? Why or Why not and how? What are some things that you will do differently?

9. How will you support your child as they take mathematics at the high school?

10. What is your perception of the mathematics curriculum? How do you feel about the mathematics curriculum?

Part 2 of Interview Questions

1. Why did you decide to participate in the mathematics workshop for parents?

2. What is your role in your child's academic success?

3. What is your role in your child's academic success in mathematics? Do you feel like it is different from other subjects? Why or why not?

4. Do you feel like there is a connection between your level of involvement and your child's academic success? Please explain.

5. If you recognize any hindrances or barriers in your level of involvement in your child's education, what would you describe them to be?

6. Are these barriers for all subjects? Why or why not

7. In thinking about your role in your child's education, in what ways do you perceive your role in the school setting? How involved are you? Why or why not

8. What types of communication do you have with your child's teachers? How do the types of communication impact your involvement?

9. Do you feel like your involvement has changed over the years? Why or why not?

10. Is the communication the same for different content areas? For example, English I versus the Math 1 teacher, do you have the same forms of contact?

11. What factors hinder your involvement with the school and/or teacher specifically when it comes to mathematics?

12. Tell me about the last time you did mathematics with your child. [If they respond it was during the workshop, then follow-up with: “That is great, and can you tell me about a time before that?]

a. What was the reason?
b. Do you remember what did you or your child say or do
c. How do you think the discussion went? Why do you think it went like that?
d. Would you say this is a typical experience? Explain

Part 3 of Interview Questions

1. How satisfied were you with the workshop?

2. Did the workshop meet your expectations?

3. Was the workshop length appropriate?

4. How useful was the content presented in the workshop?

5. What key takeaway resonated with you the most?

6. How do you plan to apply the workshop insights in your work?

7. What improvements or suggestions do you have for future workshops?

Please share some specific actions you plan to take based on the workshop content.

Appendix E

Workshop Presentation

Workshop Outline & Presentation-Four Sessions

Spring 2024

Parental Involvement in education is a vital component for creating a cooperative educational environment for students to succeed. When students know that they have support from their parents and teachers with positive reinforcement, the chances of the student becoming successful and actively involved in school increases their success in school. The study will implement the use of the Mathematics and Parent Partnerships of the Southwest (MAPPS) workshop design. The MAPPS project implemented mini courses through an 8-week workshop. In this particular study, a four-session workshop will be conducted instead of an 8-week workshop due to time constraints. The workshop sessions will begin with light refreshments and for all of the participants and will be provided by the researcher. The intent of providing light refreshments is to help dissolve any barriers and to foster a climate of comfort before the sessions. Each workshop was held in the library. Current and former mathematics teachers served as facilitators for the workshops.

Welcome to

Parent/Guardian Math Night

Consent Form

Link to the Consent Form:
https://forms.gle/kW7FzZk7sHx8izSa6

Or use
https://go.ncsu.edu/qzrpygq

SCAN ME

Workshop Overview

- Session 1: Introduction & Overview
- Session 2: Creating a home environment to stimulate mathematics learning
- Session 3: Supporting the curriculum
- Session 4: Back to the Future (Using Communication Technology for Mathematics)

Session 1

Introduction & Overview

Session 1 Agenda

Pre-survey (Please take a few minutes to locate the pre-survey and complete it). Access the survey with the QR Code.

Introduction/Overview

- Principal, (or designee)
- Lead Investigator, Shari Brockington
- Presenter, Rayshawn Locklear

Parent Communication Strategies Discussion

- Open Discussion: Topic "Why are teacher-parent relationships important?"

*****Light Refreshments*****

Parent Communication Strategies Discussion

- What are some of the best ways to communicate with the school/and or mathematics teachers?
- *Topic: "Why are teacher-parent relationships important?"*

Ways to build teacher/parent relationships

- Communicate effectively. ...
- Be knowledgeable and well informed. ...
- Set realistic expectations. ...
- Encourage student accountability. ...
- Address emotional concerns. ...
- Foster collaboration. ...
- Share success stories. ...

Activity

Materials:

- Spaghetti Noodles
- Marshmallows
- Tape
- String

Thank you for participating!

Next Workshop: Tuesday, March 26th @ 5:00 pm
Homework: Bring a recipe

Welcome to

PARENT/GUARDIAN MATH NIGHT

Workshop Overview

- Session 1: Introduction & Overview
- Session 2: Creating a home environment to stimulate mathematics learning
- Session 3: Supporting the curriculum
- Session 4: Back to the Future (Using Communication Technology for Mathematics)

Session 2

Creating a home environment to stimulate mathematics learning

Consent Form

Link to the Consent Form:
https://forms.gle/kW7FzZk7sHx8izSa6

Or use
https://go.ncsu.edu/qzrpygq

SCAN ME

Session 2 Agenda

- Recap from last meeting's activity
- ***Homework*** -Make sure you have a copy of your recipe or pick up a sample.
- Icebreaker

Mathematics around the home

- Discussion

Creating a home environment to stimulate mathematics learning

- Shari Brockington, Mathematics Instructor, Richmond CC
- Recipe Activity

***Light Refreshments**

Icebreaker

A.CED.1

26 Musketeers arrive by boat at a small seaport village F.

A war breaks out between them and the village settlers.

15 Musketeers are killed, 4 are captured by the settlers, and 4 are lost in the woods. The remainder manages to escape to their ship.

How many Musketeers made it back to the ship?

Answer: 15 + 4 + 4 = 73

26 – 23 = 3 Musketeers

15

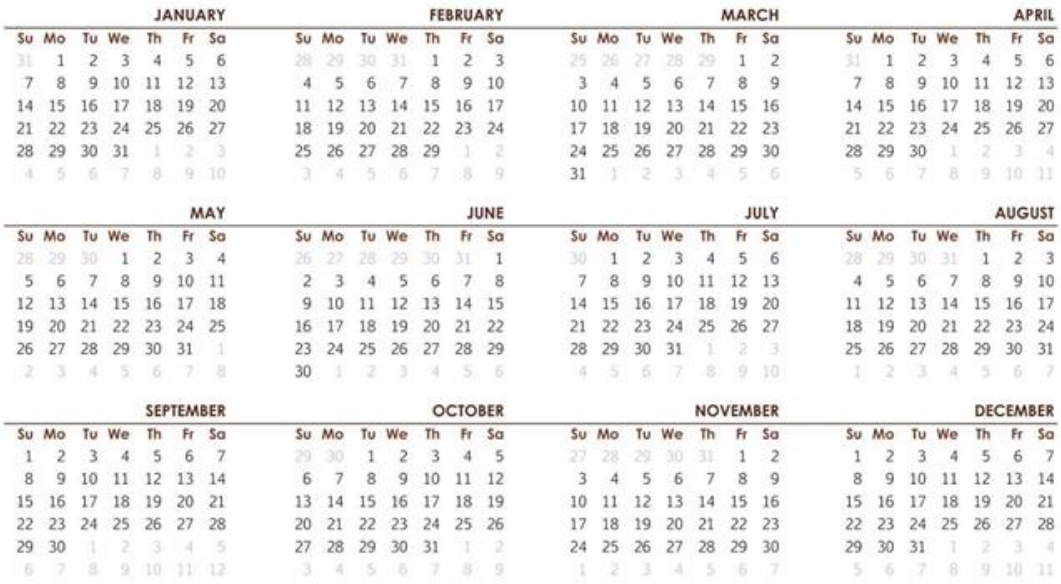
Birthdays in the family.

Think about your family members' birthdays.

How can we use birthdays to allow your children to think conceptually about the birthdays?

What are the birthdays in your household?

2024



JANUARY						
Su	Mo	Tu	We	Th	Fr	Sa
31	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31	1	2	3
4	5	6	7	8	9	10

FEBRUARY						
Su	Mo	Tu	We	Th	Fr	Sa
28	29	30	31	1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	1	2
3	4	5	6	7	8	9

MARCH						
Su	Mo	Tu	We	Th	Fr	Sa
25	26	27	28	29	1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31	1	2	3	4	5	6

APRIL						
Su	Mo	Tu	We	Th	Fr	Sa
31	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	1	2	3	4
5	6	7	8	9	10	11

MAY						
Su	Mo	Tu	We	Th	Fr	Sa
28	29	30	1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	1
2	3	4	5	6	7	8

JUNE						
Su	Mo	Tu	We	Th	Fr	Sa
26	27	28	29	30	31	1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	1	2	3	4	5	6

JULY						
Su	Mo	Tu	We	Th	Fr	Sa
30	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31	1	2	3
4	5	6	7	8	9	10

AUGUST						
Su	Mo	Tu	We	Th	Fr	Sa
28	29	30	31	1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31
1	2	3	4	5	6	7

SEPTEMBER						
Su	Mo	Tu	We	Th	Fr	Sa
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	1	2	3	4	5
6	7	8	9	10	11	12

OCTOBER						
Su	Mo	Tu	We	Th	Fr	Sa
29	30	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31	1	2
3	4	5	6	7	8	9

NOVEMBER						
Su	Mo	Tu	We	Th	Fr	Sa
27	28	29	30	31	1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
1	2	3	4	5	6	7

DECEMBER						
Su	Mo	Tu	We	Th	Fr	Sa
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	1	2	3	4
5	6	7	8	9	10	11

At-Home Learning

➔ Use games and other household activities to assist in understanding math concepts.

➔ When assisting your child with math ask, “Why did you..?”, “What can you do next?”, “Do you see any patterns?”, How do you know?”

➔ Have conversations on what is being learnt in math and how it applies to everyday tasks.

Recipe Activity

Sample
https://drive.google.com/file/d/10ye5tqeqwpKCRWPx6ZSdXEFE75tONT5r/view?usp=sharing**

Link to the Recipe Lab

https://go.ncsu.edu/4qrters

Common Core Mathematics

Overview of the Mathematics Program at School (Courses)

Tools and Resources teachers are using at the school:

- Desmos
- Geogebra

Tools and Resources parents can use at home:

- Desmos

Thank you for participating!

Next Workshop: Tuesday, April 11th @ 5:00 pm

Session 3

Supporting the curriculum

Workshop Overview

- Session 1: Introduction & Overview
- Session 2: Creating a home environment to stimulate mathematics learning
- Session 3: Supporting the curriculum
- Session 4: Back to the Future (Using Communication Technology for Mathematics)

Session 3 Agenda

- Recap from yesterday's activity
- Icebreaker

Supporting the curriculum

- Attending Parent Involvement Math Night
- Communicating with teachers
  - Powerschool, email, Remind app

Parents & Teachers Collaborative Efforts

- Shari Brockington, Mathematics Instructor, Richmond CC
- Budget Activity (Games w/families)

Link to the Activity

Light Refreshments

Icebreaker

You and 9 of your friends go in together to purchase a lottery ticket for the Million Dollar Prize.

You have the winning ticket, and now the 10 of you must divide up the winnings (before taxes!).

If the money is divided equally among you and your friends, how much will each person receive?

Answer: 1,000,000 divided by 10 = 100,000 or 100 Grand

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How can I help my child at home?

- **Be Aware and Informed**
  - Speak to your child regularly
  - Speak to the teacher
  - Watch for communication
- **Develop a Healthy "Mindset"**
  - Start with yourself
  - Build confidence
  - Praise for effort, not performance
  - Keep your child motivated
- **Practice!Practice!**

What are some "real-life" math activities?

- Shopping
- Cooking
- Gardening
- Games and puzzles
- Any more?

Questions to ask your child to check in on their math learning….

https://go.ncsu.edu/bgcsdia

As a parent… How can I support the curriculum?

https://go.ncsu.edu/rovmnse

Thank you for participating!

Next Workshop: Monday, April 22nd @ 4:00 pm

Session 4

Back to the Future (Using Communication Technology for Mathematics)

Workshop Overview

- Session 1: Introduction & Overview
- Session 2: Creating a home environment to stimulate mathematics learning
- Session 3: Supporting the curriculum
- Session 4: Devising a Plan -*Using Communication tools*

Session 4 Agenda

- Recap from last session's
- ***Word Problem Activity***

Communication Technology

- **List of Activities to engage math learning**
- **Devising a Plan**
- **Post Survey**
- **Sign Up for Interviews**

Light Refreshments

Devise a Plan

Who is responsible? What is the achievable goal? Who should be involved?

Goal: Communicate in multiple ways with parents about school events	Responsible: administration, guidance	Involved:
Goal: Hire a parent liaison	Responsible: principal	Involved:
Goal: Send out a monthly newsletter	Responsible: parent liaison	Involved:
Goal: Restart PTSA	Responsible:	Involved:
Goal: Campus tours with 8th grade students & hold panels with seniors	Responsible:	Involved:
Goal: Bring back teachers required to be part of committee	Responsible:	Involved:

What are some of the technology that is used as it related to communicating with parents?

Powerschool

Remind App

Telecom System

Facebook (Social Media)

Interview Sign Ups

Link to the Appointment Scheduler:
https://go.ncsu.edu/pnyy7nk

SCAN ME

Or use

https://calendar.app.google/B8GftWAYEHoEvekGA

Post Survey

Link to the Post Survey:

https://go.ncsu.edu/xechbyu

SCAN ME

Or use

https://forms.gle/MvPaByiwf5d9GfAs7

Thank you for participating!

Next Up Interviews:
Please take 30 minutes to fill out the post survey and set up your interviews.

Appendix F

CODEBOOK

Theme 1: Benefits of Attending the Math Workshop

Definition: This theme relates to how parents perceived their involvement, improvement, and satisfaction during the math workshop.

Code	Exemplar Quote
Parental Involvement	So I thought it was, you know, when they promoted the math sessions, family night, as far as math, it was very interesting to me because I'm a parent that's involved so it's to me besides open house a parent not I mean you know open house where you come see the teachers you know I'm coming to see my teachers the first thing they say is oh this one's been great like what you doing here you know I'm saying so I was just like this is something that I can be as a family to know especially as a parent that wants to be involved so that's it was just very the first thing the last two years that I did you.
Math Ability	I: Okay, so what are some of the key takeaways that resonated with you the most? So what's some of the content that was presented in the workshop? J: I like how we can use math to involve in things in the course. For example, if they are measuring something, if they are cooking something, if they are even spending money, you can bring it to addition and subtraction. And things you can do that doesn't make it seem like it's an uphill task. You can make it fun by incorporating daily things that you use and do.
Parents Suggestions/Improvement	I: So how satisfied, we almost finished, so part three of interview questions. So how satisfied were you with the workshop? Did it meet your expectations? S: It did. I wish it was at the beginning of the school year.

Benefits of Attending the Math Workshop/Satisfaction	“So I can go out and tell other parents because I have other kids in middle school, so I can elaborate on what we learned in this workshop to tell the teachers at my other kids' school so it can be easier for them to communicate with parents.”
Math Workshop Awareness	I: Now, do you know if the workshop, because your son is in math,too, currently, do you know if those teachers promoted it? Do you know? Did your son say anything? D: He doesn't really talk about school stuff. Did your son say anything?D: He doesn't really talk about school stuff. I: He doesn't? Okay. D: I know it was promoted to faculty members. That's how I found out about it.Well, it was in the meeting, but I'd already heard about it through, I think, our social media or through an e -mail. But there were some staff members who were like, what need? How could I?
Math Curriculum	Secondly, I'm not familiar with the curriculum here, so I can't give a fair statement to say I'm happy with the content of the curriculum. Okay. So I would say undecided. I: Undecided, okay.

Theme 2: Parent Perceptions After Attending the Math Workshop

Definition: Math perceptions are defined as how parents viewed mathematics and how they felt after attending the math workshop.

Code	**Exemplar Quote**
Increased Confidence	I: Okay. Okay. So, do you feel like you would be more involved with your child in mathematics after attending the workshop? Why or why not? And in what capacity? D: Well, yes, ma 'am, because it really highlighted the importance of knowing, because, you know, we all know as parents it's important, but things fall by the wayside, and so, and two, it helps me feel a little more confident to be able to talk, even if I don't know the math stuff. About it with them.
Enjoyment	I: Okay so um I think you stated with your perception of the math curriculum okay so why did you decide to participate in the mathematics workshop for parents what was your reasoning D: I love workshops and I was going to be around anyway I was a little I was worried at first because they were being put on Thursdays which is Nat's piano day okay but the ones that ended up being on Thursdays I had to take off piano anyway because I had game duty so I was able to be there but I enjoy being involved as a parent and when living in Fayetteville I don't like having to come back if it's late late which is why being earlier in the day was able to help me interact with people.
Academic Success	I: Okay, so what is your role in your child's academic success? I am the primary parent that checks the grades and that it asks the kids are they doing their homework and make sure that they're doing what they're supposed to do to be successful so um that involves a little more pushing with some than it does others okay Nat's one of those that I've had to push a lot um do you feel like um as far as your role in academic success in um overall in general um as far as mathematics do.

Barriers to Involvement	I: If you recognize any hindrances or barriers in your level of involvement in your child's education, what will you describe them to be? J: Sometimes, because I'm a single parent, so sometimes you must be doing little things here and there to balance the family, and you have other commitments, so sometimes spending more time with them could be a disadvantage of not getting them to where you want them to go in a match. Because you may give them something to do and sometimes I don't get to go and check but they will say this and you say okay when maybe they just do some of it okay so as thinking about your role in your child's education in what ways do you perceive your role in the school setting in terms of let's see in the school setting like as far as what is your role maybe outside of school and in the school setting I know that your profession is teaching just to be a mentor and a coach to them just to give them support emotionally motivate and inspire.

Theme 3: Parents' Feelings of Mathematics

Definition: Parents' Feelings of Mathematics are defined as how parents felt about mathematics during the workshop.

Code	**Exemplar Quote**
Math Ability/ Learning Mathematics	Okay. I know his math teacher last year talked about how great he was with math and he just sees things in a way that none of us do. And the second part, I don't think that's the part because I love math. Math was my favorite subject in high school, which I graduated over 20,30 years ago, if you like it. So that was my favorite subject. So I think that's what kind of helped. I instilled that into them because I like math. So they pretty much love math. So it's not like they, they love school all the way around so I can't say math. But that's probably a favorite because of that's what I like to do yeah.
Mathematics Curriculum	When I was in school, I didn't see, you know, my teachers didn't enforce the test. But I didn't realize now that I got older and working in the school environment and whatnot, like, they didn't stress about the test. I wouldn't know that they were stressed about the test.
Mathematics in General	Okay, so now how do you feel about mathematics in general and the math that is currently being taught? How do you feel about it? D: I think math is nasty. Now, but I lost a lot of that because I did not plan on going into a math intensive field and it just amazes me how much students are expected to do at such lower

	levels
Mathematics Changes	and how much all students are expected to do now versus even when I was in school 20 years ago because or 25 years ago because not every student had to learn pre -calculus and calculus concepts. And now it's all in the stuff.
Parental Involvement	I: Okay. So do you feel like your involvement has changed over the years? No. No? It's been the same? She always complains that I push them too much, I push them too much. So you have, how many children do you have? Just one, two, three? Okay. Okay. So they say that you push them too much. She especially, she's always saying, I'm at her, at her, at her, I'm just at her. And she's really weird, and I don't have to be at her.

Lack of communication tools	“yes especially in high school because they kind of slack up in high school and i'm not saying it's the teacher fault but if you see my child struggling give me a call send me a text message don't wait till the end of the nine weeks and no i don't look at report cards because they say you know we trust our kids what you get in math oh you know we'll take that and just run with it yeah but then at the end of the semester the teacher's calling why you call me at the beginning or halfway through no I don't want no pity party because I got eight kids because I'm there for all of them yeah but if they struggling somewhere let me know mm -hmm”
Stronger Teacher/Parent Relationships	So do you feel comfortable discussing your child's performance with their math teachers? Yes, When there's a body in front of me and not on the computer

Theme 4: Parent Suggestions

Definition: Suggestions that parents gave during and after the workshops.

Code	**Example**
Math Strategies at home	Like, do my boys stress about work? They do, and it's like when I watch them, like last year, especially in the Math 1, when I watch them work a problem, I'm like, what? Versus I know the answer. Versus now the method when I was in school, how to solve problems, is different. So it kind of bothers me And we both get the answer right but I think it's the short time how to answer the problem with that curriculum now versus me it may took a whole piece of paper yeah you know what I'm saying so it's just time difference like age difference it's a short method we're getting the right same answer but I guess it's a short method nowadays and kind of makes you frustrated like that ain't even caught like if I had to go this way you need to it so I had to learn like time to change okay so

Math Engagement	I:So you mentioned something more local. So does this school system or this county have something that's not? S: So the school system has what we call STEAM night, family engagement night, where it handles mostly science and math correlate together. It's something on a county level, but you're looking at, I think we got like 20 some schools, elementary, middle school, and high school. So the county makes something available for everybody. So it's all different grade levels, you know what I'm saying? But I think to me it focuses mostly on elementary and middle school. So you want to see something. You know, I don't see a lot of high school students go. So I think locally if our school, like the school that my boys go to, if they would have something on fires that night that will help out a whole lot okay hold one. One second, please.
Math Curriculum/Learning Math at home	I kind of know, okay, it's the month of May. Y 'all working on probability. You get what I'm saying? So I kind of would know.

Theme 5: Using Communication Tools Between the School and Parents for Involvement & Engagement

Definition: Parent Involvement strategies that use communication tools.

Code	**Exemplar Quote**
Strategies for Parental Involvement	I: okay so and that's the current math courses that they're taking so do you know your children plans after high school L: well no he's trying to go to the service okay that's my 12th grader okay and my 10th grader he don't know what he want to do he always he want to be an nba basketball star but you know how that changes I: yes no way does he play basketball L: yes ma 'am.
Parent/Teacher Conferences	So, do the teachers, um, keep you abreast of how your child is performing in the classroom, room both students honestly no i'm i make more contact to ask but they also know me so because they know me they reach out to me because they know from day one i always tell them i do not want them to regress that's one of the things i will not allow them to regress and you know everybody said covid covid mind covid you know that like that's that's excuse for me so i will okay

Communication Tools (Technology, etc)	I: So what type of communication do you have with your child's teachers and how do those types of communication impact your involvement. L: Like my middle school kids, I can go to them face -to - face, and they'll tell me. My baby, I can go to her teacher any time. I text her throughout the day, you know, she can pick up the phone. I: So you have a personal text? I: The personal number? L: Yeah. Okay. Some people pick up. I didn't know if it was, because earlier they said text messages, but they meant remind, so I didn't know if that was the same thing.
Communication Tools w/Math Grades	“They don’t do and they don’t always put in grades like they should either.

Appendix G

Email to Participate in Research

Greetings,

My name is Shari Brockington. I am a former math teacher at Red Springs High School. Currently, I am an instructor in the mathematics department at Richmond Community College.

I am pursuing my doctoral degree at NC State University and I'm seeking permission to conduct research at the local high school. The purpose of my study is to examine the impact of a series of mathematics workshops for parents of students enrolled in high school mathematics courses. This study aims to understand how parents engage in a mathematics workshop, their perception of the mathematics curriculum, and how they perceive involvement before and after the workshops.

The research will entail collecting data from parents. I will email and post on social media inviting individuals from your school to participate in this research study. If they agree, they will be asked to take a survey and potentially be interviewed. Each participant needs to set aside 8-9 hours and data will be collected at the school.

All participants will be asked to give written consent before the research begins. Their responses will be kept confidential, and pseudonyms will be given. The results will be communicated in the dissertation. The participants will be given an Amazon gift card upon completion of the workshop.

I've provided an outline of the workshop series for your convenience. Please let me know if you require any further information. I look forward to your response as soon as it is convenient for you.

Outline of the Workshop Series

Best,

Shari Brockington

Appendix H

Sample Invitation to Parts to Participate

Dear (Parent Participant),

We are conducting a research study to examine the impact of a series of mathematics workshops for parents of students enrolled in high school mathematics courses. For the research study you will be asked to take part in a workshop series, and we are conducting interviews and surveys as part of the research study. The interview is informal and will take approximately 30-45 minutes to complete. The total amount of time that you will be participating in this study is approximately 7 hours. There is a $25.00 compensation for each participant participating in this study.

If you are willing to participate, please suggest a day and time to fill out the consent form.

Appendix I

Consent Form

Title of Study: A Qualitative Exploratory Study on Parent Involvement and Perceptions of Students' Mathematical Learning through a Mathematics Workshop

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You are being asked to participate in a research study about how parents support the mathematics learning of their children. Participation is strictly voluntary. You must be 18 years of age or older and be a parent of a Math 1 student to participate in this study.

If you participate in this study, you will participate in 4 parent workshops and be asked to complete a survey at the end of the final workshop. In addition to participating in the workshop series and completing surveys, 4-8 participants will be selected for semi-structured interviews. The data collected about you from the surveys will be stored in accordance with NC State data protection standards.

The participants will complete a pre-survey and post-survey. The questions on the surveys are about how the parents feel about their child's math education and a little about the family dynamics. The surveys should take no more than about 30 minutes to complete. The total amount of time that you will be participating in this study is approximately 7 hours.

You can choose to not participate in the study or stop participating at any time by stopping any research activity that you are doing or contact the researcher, Shari Brockington, at sbrocki@ncsu.edu You can also contact the faculty advisor for this research, Erin Krupa, at eekrupa@ncsu.edu.

As a part of this research, I would like your consent to audio record you while in the breakout sessions along with the interviews if applicable. Please initial next to the sentence(s) that you agree to.

_____I consent to be audio recorded.

_____I do not consent to be audio recorded.

If you do not want this information collected, you cannot participate in this research. We would like to use these recordings for transcription only. We will keep these recordings for at least 10 years.

There are minimal risks associated with your participation in this research. There are no direct benefits to you from participating in this research.

For your participation in this study, you will receive a $25 gift card. If you withdraw from the study prior to its completion, you will not receive any compensation.

If you have questions at any time about the study itself or the procedures implemented in this study, you may contact the student researcher, Shari Brockington, at sbrock@ncsu.edu. You can also contact the faculty advisor for this research, Erin Krupa, at eekrupa@ncsu.edu.

If you have questions about your rights as a participant or are concerned with your treatment throughout the research process, please contact the NC State University IRB Director at IRB-Director@ncsu.edu, 919-515-8754, or fill out a confidential form online at https://research.ncsu.edu/administration/compliance/research-compliance/irb/irb-forms-and-templates/participant-concern-and-complaint-form/

If you consent to participate in this research study, please click on the link to access the survey, fill in your name and date, and click “Yes I consent” button to see the survey.