INVESTIGATING THE INFLUENCE OF PARENTAL INVOLVEMENT ON STUDENTS' MATHEMATICS SELF-EFFICACY AND ACHIEVEMENT: AN INTERVENTION APPROACH

by

OLUTOLA OPEYEMI AKINDIPE

(Under the Direction of Stacey Neuharth-Pritchett)

ABSTRACT

The purpose of this study was to examine the influence of a parental involvement intervention on the mathematics self-efficacy and achievement of students. A previous study showed the involvement of many Nigerian parents in their children's education was low and parents were lacking in some involvement practices. The study was a quasi-experimental study involving an intervention and a control group. The participants were fifth grade students selected from two private elementary schools in Southwestern Nigeria. The sample consisted of 17 males (33.4%) and 43 females (66.6%). Participants' ages ranged from 9 to 15 years with an average age of 10.89 years. Parents in the intervention group were provided with an intervention targeting school-home communication, parental supervision, and home structure. Participants took a mathematics pre and posttest and completed a mathematics self-efficacy measure; in addition those in the intervention group took weekly mathematics quizzes. Parents in both intervention and control groups completed a pre- and post-parental involvement measure. The research hypotheses were as follows: (1) Participants in the intervention group will have

significantly higher mathematics achievement at posttest than those in the control group. (2) Parents in the intervention group will have significantly higher perceptions of parental involvement at posttest compared to parents in the control group. (3) There will be a significant positive relationship between parental involvement and students' mathematics achievement. (4) There will be a significant positive relationship between students' mathematics self-efficacy and achievement. (5) There will be a significant positive relationship between parental involvement and students' mathematics self-efficacy. Analysis of covariance (ANCOVA) and Pearson product moment correlation analyses were used to test the research hypotheses. Results showed intervention had a significant effect on students' mathematics achievement but not on parents' perception of involvement. Also, there was significant positive relationship between mathematics self-efficacy and achievement but no significant positive relationship between parental involvement and mathematics achievement, and between parental involvement and mathematics self-efficacy. Educational implications of the results are discussed.

INDEX WORDS: Parental involvement, mathematics, achievement, self-efficacy, home structure, school home communication, parental supervision, intervention, and Nigeria.

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DEDICATION

To the Almighty God; my maker and my help, who orders my steps and teaches me in the way to profit. Thank you for being with me every step of this academic journey. I am nothing without You.

To my pillar of strength and support, Olurotimi Abisoye Akindipe, my darling husband and friend; thank you for your unwavering support and love.

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CHAPTER ONE

INTRODUCTION

Academic success is a parental aspiration for children; however, not every child performs well in school. Students' underachievement and under performance are issues of concern to parents, educators, school administrators, and policy makers (Schaps, 2005). Studies emphasize the need for both the school and the home to work collaboratively to improve the probability of educational success. Pianta and Walsh (1996) and Bronfenbrenner (1979) note the importance of the school and home micro systems together working for students' successful learning and academic development. Research highlights the role of parents in the educational achievement of their students (Ho, 2010; 1994; Keith et al 1998; Schunk & Zimmerman, 2006; Sheldon & Epstein, 2005; Sirvani 2007).

Parental involvement is beneficial to all students regardless of educational level (Epstein, 1995; Izzo et al, 1999; Schunk & Zimmerman, 2006). The impact is realized based on the percentage of the day spent at home and because parents are intimately aware of the strengths and weaknesses of their children and can channel their children toward opportunities for academic success. The family is the first contact a child has with the world and represents a dependable source of care, love, and support during the early stages of development and throughout the schooling years. Therefore, parents can serve as the motivational force propelling students toward academic excellence – especially when parents are highly involved in their children's education.

Parental involvement can occur in a variety of ways and includes various types of activities that promote academic achievement. Although different types of parental involvement are found in the literature, one model of parental involvement that has been widely acknowledged is the work of Epstein (1995). Epstein's model outlines six major types of parental involvement activities, including parenting, communicating, volunteering, learning at home, decision making, and collaborating with the community. These activities stem from three interconnected spheres of influences in a child's life, which are the family, school, and community. Epstein's model represents an attempt to understand the ways in which parents contribute to their children's education and how the family, school, and community work together to meet children's educational needs.

Similarly, Pomerantz, Moorman, and Litwack (2007) classified all forms of parental involvement into two major categories - school-based and home-based parental involvement. School-based parental involvement is identified as practices parents participate in which involve contact with their children's school. Home-based parental involvement includes activities in which parents engage at home with children in relation to their educational success. Some examples of home-based involvement include helping with homework, discussing children's grades, performances, or academic expectations, and engaging children in extracurricular activities, such as taking them to the library, a museum, or a concert. Other types of school-based parental involvement include volunteering at school events, attending Parent Teacher Association (PTA) meetings, participating in school events, serving on the school's educational boards, and communicating with the school or teachers.

Although parental involvement has been highlighted as being important for all subjects, an important subject area in which students' underachievement has constituted national and

global concern and to which some form of parental involvement intervention has been advocated is mathematics (Van Voorhis, 2011; Wilder 2014). Mathematics is relevant for people's daily living and is also crucial to national development especially in the areas of science and technology. Simple daily activities, such as paying for groceries, buying bus or cinema tickets, or calculating how many hours it will take to arrive at a given destination require some form of mathematical ability. Mathematics is the language and foundation of all science, technology, and engineering disciplines (Igbokwe, 2003); therefore, mathematics is pertinent to the economic, technological, and industrial development of nations. Mathematics determines nations' relevance on the global scene. As a result, educational administrators, policy makers, and governments globally have taken an interest in the subject and have endeavored to implement policies to advance the teaching and learning of mathematics.

However, mathematics is a subject in which many students struggle and in which proficiency level is gradually decreasing (Stigler, Givvin, & Thompson, 2010). A number of factors have been attributed to students' poor performance in mathematics. Some of these factors include instructional resources (Amazigo, 2000), pedagogy (Ale, 1989), curriculum (Iruoma, 2012), motivation (Mega, Ronconi & De Beni, 2014), classroom structure (Badiee et al., 2014), and study habit changes (Charles-Ogan & Alamina, 2014). While a number of national governments have made substantial investments to provide better educational, motivational, instructional resources, and policies to change the classroom, curriculum, and pedagogical structure of teaching mathematics, mathematics underachievement persists across the globe.

Interestingly, research indicates more parents are involved in language and literacy than mathematics learning believing that reading to their children increases school achievement (Berkowitz et. al., 2015). Several other reasons exist as to why parents might be less involved in

mathematics learning. Many parents believe that their children's learning of mathematics is the sole responsibility of the school and the teachers (Cannon & Ginsburg, 2008). As well, a number of parents want to assist their children with mathematics but do not know how to do so (Pan, Gauvain, Liu, & Cheng, 2006). Such parents do not have the necessary mathematical skills; consequently, they cannot effectively teach their children the subject (Eden, Heine & Jacobs, 2013). Also, mathematics curricula have evolved over the years, and the ways most parents were taught mathematics in their formative years differ significantly from the way mathematics is currently being taught (Shafer, 2016). Finally, some parents, especially working parents, are often not available as they are engaged in necessary work to "make ends meet", which restricts the time needed to support their children in learning mathematics.

As a result of these impeding factors, many parents need some form of assistance or intervention to increase involvement in their children's mathematics learning. Interventions can be perceived as the means of creating the appropriate environmental, policy, and resource support necessary to implement change, provide social support, and change knowledge, beliefs, and skills ("Missouri Department of Health and Senior Services," n. d.). Interventions can include instructional, behavioral, health, and educational programming. Educational interventions often include various ways of providing students with the support needed to acquire necessary skills and to equip them with the necessary cognitive, behavioral, academic, and social skills to facilitate learning (Lestrud, 2013). The central focus of any educational intervention is to bring about change and improvement in an area of learning in which students might be experiencing difficulty. Interventions that seek to improve students' learning and academic achievement are basically limited to the school and the home; the two main locations where students spend most of their time.

A review of the literature revealed that school-based interventions are more popular and used more than home-based interventions. School-based interventions are generally preferred because they are cost effective (Wang et al., 2008) and often have formal structures which support organization and implementation of interventions (Garbacz et al., 2016). Nevertheless, it is important to emphasize that both home- and school-based interventions are important because school-based interventions are more effective with the support of parents. Interventions that involve the collaboration of both school and home have resulted in significant student outcomes (Dishion, Nelson, & Kavanagh, 2003; Sheridan et al., 2012).

Parent involvement interventions empower parents to become more involved in their children's education. From the literature, parental involvement interventions involving some form of training and education are the most effective (Schwartz et al., 2006; Toomey, 2003). According to Schwartz et al. (2006), there are two types of parental involvement interventions that include education and training. First are interventions based on general education and training of parents. Second are interventions that include general education and training of parents of parents with specific add-ons in certain subject areas, such as mathematic or English Language. The general education and training interventions provide parents with necessary supporting skills, materials, activities, or information which they can utilize with their children at home while the education and training in specific subject interventions equip parents with specific skills, materials, activities, or information that parents can use with their children in certain subjects like mathematics or English Language.

Regardless of the type of intervention parents receive - general or specific- studies have generated mixed results on the effectiveness of intervention. Some studies report parental involvement interventions are effective (Thurston & Dasta 1990; Faires, Nichols, & Rickelman

(2000) while others suggest that they are not (Law & Kratochwill, 1993). A few other studies, however, reported on the lack of enough evidence to conclude on the effectiveness of parental involvement interventions (Whit, Taylor & Moss, 1992; Mattingly et al., 2002). In addition, some of the studies suggesting the absence of substantial evidence for parental involvement effectiveness were quick to state the results do not categorically imply the interventions were ineffective.

One of the ways parents motivate their children towards academic excellence is through their influence on their children's beliefs, attitudes, and ultimately, behavior. Because people's beliefs impact their emotions and behaviors, which influences development, parents can directly or indirectly influence their children's behaviors and life outcomes. The role of the family - especially that of the parents in the formation and development of students' self-efficacy - has been emphasized by many researchers (Fan & Williams 2010; Mena 2011; Schunk & Miller, 2002). Self-efficacy is defined as one's confidence in his or her ability to successfully perform a given task and produce a desired outcome. Self-efficacy refers to an individual's belief or perceived capability to perform a given or specific task at a desired level (Schunk, 1991). Postulated by Bandura (1986), self-efficacy is the judgment an individual makes about how well he or she can successfully execute a desired course of action in a specific situation. Self-efficacy has been consistently found to be significant to the learning and academic achievement of students- especially in mathematics (Britner & Pajares, 2006; Ramdas & Zimmerman, 2008).

The importance of self-efficacy for academic success cannot be overemphasized because "unless people believe that they can produce desired outcomes by their actions, they have little incentive to act or persevere in the face of difficulties" (Bandura, Barbaranelli, Caprara & Pastorelli, 2001, p.187). Students who have high self-efficacy beliefs are able to develop and

sustain interest during learning, work longer, and persist when they encounter difficult tasks. On the other hand, students who exhibit low self-efficacy are likely to become easily bored during learning, and are more likely to avoid some tasks or even stop working on difficult tasks compared to students who have high self-efficacy (Schunk & Zimmerman, 2006). Similarly, students who have high self-efficacy are motivated to expend more effort when performing task which makes them more likely to succeed in comparison to students who have low self-efficacy.

Research suggests students who have higher self-efficacy also have superior cognitive competence compared to those who have low self-efficacy (Bong, 2008). Students with high self-efficacy are able to self-regulate their behavior as well as develop and utilize cognitive strategies that help them solve problems or perform tasks (Zimmerman, 2000). Likewise, self-efficacy influences the academic choices that students make. For example, the decision to attempt to solve or avoid a difficult problem, complete a homework assignment, or watch television might depend on students' self-efficacy beliefs. Also, students' choices of what career to pursue are often based on their perception of their self-efficacy beliefs (O'Brien, Martinez-Pons & Kopala, 1999; Pajares, 1996). In other words, students who are confident they can perform successfully in certain subject areas often pursue careers in those areas while students who perceive otherwise, choose careers in other areas.

Students' mathematics self-efficacy refers to their degree of confidence in their ability to successfully perform mathematical tasks and solve mathematical problems. Students who have high mathematics self-efficacy tend to spend more time studying the subject, and they often challenge themselves by attempting and solving more difficult mathematical problems (Margolis & McCabes, 2004). Consequently, the effort they expend and the satisfaction they derive from practicing mathematics propels them to excel in the subject. Because students with high

mathematics self-efficacy want to sustain the pleasant experiences they get from learning the subject, they practice and solve more mathematics problems not only in school but also at home. Similarly, they become more confident of their mathematics ability and performance, which motivates them to pursue mathematics or science-related disciplines or careers in college (O' Brien et al, 1999).

Rationale for the Study

The current study is an extension of an earlier study that examined the relationship between parental involvement, mathematics self-efficacy, and the achievement motivation of Nigerian students (Akindipe, 2015). Findings of the study revealed positive relationships between (a) parental involvement and students' mathematics motivation, (b) mathematics self-efficacy and mathematics motivation, and (c) parental involvement and mathematics self-efficacy. In addition, the findings also revealed a low percentage of Nigerian parents were actively involved in their children's learning and that parents, in particular, were less involved in their children's learning of mathematics compared to other content areas. The results also indicated some dimensions of parental involvement, such as parental supervision, communication between the school and the home, and the existence of family rules and home structure were not being actively used by many Nigerian parents (Akindipe, 2015). Furthermore, part of the study's conclusion stated the "need to assist parents with creating the appropriate family rules that can significantly motivate their children towards academic excellence not only in mathematics but in other subjects as well (p. 80)."

Therefore, the current study was implemented to provide intervention support to Nigerian parents in the areas of parental supervision, communication between the school and the home, and the existence of home structure for learning of mathematics at home. The intervention in this

study was not focused on increasing parents' mathematical proficiency but rather on supporting parents to supervise their children's mathematics learning, to provide a quiet study area with a table and chair, and to create and use a study schedule for their children's mathematics learning at home. Also, the intervention sought to increase communication between school and parents about students' mathematics performance.

The Nigerian Context

The Nigerian culture places high value on the family. Members of the family are the most important people in an individual's life. The family comprises the father, mother, and children as well as other members of the extended family, such as uncles, aunts, grandparents, and cousins, who may live with the nuclear family or visit regularly. Thus, the members of the family are tightly knitted together and they look out for one another's welfare. Raising children is considered a communal effort rather than the sole responsibility of the father and mother and members of the extended family are often involved in this process. They assist to care for the children in the absence of their parents.

Many parents are reluctant to communicate with their children's schools. The society is a collectivist culture where the home is considered an in-group while the school is perceived as an out-group (Hofstede, 2001). Members of the in-group are closely knit and seek to maintain good relationship with one another. They live communally and value the in-group more than the out-group. Parents see school officials as authority figures to be revered and want to avoid contact with them; therefore, many parents often find it difficult to interact effectively with the teachers and school officials. More so, some parents tend to believe constant visits to the schools interfere with teachers' time and connote teachers as being incompetent (Araujo, 2009; Colombo, 2006).

In contrast, teachers and school officials want to communicate with parents; however, they do not have enough time to do so. The enormous responsibility of teaching leaves teachers with little or no time for communicating with parents. Also, many teachers feel that allowing parents access to the school might hinder their ability to effectively teach because some parents might make prolonged visits to the school thereby taking much of the time that should be used for teaching. In addition, some parents might abuse the opportunity given to visit the school, sometimes coming for the most flimsy reasons.

There are few ways that schools communicate with parents. Communication may be to inform parents about school events, students' behaviors, or performance. One of the means of schools communicating students' performances with parents is the use of report cards which are sent home to parents at the end of the semester. These report cards contain students' scores and performance grades on all subjects. Another medium through which school communicate with parents is the open house. Similar to the school conferences that occur in schools in the United States of America, the open house usually takes place once in a semester. During this period parents are invited to school to check their children's work and to talk to teachers. Although the open house is a great forum for fostering communication between parents and the school, it has only been adopted by few schools, especially private schools. A different form of communication which some schools utilize is the newsletters which are sent home once or twice within a semester.

One of the popular means by which schools communicate with parents is through the Parent Teacher Association (PTA). The Parent Teacher Association is an active forum that provides opportunity for schools to collaborate with parents for students' academic success. The primary objective of establishing the Parent Teacher Association in Nigerian schools was to

create a parents-teachers platform that would assist the schools in meeting some financial challenges. Some of the primary responsibilities of the Parent Teacher Association include raising fund to get educational resources and infrastructure to enhance students' learning. Rather than directly working with students to increase achievement or with parents to enhance their involvement in students' learning, Parent Teacher Associations execute projects such as equipping school libraries and laboratories, repairing or constructing buildings and facilities, and sourcing for educational resources and materials.

Although several schools have taken advantage of the social media, having Facebook and whatsApp accounts to reach out to parents, these apps are often used only when the school has an event or program. Because many schools cannot afford to employ a communication specialist, communication with parents is periodic but infrequent. Time and financial constraint, limited digital resources, and the lack of adequate electricity supply also hinder schools from effectively communicating with parents. Communicating with parents is expensive because it requires conscious effort, time, and money.

Many parents value and strongly believe in providing the best form of education for their children, especially when they can afford it. Generally, the society believes and associates good education with unlimited opportunities and great prestige. Parents expect that their children would get good jobs after graduating from the university or other tertiary institutions, earn good salaries, and assist other members of the family financially to live better lives. Nigerian parents perceive education to be an escape route from poverty. Parents with educated children often brag about their children's academic achievement because well-educated children are considered the pride of the society and bring honor and respect to their family.

Although many Nigerian parents want their children to succeed academically and might understand their involvement in children's education is critical to academic success, many of them are not effectively involved in their children's learning. Some parents do not know how to be involved in the children's education (Gal & Stoudt, 1995), while others are too busy trying to survive to be involved at all. The level of involvement of most Nigerian parents is generally low (Apebende et al., 2010), and this low involvement is particularly demonstrated in the area of mathematics (Akindipe, 2015). Based on their own history with mathematics learning, some parents dread mathematics and want to avoid this content as much as possible (Eden, Heine & Jacobs, 2013; Hembree, 1990), even preferring to employ tutors to teach their children mathematics rather than get involved themselves.

Ironically, mathematics and its related disciplines are some of the most desired careers parents want for their children because the jobs in this career path are usually in high demand. In several parts of the world, mathematics-related jobs are better remunerated than other positions (United States Department of Education, 2014). Being the fifth largest producer of crude oil in the world, Nigeria has several domestic and multinational companies in its oil and gas industry seeking to offer jobs to individuals in the Science, Technology, Engineering, and Mathematics (STEM) disciplines. These jobs have attractive employee benefits, such as high salaries, allowances, and overseas training, making them highly desirable careers compared to non-STEM careers. For these reasons many parents, especially educated ones, want their children to excel in mathematics at the lower educational level such as the elementary and middle school so that their children can get into mathematics and STEM careers at the higher education level.

Although previously unpopular in the Nigerian educational system, parental involvement in recent times has received increased attention from researchers. The advocacy for increased

and more effective parental involvement in children's education has been on the rise. The Federal Government of Nigeria (2004) called for parental involvement in its National Policy on education stating that close participation and involvement of the communities, at the local level in the administration and management of schools will be encouraged. This call has virtually brought parental involvement to the national limelight. However, to ensure that parental involvement becomes effective and achieves its fundamental objective of enhancing students' academic achievement, some form of assistance or parental involvement intervention should be provided to parents who are not effectively involved and also to increase the involvement of those parents who are already involved.

Statement of the Problem

The issue of mathematics underachievement can be considered a global problem that plagues both the developed and developing countries of the world. In Nigeria, many students perform poorly in mathematics (Akubuiro & Joshua, 2004; Olunloye, 2010). Mathematics underachievement is not only limited to a specific level but occurs at all of the educational levels (Zakariya & Bamidele, 2015). Students' performances on mathematics examinations at the national and local levels have worsened over the years (Ahiakwo, 2006). For example, students' performances in the subject in the Senior Secondary School Certificate Examination (SSCE) have deteriorated over the years (Akubuiro & Joshua, 2004).

Consequently, students' admission, enrollment and graduation from mathematics-related careers have been severely affected. Although the Nigerian Federal government made passing mathematics mandatory and a prerequisite for students' admission to tertiary institutions, irrespective of the discipline being pursued, only a small percentage of students are admitted and enrolled into mathematics-related disciplines (Salman, 2001). Furthermore, many of the students

who are admitted into these disciplines do not graduate. Some of them change to some other non-STEM courses or drop out from the colleges based on their inability to cope with the academic rigors and challenges of the discipline (Inside Higher Ed, 2013; U.S. Education Department's National Center for Education Statistics, 2014), which leads to a lower percentage of students graduating within the STEM fields.

While significant investments and measures, such as curricular, instructional, technological, and motivational changes have been implemented to tackle students' underachievement in mathematics, many students do not perform well in mathematics. A new approach that has been undertaken to alleviating the problem of mathematics underachievement is the advocacy for more school-home collaboration that involves those who are the closest to the students: parents and family. However, many parents do not know how to be effectively involved in helping their children learn mathematics and need assistance.

Many parents do not supervise their children's mathematics work and do not ensure that their children have a place where they can study mathematics at home or that they have a mathematics study schedule that they can utilize for learning at home (Akindipe, 2015). Similarly, many parents do not receive regular information about their children's mathematics performances from the school which can inform them how and where their children need help.

Purpose of the Study

The primary objective of this study was to investigate the effect of a parental involvement intervention on students' mathematics self-efficacy and achievement. The study sought to determine whether parental involvement intervention with students' mathematics learning would lead to higher mathematics achievement. Another goal of this study was to examine whether the intervention would change parents' perception of involvement. In addition, the study examined

the relationship between mathematics self-efficacy and students' mathematics achievement, parental involvement and mathematics self-efficacy, and parental involvement and mathematics achievement.

Research Questions

The questions that this research sought to answer included the following:

Does a parental involvement intervention that includes providing a study schedule, place, parental supervision, and school-home communication have a significant effect on students' mathematics achievement?

Does a parental involvement intervention that includes providing a study schedule, place, parental supervision, and school-home communication have a significant effect on parents' perception of involvement?

What is the relationship between parental involvement and students' mathematics achievement?

What is the relationship between students' mathematics self-efficacy and achievement?

What is the relationship between parental involvement and students' mathematics self-efficacy?

Research Hypotheses

The following were the hypotheses that the study sought to answer.

Hypothesis 1: Students in the intervention group will have a significantly higher mathematics achievement at posttest than those in the control group.

Hypothesis 2: Parents in the intervention group will have a significantly higher perception of parental involvement at posttest than those in the control group

Hypothesis 3: There will be a significantly positive relationship between parental involvement and students' mathematics achievement.

Hypothesis 4: There will be a significant positive relationship between students' mathematics self-efficacy and their mathematic achievement.

Hypothesis 5: There will be a significant positive relationship between parental involvement and students' mathematics self-efficacy.

Parental Involvement Dimensions of Study

Parental involvement is a multidimensional construct that covers different behaviors and practices. Parents' attitude and involvement in their children's learning of mathematics was measured by parents' scores on the parental involvement measure. However, for the purpose of this study the intervention dimensions of parental involvement that were implemented and examined were school-home communication, home structure, and parental supervision of students' mathematics learning at home. Although these three dimensions of parental involvement basically occurred within the students' home, they involved a collaborative effort between the school and the home.

School Home Communication

This dimension involved students' mathematics teachers making contact with parents about students' mathematics performance. Parents received and signed weekly reports of students' performances in the mathematics quizzes that they took during the period of the intervention.

Home Structure

This dimension of parental involvement focused on the presence of home structure for students' mathematics learning at home. This dimension was measured in terms of parents' creating a quiet place with a table and chair where student can study at home and creating a study schedule for students to learn mathematics at home.

Parental Supervision

This dimension focused on parents supervising or monitoring students' mathematics learning at home for at least 15 minutes daily.

Operational Definitions of Terms

Students' Mathematics Self-Efficacy

In this study, mathematics self-efficacy was operationalized as students' score on the mathematics self-efficacy measure. It was assessed by using participants' perception of their confidence and ability in solving mathematics problems as measured by the adapted Pintrich and DeGroot's (1990) self-efficacy measure.

Students' Mathematics Achievement

This variable was measured by the participants' scores on the mathematics pre and posttest tests.

CHAPTER TWO

LITERATURE REVIEW

This chapter focuses on a review of the theoretical frameworks and empirical studies on parental involvement interventions, mathematics self-efficacy and students' mathematics achievement used in this study. Thereafter, the chapter presents a review of empirical studies of the dimensions of the intervention, parental supervision, home structure, and parental supervision implemented within the current study

Theoretical Framework

The Social Cognitive Theory

Postulated by Bandura (1977), the social cognitive theory (SCT) is an extension of social learning theory. Basically, it is a theory of agency that views people as self-organizing, proactive, self-regulating, and self-reflecting (Bandura, 2005). Human agency refers to the ability of an individual to intentionally engage in learning with the view of adapting or modifying behavior (Bandura, 2001). The social cognitive theory represents one of the mostly utilized theoretical frameworks for understanding human behaviors (Buchan et al., 2012).

According to the social cognitive theory, human behavior is a function of the complex interrelationship that exists between three main factors namely personal, environmental, and behavioral factors. Personal factors are those characteristics of an individual such as emotions, thoughts and cognition, personal beliefs, expectations, and biological dispositions that may influence behavior. Environmental factors are the external influences on an individual's behavior, while behavioral factors are those actions exhibited by an individual such as self-

observation or evaluation. These factors are in a state of intricate interaction known as triadic reciprocality, where there is a reciprocal interplay among and between the factors, not only in determining behavior but in influencing each other (Bandura, 1986). Although independent, the three factors are dynamic and impact human behavior in significant ways (Bandura, 1977, 1989a). For example, different forms of person-behavior, environment-person or environment–behavior bidirectional interactions might occur among the three factors. The behavioral outcomes of such complex and intricate interactions are often based on the individual in question, the specific behavior being exhibited or the environment in which the behavior takes place (Bandura, 2001).

An important concept in the social cognitive theory is reciprocal determinism. Also known as the model of causality, reciprocal determinism emphasizes that people construct their social environment based on their efforts which, in turn, determines the reciprocal interplay between the behavioral, environmental, and personal factors. This means people are not just the product of their environment but are also contributors and influencers of their environment (Bandura, 2006). Thus reciprocal determinism enables people to control their thoughts and feelings, to consciously invest in learning, and to enact behavior change (Bandura, 2001). All of these actions impact directly or indirectly on peoples' subsequent behaviors (Bandura, 2004; Pajares, 1996).

Fundamental to the social cognitive theory is the cognitive interpretation and processing of information. In particular, the strength, intensity, and cognitive appraisal given to the interplay of triadic factors vary from individual to individual thereby resulting in differences in human behavior even when peoples' experiences are similar or the same**.** Furthermore, the theory emphasizes that the cognitive processing of information that accompanies the triadic reciprocal

process allows people to develop their own perception of reality which they use in their subsequent social experiences to understand and modify their behavior and environment (Bandura, 2001).

The theory proposes the triadic factors modify or influence behavior by operating through some human capabilities or constructs. These capabilities or constructs are believed to play a pertinent role in the development of human behavior and they include self-reflection, vicarious learning, symbolism, forethought, and self-regulation (Bandura, 1986).

As a special feature of the social cognitive theory, self-reflection capabilities equip people with the ability to cognitively evaluate their behavior and to examine their thoughts, beliefs, and cognition. This helps people to make sense of their social experiences and to change or modify their behavior accordingly (Bandura, 2012). Therefore, self-reflection plays an essential role in the development and enactment of behavior and is particularly believed to be fundamental to all forms of human survival and progress (Bandura, 2001). Specifically, Bandura noted self-reflection allowed people to "judge the correctness of their predictive and operative thinking against the outcomes of their actions, the effects that other people's actions produce, what others believe, deductions from established knowledge and what necessarily follows from it" (Bandura, 2001, p. 10).

Another essential construct of the social cognitive theory is self-regulation. Self-regulation represents the unique ability of humans to change or redirect their behavior (Bandura, 1986). The construct centers on how humans utilize their thought processes to select specific goal or plan and to devise strategies to achieve the goal, execute the strategies, and then monitor their behavior until the goal is achieved. Self-regulation is an individual's ability to control

actions, thoughts, and feelings, and to develop strategies to sustain or improve behavior (Bandura, 2005).

Symbolism refers to the process whereby people are able to represent their thoughts and feelings with symbols such as words, images, and language. According to Bandura (1999), symbols do not only drive our thoughts but give our lives meaning, structure, and continuity. The human capacity to develop and use symbols mediates human thought and the cognitive processing of information which occur on social experiences. Symbolism plays a vital part in almost all aspects of the human behavior. First, symbols guide human behavior and enhance the reproduction of observed behavior. Second, symbols enhance communication and problem solving. Third, symbols enable individuals to observe and make sense of social experiences and to create ideas that transcend experiences. Fourth, symbols help people to relate the past with the present and the future, and to anticipate the consequences or outcomes of behavior which eventually leads to the sustenance, modification or change of behavior (Bandura, 1989b, 1999). Therefore, the social cognitive theory perceives symbolism as influencing humans' processing of information especially which events will be observed, the meaning that will be given to the events, and how the information obtained will be organized for future use.

The social cognitive theory sees human's capacity for vicarious learning as a powerful tool for cognitive and social development. Vicarious learning is the process by which people observe others within their social environment to learn or change their behavior. Often people observe others and align their behavior to become like those of the observed individuals. Vicarious learning sometimes provides human with the opportunity to avoid some of the negative consequences of a behavior by watching and learning from others who made terrible mistakes while exhibiting a similar behavior. Synonymous with modeling, the observer watches

a model enact a behavior, learns from it and replicates his or her own behavior to that of the model without learning that behavior. Thus vicarious learning represents a rich and potent process of behavior development (Bandura 1977, 1986).

The social cognitive theory views forethought as an anticipative mechanism that aids the regulation of human motivation and behavior. Forethought influences human behavior by helping people to set goal, plan, and to anticipate the consequences of their actions. Therefore, it is a human capability that provides direction, coherence, and meaning to people's life. Moreover, forethought helps individuals to cognitively represent present experiences, predict future events and use them to direct, modify, or motivate behavior (Bandura, 1989b, 1999).

Central to the social cognitive theory is the concept of self-efficacy. Bandura (2001) believed self-efficacy is the foundation of human agency and that it underlines human capabilities identified in the social cognitive theory. Self-efficacy belief refers to a person's perceived capacity to successfully perform a task or assignment (Bandura, 1986). According to Bandura et al (2001), the role of self-efficacy is very crucial because unless "one has the power to produce desired effects by one's actions, they have little incentive to act or to persevere in the face of difficulties" (p.187).

Self-Efficacy

Coined by Bandura (1977), self-efficacy is an individual's perceived capabilities to successful perform a specific task. Through self-efficacy individuals assess their ability to be successful at specific tasks. Self-efficacy is evaluative or judgmental in nature. Through its role in task performance, self-efficacy plays a crucial role in influencing human behavior. The concept of self-efficacy has been applied to several disciplines; however, in the field of education, it is both a determinant and a mediator of students' achievement (Pajares, 1996). For

example, self-efficacy influences student problem solving abilities, meaningful strategies, self-regulation use, persistence at task, and favorable attitudes towards learning (Bandura, 2005; Fenollar et al., 2007; Pajares, Britner, & Valiante, 2000). Students with higher self-efficacy beliefs tend to "participate more readily, work harder, persist longer when they encounter difficulties, and achieve at a higher level" in comparison to students with lower self-efficacy beliefs (Margolis and McCabes 2004, p. 241).

Contributing to the impact of self-efficacy on performance is the amount of effort and time expended on a task. Usually, individuals who are highly confident or who perceive themselves as capable of solving a problem see effort invested in a problem as valuable input that will probably culminate in success. Similarly, they perceive time dedicated to the task as investment that will yield good results. Therefore, individuals with high self-efficacy are often not afraid to attempt difficult tasks because they believe they have what it takes to successfully complete the task. Individuals with low self-efficacy, in contrast, perceive themselves as incompetent or unable to solve the problem; therefore, they give up when they encounter difficulty or failure on a task (Bandura, 1994).

Self-efficacy theory suggests what is important in task performance is not only an individual's possession of the required skills or capacities for a task but his or her confidence in the ability to be successful at the task (Bandura, 2012). This position was also supported by Schunk (1984) who noted that although self-efficacy operates independently of skills, both are necessary for success. Possession of both ability and self-efficacy beliefs is instrumental to the rate of successful task performance. The lack of prerequisite skills and knowledge does not impact self-efficacy beliefs; rather, self-efficacy influences performance only when the right abilities or skills are in place. Invariably, this assertion explains the differences in the

performances of two individuals who possess the same level of skills or knowledge but different self-efficacy beliefs. An individual with higher self-efficacy is likely to put in more effort, persist at a given task, and not easily give up while another individual, with the same ability but lower self-efficacy, is more likely to exert less effort and easily give up when the task becomes difficult. Therefore, individuals with higher self-efficacy belief often outperform those with lower self-efficacy.

Sources of Self-Efficacy

According to Bandura (1986), four factors impact the development of self-efficacy beliefs: mastery experience, vicarious experiences, verbal persuasion, and physiological or affective arousal. These sources of self-efficacy beliefs are not simply important in themselves but their relevance emanates from the cognitive interpretation of information obtained from them.

Mastery experiences relate to an individual's personal experiences at performing a task. Usually, when a person repeatedly succeeds at a task performance, his or her confidence to perform the same or a similar task increases. Conversely, when a person repeatedly fails at a task, his or her confidence tends to become eroded. Repeated successful completion of a task enhances self-efficacy beliefs, whereas repeated failures do the opposite. Bandura (1997) suggested mastery experience is the most influential source of efficacy information because it provides the most obvious evidence an individual possesses what it takes to be successful at a task.

Another factor impacting the development of self-efficacy development is vicarious experiences. Bandura (1986) believed self-efficacy beliefs are impacted by watching or observing other people's behaviors. Watching others succeed at an assignment may increase

one's confidence to attempt the same or similar tasks while seeing others fail could lower self-efficacy beliefs. Usually this influence occurs through a social comparison and evaluative process in which the observer watches the observed or model to make inferences about his or her behavior. Self-efficacy development is often enhanced when both the observer and the observed are similar to one another and when the observed is an influential person. Therefore, self-efficacy can be developed through interaction with models such as one's peer, teachers, or parents in school or at home.

The feedback or verbal persuasion that people receive when performing a task can also impact self-efficacy beliefs. For example, if an individual receives positive feedback or encouragement while performing a task, his or her self-efficacy beliefs could be positively impacted. The impact is more significant when the observer perceives the information as true and aligning with his or her self-knowledge. Such information enhances self-efficacy because it gives the individual additional confirmation he or she can perform the task. Positive feedback likely leads to increased self-efficacy beliefs about performing specific tasks, whereas negative feedback likely results in lowered self-efficacy.

The physiological or bodily arousal an individual experiences before or during a task performance can also affect self-efficacy development. An individual with high self-efficacy is often unperturbed and calm when about to perform a task. Because the individual possesses what it takes to perform the task, he or she is not afraid and can function optimally when performing the task. Individuals with low self-efficacy perceive themselves as incapable of performing the task, therefore, their bodies generate negative physiological signals leading to feelings of anxiety and distress which ultimately hinders performance and further lowers self-efficacy. Bodily

sensations signal to individuals that they have or do not have what it takes to successfully perform tasks, thereby impacting their self-efficacy development.

Bronfenbrenner Ecological System Theory

The ecological system theory of development (Bronfenbrenner, 1989) provides a conceptual framework to understanding human development. It gives a unique approach to the comprehension of the role of parental involvement in the academic success of students. According to the model, individuals live in environments consisting of different systems which influence behaviors and development. When the interactions among the various systems are positive and healthy, the individual develops normally, but conflicts or dissonance among the systems affect the individual negatively hindering growth and development. Bronfenbrenner (1989) postulated an individual's ecosystem is made up of five systems namely the microsystem, mesosystem, exosystem, macrosystem, and the chronosystem. All these systems exert some direct or indirect influences on the individual's life and significantly impact development.

First among the systems identified in Bronfenbrenner's model is the microsystem consisting of the individual's immediate environment. The microsystem is the most influential system in an individual's life and one in which individuals have the closest contact. For students, it mostly comprises the home and the school. The home or family represents the first contact a person has with the world and is a reliable source of care, love, and support for the individual. The next important microsystem in a student's life is the school. Interactions within an individual's microsystem are bidirectional and often have the greatest impact on the individual's life. For example, interactions within the home, specifically between a parent and a child can significantly affect the child's development. When a child receives love, support, security, and attention from the parents, it positively affects his or her behavior and development. Similarly,

positive interaction with teachers and class mates in the school can greatly impact a student's learning and development.

The second system in Bronfenbrenner's model, the mesosystem, comprises the interrelationships that take place between the different microsystems in an individual's life. Although the microsystems are separate and unique, they do not act independently but are in constant interactions with one another. Basically, the nature of their interconnectedness, whether positive or negative, impacts the growth and development of the individual. Also, occurrences within one microsystem affects the other microsystem and vice versa. For example, an event that occurred at home can affect a student's behavior or performance in school while occurrences within the school environment can influence a child's behavior at home. Specifically, if a student's parents are involved with learning at home, his or her performance in school is likely to be positively impacted; if the school is constantly communicating with parents and collaborating with parents, students are likely to study at home. Therefore, if interactions within the mesosystem are positive, the individual develops properly.

The third system in Bronfenbrenner's ecological system is the exosystem. It represents the external system in an individual's life. The exosystem is so large that although an individual cannot directly influence it, it exerts an indirect effect on the individual. The exosystem's impact emanates from its power to affect other people in an individual's microsystem and to make influence decisions that directly affect those individuals. Examples of exosystem include parents' offices, the school board, local, or state government. For example, if a parent receives a promotion at work that is accompanied with pay raise, the parent might be able to afford additional educational resources for his or her child. Similarly, if a parent's employer allows for

job flexibility like working from home, the parent might be able to spend time saved on commuting to work to be more involved in his or her child's education and life.

The macrosystem, the fourth system in the individual's ecosystem, is very important because it exerts a powerful influence on all the other systems within the ecosystem. The macrosystem includes the beliefs, norms, values, laws, and customs of the society that are often disseminated through the mass and social media, education, and religion. These indirectly impact an individual's development. The macrosystem dictates the beliefs and the behavior of the society at large; therefore, it indirectly influences the individual in a more substantial sense. For example, the norms, beliefs, and values of parents often determine their involvement in their children's education and how far they would go to help their children achieve academic success. Similarly, the beliefs and values of the school would determine the extent to which they reach out to parents and seek their collaboration on students' education.

The fifth and final system within the model is the chronosystem. The chronosystem encompasses the element of time, movement, or change as it influences an individual's systems and ultimately impacts his or her development. Primarily, its focus is on life transitions which could positively or negatively impact an individual's life and development. Based on Bronfenbrenner's model, life transitions can either be normal or abnormal. Examples of normal transition occur when an individual develops through life normally without stressful life events that could have an adverse effect on development. This includes growing up normally as a child, becoming a teenager, getting married, having children, and getting old. In contrast, an abnormal transition could include a loved one becoming terminally sick, experiencing divorce, the death of a loved one, or even bankruptcy. When transitions follow a normal trajectory, the individual functions and develops healthily, but the reverse is the case when transitions are abnormal.

The concept of parental involvement can be well understood from Bronfenbrenner's (1989) model. An interconnection and interrelationship among the two major microsystems in a student's life, the school and the home, substantially impacts an individual. When interactions are constant, positive, and engaging, students develop more positively- motivationally, behaviorally, and academically. However, when the interactions among the two systems are erratic or conflicting, the reverse occurs. Therefore, for parental involvement to be very effective, there must be communication among the home and school microsystems. This involves each microsystem understanding the other and being current on what is happening within the other microsystem. Invariably, this means parents need to be constantly aware of what is happening in school and to be in touch with school events on a daily basis. Likewise, the school must try to reach out to the student's family to better understand the student. Both microsystems must perceive and work with each other as joint partners in ensuring students' academic success.

Similarly, Bronfenbrenner's highlights the role of the community and educational and governmental agencies in parental involvement. Organizations such as the school boards, departments of education, local educational districts, county, state and federal government, and private and public organizations all indirectly impact parental involvement through implemented policies and decisions. These outcomes affect parents and the school systems resulting in a trickle-down effect that impact students' learning and development. Thus the theory opines students' academic achievement or success is dependent upon the systems in the individual's life of which the home and school microsystems and the interconnectedness between them are the most direct and significant.

Parental Involvement

The family, especially the parents, represents the first contact a child has with the world. The family is a reliable source of care, love, and support for individuals not only during the early stages of development but also throughout the entire schooling years**.** Although not all parents can fully support their children academically either due to financial, educational, health, emotional, or other constraints, the desire of most parents is that their children succeed in school.

Parental involvement refers to the different activities in which parents participate to help their children become academically successful. Although there are various ways that parents get involved in their children's lives and education, they primarily occur either at home or in school. Pomerantz, Moorman, and Litwack (2007) classified parental involvement as school- or home-based parental involvement. They defined school-based parental involvement as the practices in which parents engage and which involve making contact with their children's school, while home-based parental involvement are those activities which usually occur at home or outside the school and which are related to their children's educational success. Some types of home based involvement include parental assistance with homework, discussing grades, performance, or academic expectations with students, and engaging children in extracurricular activities like going to the library, museums, or concerts. On the other hand, some examples of school-based parental involvement include volunteering at school events, attending Parent Teacher Association meetings, and representing the school on the educational District Board among others.

Importance of Parental Involvement

The relevance of parental involvement to students' educational success and development has been outlined by quite a number studies (Ho, 2010; 1994; Keith et al 1998; Schunk &

Zimmerman, 2006). Although there are conflicting and inconsistent findings associated with parental involvement studies in literature, Fan and Chen (2001) believed this is largely the result of differences in the operationalization of the construct. Nevertheless, numerous studies have highlighted the enormous benefits of parental involvement not only to students but to the parents and community as well. More so, the benefits have been discovered to transcend elementary and middle school to all educational levels including high school and college (Epstein, 1995; Izzo et al, 1999; Schunk & Zimmerman, 2006).

Parental involvement is positively associated with students' achievement (Jeynes 2005; Sheldon & Epstein, 2005; Sirvani 2007), improved behaviors and school attitude (Domina, 2005; Sheldon & Epstein, 2005; Simon, 2000), higher classroom participation (Simon, 2001), better attitudes (Chrispeels, 1996), reduced absenteeism and dropout rates (Rumberger, 1995; Simon, 2001), higher graduation rates among high school and college students (Bridgeland, Dilulio, & Morison, 2006), student's college enrollment (Catsambis 2001; Perna & Titus 2005), better career choices (Turner et al. 2004), and better academic achievement and performance (Schunk & Zimmerman, 2006) .

Parental Involvement and Academic Achievement

Several research studies have highlighted the benefits of parental involvement to students' achievement, not only in the learning of mathematics but also in other subjects. In particular, parental involvement has been found to lead to increased school participation (Simon, 2001) and better academic achievement and performance (Schunk & Zimmerman, 2006), which culminates in better academic outcomes (Pomerantz & Moorman, 2010; Muller, 1995). Although parental involvement has also been found to be a significant predictor of students' mathematics choices (Turner et al. 2004), there are few studies reporting a negative or non-significant

relationship between parental involvement and students' mathematics achievement (Chowa, Ansong & Osei-Akoto, 2012; El Nokali et al., 2010; Fan, 2001).

A study investigating the effect of parental involvement on students' academic performance was conducted by Khajehpour and Ghazvini (2011). Participants in the study were 200 male participants drawn through a multistage cluster randomized sampling technique from 100 schools in Iran. Assessing different dimensions of parental involvement from self-report questionnaires administered to the participants, the result indicated students whose parents were involved in their children's education had higher grades compared to students whose parents were not very involved.

Marchant et al. (2001) examined the effect of school and family contexts on students' achievement. Participants in the study were 230 fifth and sixth grade students in a middle school whose perceptions of teaching style, parenting style, school atmosphere, and parental involvement were assessed. All of the students' perceptions were found to predict their academic achievement. Thus, the study concluded parental involvement had a significant effect on academic achievement. Furthermore, the study revealed students' motivation and academic achievement were predicted by a combination of parental and school values and emphasized the need for supportive collaborative between the home and the school.

Parental Involvement and Self-Efficacy

When parents are involved in their children's education, they unconsciously transfer the value of education to their children (Coleman, 1988). Parents who are involved in their children's education indirectly communicate the appropriate norms, information, and expectations that education is good, valuable, and that it should be pursued. Therefore, parental

involvement is likely to increase students' self-efficacy or beliefs in their ability to become academically successful.

Friedel, Cortino, Turner, and Midgley (2010) investigated the effect of teachers' and parents' goals on students' mathematics self-efficacy beliefs during their transition to middle school. The study was a longitudinal study that utilized sixth and seventh grade students as participants. Data were collected from students using the cross-classified hierarchical linear model analysis and the findings revealed parental involvement played an important role in students' mathematics self-efficacy development and mathematics achievement. In addition, parental variables such as interest in the child's school work and educational qualification were identified as significant in influencing students' career choices.

In one study, Adeyemo (2005) investigated the impact of parental involvement, interest in schooling, and school environment on the self-efficacy of students. The participants (n = 250 students) had recently secured admission into 20 public schools secondary school in the Southwestern part of Nigeria. The selected secondary schools were drawn by stratified random sampling. The study revealed parental involvement had a significant impact on students' self-efficacy and stressed the need for better home-school partnership.

In a recent research conducted in Taiwan, Kung and Lee (2016) examined students' mathematics self-efficacy to deteremine if it mediated the effect of parental involvement on students' mathematics achievement. The participants were seventh grade students who were drawn from different schools across Central China. Using structural equation modeling method to statistically analyze the data, the authors reported parental involvement had an indirect effect on students' mathematics achievement. Pomerantz and Eaton (2001), in a longitudinal study, examined the processes involved in the socialization of students' achievement. The study

reported parents exert a very significant impact on their children's academic achievement, and that parental support and involvement increases when students are performing poorly and when parents are overtly worried or uncertain about their students' performances. In particular, the study suggested that although parental involvement did not transform low achieving students to high achievers, it led to higher grades.

Parental Involvement Intervention

A review of the literature on parental involvement interventions reveals mixed results on the effectiveness of interventions. Some studies conclude parental involvement interventions are effective and beneficial to students while others indicate otherwise. Acknowledging there are different forms of parental involvement interventions utilized in literature, Nye et al. (2006) and Toomey (1993) suggested parental involvement interventions that involved some form of education and training were most effective for increasing students' achievement compared to those that did not include any form of training and education. Furthermore, the authors stated the minimum length of time for any intervention to be meaningful and substantively effective was four weeks but that the most positive effect of any parental involvement intervention on students' achievement is generally obtainable between 6 and 28 weeks.

Fishel and Ramirez (2005) in a meta-analytic study examined the effectiveness of parents' involvement intervention on students' academic achievement in mathematics or reading skills. Although the study reviewed 24 parental involvement studies that involved one form of intervention or the other, all the studies implemented interventions that included helping children to learn at home and to complete their homework. The participants in the studies were school aged children whose parents had received some interventions to either help their children to complete homework, read, or solve problems at home. The result of the study revealed an

inconclusive finding of the effect of the parental involvement intervention. More specifically, the study indicated there were no clear evidences to conclude the interventions were effective. The inconclusiveness of the findings was attributed to the weak methodologies of the studies such as insufficient data and non-clarity of information collected which inhibited proper data analysis.

Similarly, Berkowitz et al (2015) examined the effect of a parental involvement intervention in a study among early elementary school students. Using over 500 first graders in a randomized study, parents were supported to teach their children mathematics at home using a specially developed iPad application in an intervention that lasted a school year. The participating families were selected from 22 Chicago area schools and 420 children were randomly assigned to the intervention group while 167 were randomly assigned to the control group. Parents in the intervention group practiced mathematics with their children while parents in the control group read to their children using an iPad application. The finding of the study revealed the parental involvement intervention was effective and that it led to a significant increase in the children's mathematics achievement compared to the control group. Also, students in the intervention group whose parents spent more time in using the app recorded higher mathematics achievement than those whose parents spent less time with the app.

In a pilot study using only homework to assess parental involvement, Williams et al (2017) examined the effect of a parental involvement intervention on students' achievement and self-efficacy. The study was conducted in Northwest England using 27 students in Year 5 with ages ranging from 9 to 10 years. All participants were involved in the intervention; therefore, there was no control group. For 8 weeks, students were exposed to an intervention which included using a mathematics homework package that had numerous problem solving activities. Parents were instructed to assist children with the homework by encouraging and reinforcing

their learning but not to teach them. Students were encouraged to share and discuss the strategies they used in solving the homework tasks with other students in their class the following day. The participants were given a mathematics posttest at the end of the intervention. The data were collected using focus group discussions, feedback sheets, and questionnaires which were analyzed qualitatively. Although the result of the study revealed the intervention led to greater level of involvement among the parents, the participants' mathematics learning and self-efficacy were merely sustained and did not significantly increase.

In another study, Ketterlin-Geller et al. (2008) implemented two types of interventions with fifth grade students who were performing poorly in mathematics. The study was aimed at teaching students some fundamental elements of mathematics in order to improve their mathematics achievement. Fifty-two participants were selected across four elementary schools in the US Pacific Northwest. Seventeen (17) of the participants were assigned to the mathematics conceptual group, twenty-seven (27) were assigned to the extended curriculum intervention group, and eight (8) participants were assigned to the control group. The first intervention was focused on using mathematics concepts such as the think-aloud method, whereas the second was centered on giving students extended time to learn the mathematics curriculum. The intervention lasted for 16 weeks and, at the end of the study, students in the two intervention groups performed better on a mathematics test than students in the control group.

In a different study aimed at investigating the effect of a parental intervention on students' mathematics achievement, Svoboda and Destin (2017) utilized a randomized controlled trial with 8th grade middle school students as the participants. Six experienced parents were recruited based on the school's recommendation as facilitators for a parental involvement training intervention. Forty-five parents were recruited as the participants for the study during a

school event. The recruited parents were randomly assigned to the intervention group or to the control group. Parents in the intervention group attended a training session and were given handouts on the discussed topics while parents in the control group were simply involved in a greeting session. During the training, the facilitators presented important academic information on parents' involvement in their children's learning. Also, the training, which lasted for 45 minutes, was focused on helping students think about future opportunities and resolving challenging academic problems. At the end of the study, parents in the intervention group reported a greater likelihood to respond to students' academic problems and have academic discussions with their children in the future than those in the control group. Also, students in the intervention group had significantly higher mathematics grades than those in the control group.

Kiger et al. (2012) in an intervention study examined the effect of a mobile learning intervention on students' mathematics achievement. The participants were third grade students who were selected from a Midwestern elementary school and were assigned to four classrooms. Two of the classrooms consisted of an intervention that involved daily use of Everyday Math and flashcards to learn multiplication while the other two classrooms used Everyday math and a web application on an iPad to learn multiplication. The intervention was implemented for 9 weeks and the findings of the study indicated students in all the four intervention classrooms performed better than the control group in a mathematics multiplication test.

Harackiewicz et al. (2012) conducted a study with 11th grade students to investigate the effect of a theory-based intervention in helping parents communicate the importance of mathematics to their high school-aged children. The participants were 88 girls and 100 boys who were selected across 108 high schools within the state of Wisconsin and who were participants in a longitudinal study. Two brochures of a website that emphasized the importance of STEM

courses were mailed to participants' parents. The brochures outlined information on the importance of STEM courses, how parents can engage their children in conversation connecting STEM courses and living, examples on the relevance of mathematics, and how parents can utilize the information personally in conversation with their children. Parents were engaged in the intervention for the duration of 15 months. At the end of the intervention, students in the intervention group enrolled in more STEM courses over the next two years than those in the control group.

A study by Toney et al. (2003) examined the effect of two types of interventions, parental monitoring and structuring of homework and adolescent self-monitoring and structuring of homework, on middle school students' homework completion. The participants were thirty-seven sixth to eighth grade students comprising 24 boys and 13 girls. The mean age of the participants was 12.06 years. Eligibility for participation in the study was based on having difficulty in completing homework. Using a homework checklist provided by the teachers, parents identified students having difficulty in completing homework. In an intervention that lasted for 6 weeks, the participants were given homework at least 4 times weekly. In one of the intervention group, parents helped to monitor and structure participants' homework while in the other intervention group, the participants monitored and structured the homework themselves. The findings of the study indicated more homework was completed by the students in the two intervention groups than by students in the control group but there was no significant difference between the two interventions in terms of students' mathematics achievement.

Gang and Poche (1982) investigated the effectiveness of reading interventions on the reading skills of elementary school students. The participants were three third grade students identified by their teacher as lagging behind in their grade level reading. The parents were

contacted and attended six training sessions comprising two phases on how to use material presentation and instruction, use of correction, or providing consequences with their children. The first two training sessions in the first phase focused on the need for a good tutoring environment, appropriate tutoring time, and a safe and distraction-free space among others. The second phase of the intervention included four tutoring sessions on how to make corrective responses to students' reading questions. At the end of the study, all the participants recorded higher reading skills in a reading posttest and they were able to sustain the reading gains 11 weeks after the study ended.

In another study, Faires, Nichols, and Rickelman (2000) examined the effect of parental training on the reading skills of elementary school students. The participants were eight first grade students in a school in Southeastern US who were below their grade reading level. The participants' parents were invited to participate in a reading intervention to improve their children's reading skills. Four of the parents who agreed to participate in the study comprised the intervention group while the remaining four parents comprised the control group. Parents in the intervention group attended training on how to use reading strategies with their children at home and spent between 20 to 30 minutes three times weekly implementing the intervention. Parents in the control group did not receive anything. The intervention lasted for 5 weeks after which the participants' reading skills were assessed using an informal reading test. At the end of the study, the participants in the intervention group performed significantly better than those in the control group.

Similarly, Nye et al (2006) in their meta-analytical study examined the effectiveness of parental involvement intervention on students' academic achievement. The study included a review of 19 randomized controlled trials of parental involvement studies. The study concluded

parent involvement intervention programs are impactful in enhancing students' achievement. The study went further to suggest the effect was large enough to have practical educational implications and to provide support for the utilization of parental involvement intervention programs to enhance students' achievement.

The above review of empirical studies reveals an inconsistency of findings in intervention studies. Although the majority of the studies reported that the interventions were effective, a few studies reported interventions were ineffective. Therefore, the current study investigated the effectiveness of a parental involvement intervention that involved supervising students' mathematics learning, communicating with the school, and providing home structure specifically a study place and study schedule on students' mathematics self-efficacy and achievement.

Empirical Studies on Intervention Dimensions

Home Structure

The operational definition of home structure employed in the literature varies across studies. Singh et al. (1995) defined home structure as the amount of discipline parents exerted on their children to complete their homework and to reduce learning distractions such as watching television. Similarly, Keith et al. (1993) referred to home structure as the degree to which the home environment is structured toward learning while Grolnick and Ryan (1989) defined it as the extent to which parents provided clearly stated guidelines for children's learning at home. Wang et al. (2014), operationalized home structure was defined as "the extent to which parents create schedules and guidelines for studying and provide academically enriching materials and events at home" (p. 2156).

Many aspects of home structure such as time spent watching television, scheduling students' homework, and supervising students' learning at home have been found to be directly

impactful on students' achievement. For example, the United States Department of Education (1994) stated that the provision of some form of structure for children's learning at home such as restricting students' watching of television, scheduling, and monitoring of homework was instrumental to improving academic success. Other studies (Clark, 1993; Jeynes, 2007; Keith et al., 1993) also reported similar results corroborating the conclusions that the existence of home structure such as rules for monitoring students' television watching and home supervision was positively correlated with students' academic achievement. In contrast, there have been some contradictory findings on the effect of home structure on students' achievement. Shumow and Miller (2001) in their longitudinal study that involved a national sample of middle school students reported that parents' involvement with students learning at home was negatively correlated with their academic performance, specifically their grade point average (GPA).

Also, studies such as Bembenutty (2006) and Hancox, Milne, and Poulton (2005) found students perform better in school when they had home rules and structure that limited their access to watching television, computer use, and playing games. In contrast, Ponzo (2011) and Livazovic (2010) found family rules and home structure such as routines for watching television and playing computer games were not significantly correlated with students' academic performance.

School-Home communication

One of the ways schools can increase parents' involvement in their children's education is through better and more effective communication. Communication can basically occur in two ways – parents communicating with the school or the school communicating with parents. Some common types of communication between the school and the home include physical contacts, phone calls, text messages and notes, conferences, report cards, progress reports, and newsletters.

However, in many situations, some parents might not know how to establish effective communication with their children's schools. This is particularly so in cultures that view the school as an out-group, making parents reluctant or uncertain about how to initiate communication with teachers and school officials (Araujo, 2009).

Despite the challenges often associated with school-home communication, the literature emphasizes the need for both parents and the school to learn to initiate and sustain effective communication with one another. Also, research reveals students whose parents initiated contacts with their children's schools performed better than students whose parents who made less contact with the schools (Stevenson & Baker, 1987). Singh et al. (1995) in their study revealed communication moderately impacted students' achievement and recommended that school officials should promptly communicate students' academic performances to parents. Also, Wang et al. (2014) reported parents' communication with schools impacted students' achievement resulting higher grade point average and concluded it was very important for parents to communicate with their children's schools. In a related study, Harry (1992) concluded parents from low socioeconomic background rarely got involved in home-school communication but that such communication was instrumental to students' academic success. Likewise, McWayne et al. (2004) suggested parents' communication with their children's school was positively associated with students' cooperation. In contrast, Yan (1999) reported no significant effect of parents' communication with the school on students' academic achievement. Similarly, Fan and William (2010) found parent–school communication was strong negatively correlated with students' engagement.

Parental Supervision

The results of studies that examined the effect of parental supervision on students' academic achievement have also been inconsistent. Although some studies have suggested parental supervision leads to students' academic gains, others have reported the reverse. The results from Fan and Chen's study (2001) indicated parental supervision of students' rules for watching television at home and for doing home and school work had the weakest correlation with students' mathematics achievement. Similarly, Shute et al. (2011) in their study suggested parental home supervision did not have a significant effect on students' academic achievement. However, Catsambis and Beveridge (2001) in a study centered on students from disadvantaged neighborhoods indicated parental supervision had a positive effect on students' mathematics achievement. Clark (1993) noted parental homework support for students such as setting time for home learning had a significant effect on students' mathematics achievement and that parental monitoring of home and school work was positively related with student academic achievement.

CHAPTER THREE

RESEARCH METHODOLOGY

This chapter reviews the methodology employed in this study. Some of the areas discussed include the research design, participants, working definitions, instruments, inclusion/exclusion criteria, intervention, parental involvement training, cultural adaptation, didactic component, intervention training component, intervention integrity, pilot study, data collection method, and scoring of instrument.

Research Design

The study is a quasi-experimental research design that utilizes an intervention and a control group. The study was conducted with participants from two private elementary schools in Southwest Nigeria who were selected based on convenience and the schools' willingness to participate in the study. Students from one of the two schools were included as participants for the intervention group, while students from the other school served as participants for the control group. The participants were not randomly selected from their grade or randomly assigned into the intervention and control groups.

Participants

The participants included in the study were 51 fifth grade students drawn from two private elementary schools in Lagos, Southwestern Nigeria. The participants were between the ages of 9 and 14 years and consisted of 34 female (66.6 %) and 17 male (33.4%). Twenty-one of the participants (41.18%) were in the intervention group and thirty participants (58.82%) were in the control group. The overall mean age of the participants was 10.89 years. There were 9 boys

(42.86%) and 12 girls (57.14%) in the intervention group, and there were 8 boys (26.67%) and girls (73.77%) in the control group. Although several of the parents did not disclose their age, the age range of those who did were between 31 and 55. The majority of the parents were females (52.9%), a smaller percentage were males (35.3%), while some did not indicate their gender (11.8%). I was not permitted by the school principals to collect data on parents' income level but judging by the fact that the schools were located within a middleclass neighborhood in the region and that more than 95% of the parents had attended college, it can be implied that the majority of the participants belonged to the middle socioeconomic class.

Working Definitions

Parental involvement Intervention

Although parental involvement is a multidimensional construct covering different behaviors and practices, for the purpose of this study, the parental involvement intervention provided to parents was in three major areas: home structure, parental supervision of mathematics learning, and school-home communication. The home structure focused on parents providing structure specifically a quiet study area with table and chair and a study schedule for students' learning. Parental supervision was based on parents supervising or monitoring students' mathematics learning at home. The school-home communication dimension entailed school teachers contacting parents about students' mathematics performance and sending reports on weekly mathematics quizzes home for parents to sign.

School-Home communication

This dimension involved the mathematics teachers making contact and communicating with the parents about students' mathematics performance throughout the period of the

intervention. Parents in the intervention group received, signed, and returned weekly report of students' performances in mathematics.

Home Structure

This dimension of parental involvement was focused on parents providing some form of home structure to assist students' learning of mathematics at home. Home structure was measured by parents creating a study schedule and setting up a quiet study place with a table and chair for students to study at home.

Parental Supervision

This dimension was centered on parents supervising or monitoring students' mathematics learning for at least 15 minutes daily.

Students' Mathematics Self-Efficacy

This variable was assessed using participants' perception of their confidence and ability in solving mathematics problems as measured by the adapted Pintrich and DeGroot (1990) self-efficacy measure. It was administered to the students at the end of the study.

Mathematics Achievement

This variable was measured by the participants' scores on pre- and post-intervention mathematics tests.

The outcome variables examined in the study were students' mathematics achievement and parents' perception of involvement, while the independent variables or predictors were the parental involvement intervention dimensions -home structure, school-home communication, parental supervision- and mathematics self-efficacy. Figure 1 depicts the relationship between the parental involvement intervention dimensions, mathematics self-efficacy, parents' perception of involvement, and mathematics achievement, as investigated in the study.

Instruments

Parental Involvement Instrument

The parental involvement measure was parents' self-report of involvement in their children's education. The measure was adapted from Fan (2001), Epstein (1995), and Yan and Lin (2005) studies. The measure had 25 items that tapped into parents' involvement in their children's learning from a multidimensional perspective which included participation in school activities, extracurricular learning, home structure and supervision, school-home communication, and educational aspiration. Items 7, 8, 12 and 21 of the measure were reverse scored. All the items of the measure were structured after the 4-point Likert scale which ranged from strongly agree to strongly disagree.

Based on a factor analysis conducted on the parental involvement measure using the rotated component matrix, five factors or components loaded significantly well on the measure to determine the parental involvement. All the items loaded moderately or highly on the five factors and together the factors accounted for about 51.1% of the variance in parental involvement. The five factors were parents' participation in school activities and programs, school-home and parent-child communication, family rules, structure, and supervision, extracurricular activities, and educational aspiration. The adequate Kaiser-Meyer Olkin measure of sampling value was .626 while the Barlett's test of Sphericity was significant (χ^2 (120) = 420.66, $p < .05$). The parental involvement measure was administered twice to parents in both the intervention and control group; at the beginning and at the end of the study.

Self-Efficacy Instrument

Participants' mathematics self-efficacy was measured using students' self-report on the self-efficacy subscale of Pintrich and DeGroot's (1990) Motivated Strategies for Learning

Questionnaire (MSLQ). Originally designed for college students, the Motivated Strategies for Learning Questionnaire is divided into 2 broad categories namely motivation and learning strategies. Consisting of 81 items, the instrument has 6 subscales on motivation and 9 on learning strategies. The questionnaire is formatted after the 7 point Likert scale with 1 representing "Not at all true of me" and 7 being "Very true of me". The Motivated Strategies for Learning Questionnaire has been extensively used in studies involving elementary, middle and high school students (Artino, 2005). The internal consistencies for the 15 subscales reported in most research studies is above .70. The self-efficacy subscale is one of the subscales under the motivation category and it comprises 8 items which assess students' self-efficacy. The internal consistency reliability (Cronbach Alpha) predictive validity with students' course grade of the self-efficacy subscale is .93 and .41 respectively.

The adapted measure of the MSLQ self-efficacy subscale utilized in the study consists of 9 items which have been widely used by experts across several disciplines based on its good validity score. A review of the literature suggests consistency of the self-efficacy construct with the Nigerian culture; therefore, no additional items were added to the measure. However, to establish the validity of the measure, its linguistic equivalence was examined by checking the items, identifying, and rephrasing ambiguous words to make understanding easy for Nigerian elementary school students. Most importantly, the self-efficacy items were reworded to reflect mathematics self-efficacy. For example, I expect to do very well in this class" was changed to "I expect to do very well in my mathematics class". Also, the 7 point Likert scale format was readjusted to 4 points to remove any difficulty with response especially for younger subjects such as elementary school students (Borgers, Hox & Sikkel, 2004). Similarly, negatively worded items were rephrased to avoid ambiguity and to enhance comprehension. After

implementing the appropriate and outlined changes to the self-efficacy measure, the final version of the adapted mathematics self-efficacy measure was administered to the students at the end of the study.

Mathematics Pretest and Posttest Instrument

The mathematics pre and posttest were criterion reference tests developed by the mathematics teachers in the two schools using the state's mathematics curriculum (see Appendix A). Criterion-referenced tests are tests which assess students' knowledge or mastery of known curricular context against some defined criteria and standards (Howell & Hricko, 2005). The mathematics teachers in the two schools each developed 30 mathematics questions and corresponding grading rubric. Twenty items were used to test students' mathematical knowledge in the mathematics pre and posttest. The participants solved the questions by showing their workings.

To establish Messick's unified concept of validity, the teachers were requested to provide empirical evidence the test items aligned with the curricular content by matching each item against the curricular content. Also, the questions developed by teachers in one of the schools were exchanged among teachers in the other school, and the teachers were asked to indicate if the questions had evidences of content and construct validity. As experts, the teachers were asked to generate empirical evidences that the items aligned with the content of the curriculum thus ensuring evidence of content aspect of construct validity. Specifically, the teachers in both schools agreed the test items were construct-relevant and representative of the content hereby providing evidences of content and construct validity. In addition, the mathematic teachers were asked to indicate their level of agreement with the rubric or scoring structure thereby providing

evidence of structural aspect of validity. The teachers were also in total agreement on the appropriateness of the grading rubric.

To provide evidences of substantive aspect of validity, the mathematics achievement test was given to a group of 4 students from different schools in a pilot study. The students were provided with sheets to show their workings. The participants were not timed on the test but it took them an average of about 50 minutes to answer the questions. Both the questions and the working sheets were collected from the students. An observation of the students solving the mathematics test provided evidence to the meaning and the usefulness of the test. Also, after the finishing the test, I briefly interviewed the students asking them to reflect on the importance and usefulness of the test to them as students. Their responses as well as observed performance provided substantive evidences of the validity of the mathematics achievement measure.

Evidence of the validity of the mathematics achievement test ensured the measure had both value and meaning and that the inferences drawn were valid. Twenty of the sixty generated mathematics test items were used for the mathematics pre and posttest while the remaining 40 items were set apart for the weekly mathematics quizzes given to participants in the intervention group. A higher score on the mathematics measure represented a higher mathematics achievement while a lower score represented a lower mathematics achievement.

Mathematics Quizzes

The mathematics quiz items were selected from the remaining mathematics questions developed by the teachers. Each quiz comprised 5 questions the participants solved for 15 minutes. Participants in the intervention group took 6 quizzes, one for each week of the intervention. Like the math pre and posttests, the participants showed their work on answer

sheets. I administered the mathematics quizzes to the participants in their classes and personally graded them.

Inclusion / Exclusion Criteria

Apart from completing the assent forms, students' eligibility for participating in the study was also dependent on parents' involvement in supervising students' mathematics learning at home, providing home structure, and communicating with students' schools. This eligibility information constituted the inclusion/exclusion criteria and it was measured by five items that parents completed on communication with their children's school, daily supervision of students' mathematics work, and the use of a study schedule and study area with a table and chair for children's learning at home. The minimum and maximum scores obtainable on the criteria are 5 and 25 respectively. For example, one of the criteria item read "Does your child have a regular study place or area for mathematics practice at home? If yes, how often is this place or area used daily?" (see Appendix B).

Parents that reported "yes" to 3 or more items on the inclusion/exclusion criteria and who scored 15 points or more out of the obtainable 25 points were considered as high on the use of the intervention dimensions of home structure, home communication, and parental supervision, therefore, they were excluded from the study. In contrast, students whose parents reported 'no' to the items or "yes" to less than 3 items and who scored less than 15 points in the inclusion/exclusion criteria were allowed to participate in the study. Students' eligibility was also contingent upon parents signing and returning the consent forms.

Intervention

The parental involvement intervention consisted of the intervention and the didactic components. The parental involvement training, a major part of the intervention component was

an education based intervention designed to train parents on appropriate and supportive skills-based activities, materials, and to give information to assist parents with students' mathematics learning at home (Shechter et. al, 2010). The primary goal of the training was to educate parents on the importance of the intervention that included supervising children's mathematics work, creating the appropriate home structure such as a study area and a regular study time for their children, and communicating with the schools on students' mathematics performance. Other goals of the training were to teach parents how to implement the intervention by showing them examples of the intervention and how to use fill the checklist and school-communication reports. The training was delivered to parents using a power point presentation.

Intervention Components

The intervention training consisted of four major components which included the importance of parental involvement to students' academic outcomes, importance of a study area and a regular schedule for study, the need to supervise children's study time, and the need for parents' increased awareness of their children's performance through school-home communication.

Parental Involvement Training

Using the Involvement Schools Parents & You (I-S-P-Y) parental involvement training manual (http://www.pattonsprings.net/files/parents/guide-parental-involvement.pdf) developed in Texas, I crafted the parental involvement training. This training manual developed by the Texas Education Agency is an extensive one used in schools across the United States. The I-S-P-Y training manual contains very detailed information on different aspects of parental involvement such as the benefits, key stakeholders in parent involvement and their responsibilities, collaboration partnerships, parents and teachers, partners for student success,

legislative requirements for parent involvement, parental involvement policy and school-parent compact, family friendly school, school-parent organizations, and an appendix with supplemental materials on bullying, suicide prevention, and Parent Teacher Association.

Canter and Hausner's (1988) Homework without Tears

The second intervention component, importance of a study area and a regular schedule for study, was modeled after Canter and Hausner's (1988) "Homework without Tears" handbook. Canter and Hausner's (1988) homework without tears is a research based program that has been effectively used to help parents and students succeed in the area of homework. Literature shows that parents' interest and involvement with homework is instrumental to children's school success (Cooper, Robinson, & Patall, 2006). Effectively doing homework helps students develop the appropriate skills for academic excellence. Also, through homework students learn to study independently and to complete tasks. Homework has also been associated with students' success in all subject areas and at all educational levels (Canter & Hausner, 1988). Homework helps parents to have day-to-day connection with their children's learning and through involvement in homework parents show their children they are interested in their school work and life.

The homework without tears program does not require parents to teach their children, rather, it aims to guide parents in "establishing a disciplined, supportive learning environment in your home" (Canter & Hausner, 1988, p. 8). The program is divided into segments that include the following: Setting up a study place, getting homework finished on time, getting students do homework themselves, motivating students with praise, motivating students to perform their best, assertively communicating with students, backing up words with action, working with student's teachers, and providing study skills to improve students' performance in school.

According to Canter and Hausner (1988), the purpose of setting up a study place is to create conducive environment for homework. Some of the guidelines in the program for setting up a study place include (a) doing homework in a quiet place with no distraction such television, telephone, or disturbance by family members and (b) having a comfortable well-lit but not necessarily big space with essential supplies and materials needed for homework. Although students' material requirements vary according to grade levels, for the fifth grade students, the required materials are crayons, pens, pencils, markers, pencil sharpeners, erasers, glue, tape, writing paper, construction paper, hole punch, staplers, scissors, paper clips, white out, assignment book, folders for reports, index cards, intermediate dictionary, atlas, thesaurus, almanac, and rubber bands.

The second aspect of Canter and Hausner's (1988) program, getting homework finished on time, was used for the study schedule intervention. The authors stated that getting homework finished on time requires having a regular study schedule which must be preplanned, regular, and scheduled, and which must also a priority for parents and students. The program proposes that the schedule must be placed in a prominent location such as the kitchen wall or refrigerator where everyone can easily see it. Basically, parents' responsibilities for setting homework schedule include creating the schedule, determining the length of the schedule, and posting the schedule where students can see it. Similarly, the guidelines for finishing homework on time vary according to students' grade level, however, for fifth grade students, the program recommended minimum of 15 minutes per schedule with students allowed to determine the schedule's starting time.

The third intervention component was also based on the work of Canter and Hausner (1988). This component emphasized the need for parents to effectively supervise their children's

learning at home, especially in mathematics. The aim of this intervention component was not for parents to teach their children but to assist in supervising or monitoring their children's mathematics learning at home. The program's guidelines for parental supervision also vary based on students' grade level. For example, the program states for fifth grade students, parents must check to see students are doing their work, students may reach out to a friend when help is needed, parents only give help after students have made efforts, and parents teach students study skills which enhance independent work.

Sirvani's (2007) School-Home Communication

The last dimension of the intervention, school-home communication, was modeled after Sirvani's (2007) study that was conducted to investigate the effect of parental involvement on students' mathematics achievement. Specifically the area of parental involvement that Sirvani examined was teachers-parents communication. Using four classes of high school algebra freshmen, two classes were randomly assigned into the experimental group while the remaining two classes were drafted to become the control group. Parents of students in the experimental group received communication from teachers that included monitoring sheet of students' scores and grades. Parents had to sign and return the monitoring sheets of students' performances which they received twice weekly to students' teachers. Parents in the control group did not receive anything. At the end of the study students in the experimental group performed better in mathematics than those in the control group.

Cultural Adaptation

The parental involvement manual is simply a guideline for training and does not have a specific format for delivery. Also, the manual encourages trainers to use the resource information in the way that best meets the need of their audience. Therefore, I adapted the manual for the

current study by focusing the training on the benefits of parental involvement, key stakeholders and their responsibilities, parents' rights and responsibilities, parents and teachers, family friendly school, school-parent compact, and keys to successful partnership. These aspects represent fundamental areas of parental involvement given that the Nigerian society embraced parental involvement within the last few decades. Also, the areas represent basic parental involvement information which are not culturally sensitive and which most schools would want parents to be aware of. For example, the supplementary section on bullying and suicide prevention was avoided because talking about these issues might make parents uncomfortable given that these issues are seldom discussed in public. Also, the section on Parent Teacher Association was expunged because most Nigerian schools, including the two schools in this study, have an active and functioning Parent Teacher Association. Furthermore, I adapted the manual to the current study by linking areas of parental involvement to students' mathematics achievement. I did not use prompts or ask parents direct questions about the strength of their involvement in the school or community, benefits of working with schools, or areas that could be improved upon but rather talked about the benefits of involvement, collaborating with the school, and how it can be achieved.

Aspects of the Homework without tears program utilized in this study were- setting up a study place, getting homework finished on time, and getting students do homework themselves. The setting up a study place and getting homework finished on time aspects were used for the study place and study schedule respectively, while getting students do homework themselves was used for the parental supervision intervention. Canter and Hausner's (1988) guidelines for setting up a study place was used for the current study, however, it was slightly adapted for the Nigerian context. Parents were told not to focus on too much on comfort but encouraged to use

whatever furniture they had available within the house to achieve the goal of setting up study place for their children. Although I emphasized the need for a well-lit environment, participants were allowed to use other means of lighting such as gas light or lantern whenever the electricity goes out. Also, parents were informed to use any part of their house that could best serve as a study place. In addition, parents were told to get pens, pencils, sharpeners, erasers, notebooks, writing paper, and textbooks for their children and also to ensure that the materials were available for students to use within their study area. In Nigeria, these materials represent the minimum resources needed for any substantive learning or studying.

The study schedule was adapted to the Nigerian context by having parents rather than the participants pick the time schedule since the parents needed to be around to ensure adherence to the intervention or to delegate the responsibility to a relative or someone else. All other guidelines such as minimum time duration of 15 minutes and posting the schedule in a location where it could be easily seen by the students were maintained for the study.

For students in the current study, all aspects of the parental supervision program were utilized except that of reaching out to a friend when needing help. This decision was taken because most fifth grade students in Nigerian do not own telephone or have access to one at home. This aspect of the program was not feasible for the students; therefore, it was not included. In addition, a requirement of the Canter and Hausner's (1988) program for students in grades one to three which I implemented for the participants in this study was for parents to remind their children of the schedule time for mathematics learning. I decided to include this aspect of the program because I wanted to ensure participants adhered to the intervention. Parents were also informed to provide supervision by checking to ensure students do their work,

giving help only when students have made effort, and helping students utilize study skills that foster independent work.

The procedure of the school-home communication utilized in Sirvani's study was also used for the current study, however, the only difference was the mathematics task used to obtain students' grades. Whereas Sirvani's study utilized daily homework assignment, test, or examination to obtain students' grades, the current study used students' performances in weekly mathematics quizzes. The choice of weekly mathematics quizzes was used because in Nigeria, school officials do not like releasing students' reports and are more comfortable with researchers obtaining their own assessment of students' performances. Most private schools principals consider students' grades as official and confidential information which should not be disclosed. Parents in the study were also informed of the benefits of better communication between the school and the home especially the need for parents to become aware of their children's performances.

Didactic Components

The didactic components of the intervention included parents' meetings, handouts, performance reports, text messages, and checklists parents received during the intervention. The handout contained the information presented in the training session and also served as reference material for parents to implement the intervention at home. The performance reports were communication notes sent by the teachers to the parents notifying them of their children's performances on weekly mathematics quizzes (see Appendix C). These performance reports were signed by parents and returned to the school. The checklists were weekly documents sent to parents to monitor and implement the intervention (see Appendix D). Also, a student's version of the checklists was given to the students at the end of each week to confirm parents' adherence to

the intervention and to help monitor the intervention. The text messages were weekly reminders sent to parents to use the checklist and to continue the intervention.

Parents at the intervention training were shown some samples of the performance reports and checklists and how to complete them or use them during the study. Also, parents were also informed to expect weekly text messages. The training handouts were given to the parents that attended the training session and were also sent home to parents who were absent from the meeting.

Intervention Training Description

The intervention training occurred a week after the participants had taken the mathematics pretest, precisely the following weekend. The training took place in the school's hall on a Saturday morning to allow parents attend. Earlier in the week, I sent letters to the parents in the intervention group inviting them for the training. I also sent text messages to parents a day before the training to remind them.

On the morning of the training, it started raining very heavily. Despite this, I arrived at the school premises an hour earlier to set up the venue and ensure everything was ready for the training. I was later joined by the school principal and some teachers who helped in getting the hall ready for the meeting and to ensure the presentation devices were working perfectly while we waited for the parents. Although the training was scheduled for 11 am in the morning, only a few parents had shown up by 12:15 pm. The school principal and I decided to start the training at 12:30 pm with the six parents who were in attendance to prevent them from leaving.

First, the registration form was passed to parents to fill their names, email, and telephone information. Next, the principal addressed the parents briefly before calling on me. I thanked the school's management for the opportunity to use their school for the study and training and also

welcomed the parents in attendance. Thereafter, the parents were given the parental involvement questionnaires to complete before I started the training. The first part of the training focused on the intervention components while the second part was used to teach parents on the didactic components of the study and to answer their questions. Overall, the training lasted for about 55 minutes.

Parents were told to set up place a study place and create a study schedule for their children' use immediately when they got home. Parents were also informed that there would be a second meeting where they would fill a second parental involvement questionnaire and have opportunity to be briefly interviewed at the end of the study. I thanked the parents for coming and gave them copies of the handout on their way out. Copies of the training handout and parental involvement questionnaires were sent home to the parents who did not attend the training.

Intervention Integrity

The intervention commenced one week after the training session to allow parents to prepare and get the study schedule, table, and chair for students' learning at home. A few days prior to the beginning of the intervention, I met with the mathematics teachers to remind them of the distribution and collection of the communication reports and checklists from the students. The checklists were sent to parents on Mondays to use for the whole week and they were collected the following week. Similarly, I conducted the mathematics quizzes on Fridays, developed the performance reports over the weekend and sent them to the parents on Monday. The teachers agreed to let me use the classroom for the students' mathematics quizzes. So, at the beginning of each week, parents got new checklists and performance reports and also returned those used the previous week.

One area of the study that was a little challenging was the collection of the checklists and communication reports from parents. Some of the parents did not return the checklists and reports on time while others lost theirs. In addition, some students misplaced the checklists and performance reports that were given to them or those that their parents had signed. Consequently, I had to give new checklists and reports to affected students and parents repeatedly. However I was able to ensure intervention integrity, especially parents' implementation of the intervention at home, using the students' checklists. Using students' checklist proved not only to be effective but useful because I administered them to the students in school and I was able to collect the information immediately thereby leading to no loss of data. In addition, students' responses were more likely to be truthful and less prone to social desirability bias compared to the responses obtained from parents. The checklists were given to the students on Fridays and completed based on the intervention that their parents implemented in the week. The students' checklists both supplemented and confirmed parents' responses.

Pilot Study

Prior to the commencement of the intervention I carried out a pilot study to ensure the mathematics tests were reliable and valid. The mathematics test was administered to four students consisting of 3 female and 1 male students between the ages of 10 and 12 years old. The students were a group of young children living in my neighborhood and who attend my local parish. I obtained the students' assent and parents' consent to take the mathematics test. The venue of the test was one of the reserved rooms within the church's premises and the test was taken after a Sunday worship service. The students were provided with sheets to show their working and asked to identify any ambiguous questions. Although the test was not timed, the average time it took the students to solve the questions was 48.75 minutes.

I conducted a brief cognitive interview with the students in the pilot study after they had completed the test. This guided cognitive interview was to collect important verbal information about the mathematics test (Beatty & Willis, 2007). I probed the participants by asking some direct questions which included the following: Was there any item on the test that you have not been taught in school? Was there any item on the test that you felt was too difficult for you to solve? Was there any item that you think was unclear or confusing? I asked all the questions sequentially allowing enough time for participants' responses before moving to the next question. The participants responded that they were familiar with all the questions in the test and that the different topics had been covered by their mathematics teachers. Also, the participants stated that none of the questions were difficult for them; however, they had forgotten how to solve a few of the questions.

The students identified two questions they perceived were ambiguous. The first question was the third item on the mathematics test which was a problem on finding the Highest Common Factor (HCF) of some numbers. Two of the students could not vividly remember what HCF represented and had asked me for the meaning during the test, so during the interview, one of the students requested that the acronym be written out in full. The item was corrected on the test to read Highest Common Factor instead of HCF to prevent ambiguity. Also, item 13 on the test was a question that asked students to "evaluate" a problem. One student noted the term "Evaluate" was unclear and had asked for its meaning during the test. Therefore, during the interview, another student suggested that "Evaluate" be replaced with "Solve". The remaining students agreed that they preferred "solve" to "evaluate". Although the students did not get all the items on the test correct, they stated they were familiar with the topics covered in the test and felt the

test was a meaningful assessment of their mathematical ability given what they had learned in school.

Therefore, the pilot study provided evidence of substantive aspect of validity via the meaning and usefulness of the test as observed from students' solving the questions. Also it represented a perfect measure of students' mathematical proficiency given that it aligned with the state's mathematics curriculum as reechoed by the pilot students. Two items on the mathematics test were slightly rephrased based on the pilot sample's suggestions. A pilot study of the parental involvement measure and intervention components were not conducted given that the measures had already been used in previous studies and there are detailed and existing information on them.

Data Collection Method

After obtaining the Institutional Review Board (IRB) approval for the study and permission from the Lagos State Universal Basic Education Board (LSUBEB), the governmental agency in charge of primary schools, I contacted eight school principals in Lekki, Southwestern Nigeria, for an introduction and brief discussion of the study. Only two of the school principals permitted me to conduct the study in their schools. For record purposes, the school principals were asked to sign a form indicating that they had given permission for the study to be conducted in their schools. Thereafter, I met and briefed the mathematics teachers in the two schools on the purpose of the study.

Using the state's mathematics curriculum, the teachers in each school developed a mathematics test consisting of 30 questions. The collaborative effort of the teachers in developing the mathematics test ensured uniformity and consistency of grading via the establishment of inter raters' reliability, given that there was more than one mathematics teacher

in the fifth grade. Also, I solicited for the teachers' cooperation in distributing the checklists and participants' performance reports to the parents in the intervention group.

I later met the fifth grade students in the two schools during their morning assembly periods. I introduced myself to the students and explained the purpose of the study to them after which they were given two recruitment sheets, one for themselves and the other for their parents (see Appendix E). Students who indicated interest in participating in the study were asked to fill the assent forms. The number of students who signed the assent forms was 132; 62 in the first school and 70 in the second school. Also, consent forms were sent to parents to sign and return back to the teachers (see Appendix F). The students were informed their participation in the study was partly dependent on their parents signing the forms and returning them to the mathematics teachers.

The parents' recruitment sheets contained information on the purpose of the research, responsibilities of participants and parents, risks and benefits associated with the study as well as my contact details. In addition, each form contained 5 inclusion/exclusion criteria items that elicited information on parents' communication with students' school, supervision of students' mathematics work, and the use of a study area and study schedule for students' learning at home. Parents' responses to the items were used to determine students' eligibility for the study. Parents were told that all information provided in the questionnaire would be treated confidentially.

I returned to the schools after a few days to select participants for the study. Students who had signed and returned the assent forms and whose parents had also signed and returned the consent forms were first selected. Although many students had signed the assent forms, several of them did not return the parental consent forms. Students who met the eligibility condition of scoring less than 15 points on the inclusion/ exclusion criteria were finally selected as

participants for the study. Participants who satisfied the condition in the first school constituted the intervention group while those that met the condition in the second school served as the control group. Overall, 56 participants met the eligibility condition, 23 participants in the intervention group and 33 participants in the control group, however five participants dropped out of the study making for 51 students who participated in the study.

The mathematics pretest was administered at different times to participants in the intervention and control groups. The mathematics pretest took place in the participants' classrooms and they were given plain sheets to show their workings and 50 minutes to complete the test. To prevent any form of test bias, I personally administered the test to the participants and graded the same using the teachers' generated rubric. Given the schools' busy schedule and available periods, it took me four days to finish the administration of the test to participants in the intervention and control groups. Students' performances on the pretest served as a baseline for comparing the intervention and control group and for evaluating the effectiveness of the intervention.

Participants in the intervention group were given letters inviting their parents for parental involvement training in the school the following weekend. Also, I sent text messages during the week to remind the parents about the training. The intervention training took place on the school premises with the school principal, the teachers, and only six parents in attendance. Parents' names, telephone number, and email information were taken and parents were also given the first parental involvement measure to fill. The training lasted for about 55 minutes and parents were given the handout used during the training. The parental involvement measure and handouts were sent to the parents who did not attend the training while only the parental involvement questionnaires were sent to parents in the control group.

Due to time constraints, I sent messages to parents in the intervention group to start the intervention one week after the training. Specifically, parents were reminded to get their children a study place with table and chair at home and to create a study schedule for them. Also, parents were informed to start supervising their children's mathematics learning for at least 15 minutes daily and to maintain school-home communication by signing and returning the weekly reports they would get from the school. Also, the participants in the intervention group took weekly mathematics quizzes and their performance reports were sent to their parents. The first checklists were sent to parents in the intervention group on the Friday prior to the week the intervention started while subsequent checklists were sent on Mondays, the first day of the week. Participants' checklists were marked by the students on Fridays after they had completed the mathematics quizzes. I graded the quizzes over the weekend, prepared the performance reports and gave them to the teachers on Mondays to send to the parents.

The intervention could only be implemented for 6 weeks because schools had lost a week of the semester to two national holidays and the mid-semester break. Also, because the schools were preparing for the end of the school year, there was a time constraint and I could only implement six weeks of the intervention against the original plan of 8 weeks. Consequently, I could not hold the second meeting or conduct interviews with parents as earlier planned. The interview would have provided a deeper and richer understanding of the effect of the intervention for parents and obtained a greater insight into parents' perception of the intervention and the whole study. The mathematics posttest and the self-efficacy measure were administered to all participants in both intervention and control group. The second parental involvement questionnaires were sent home to all the parents to fill and return back to the school. At the end

of the study, all participants and teachers were given customized school bags as compensation for their participation in the study.

Scoring of Instrument

The socio-demographic information provided by the participants in the parental involvement and self-efficacy questionnaire was coded based on the response options given. For example, for gender, male participants were coded ‘1 while female participants were coded ‘2’. Participants’ responses to the parental involvement and mathematics self-efficacy measures were scored based on the 4 point Likert scale format of the measures. Responses to ‘Not true at all’ were given ‘1’ point while ‘Very true’ was rated ‘4’. The two intermediate responses ‘Not very true’ and ‘Sort of true’ were allotted 2 and 3 points respectively. There were no reverse order items on the self-efficacy measure, so, there was no need for a reverse scoring. However, in the parental involvement measure items 7, 8, 12 and 21 were reverse order items that attracted a reverse scoring. A response of ‘very true’ (4) had its scoring reversed to a score of ‘1’ while a response of ‘Not true at all’(1) was allotted a score of ‘4’. For the intermediate responses, Not very true’ was scored as ‘3’ while the response ‘Sort of true’ was given ‘2’ points. Each item on the mathematics achievement posttest carried 5 points.

A higher score on the parental involvement measure represented parents’ higher perception of involvement in student’s learning while a lower score reflected a lower parental involvement. Similarly, students with higher scores on the mathematics self-efficacy measure indicated a higher level of confidence in solving mathematics problems while lower scores indicated the reverse. Similarly, higher scores on the mathematics pre and posttest indicated higher mathematics proficiency and achievement while lower scores suggest lower mathematics achievement.

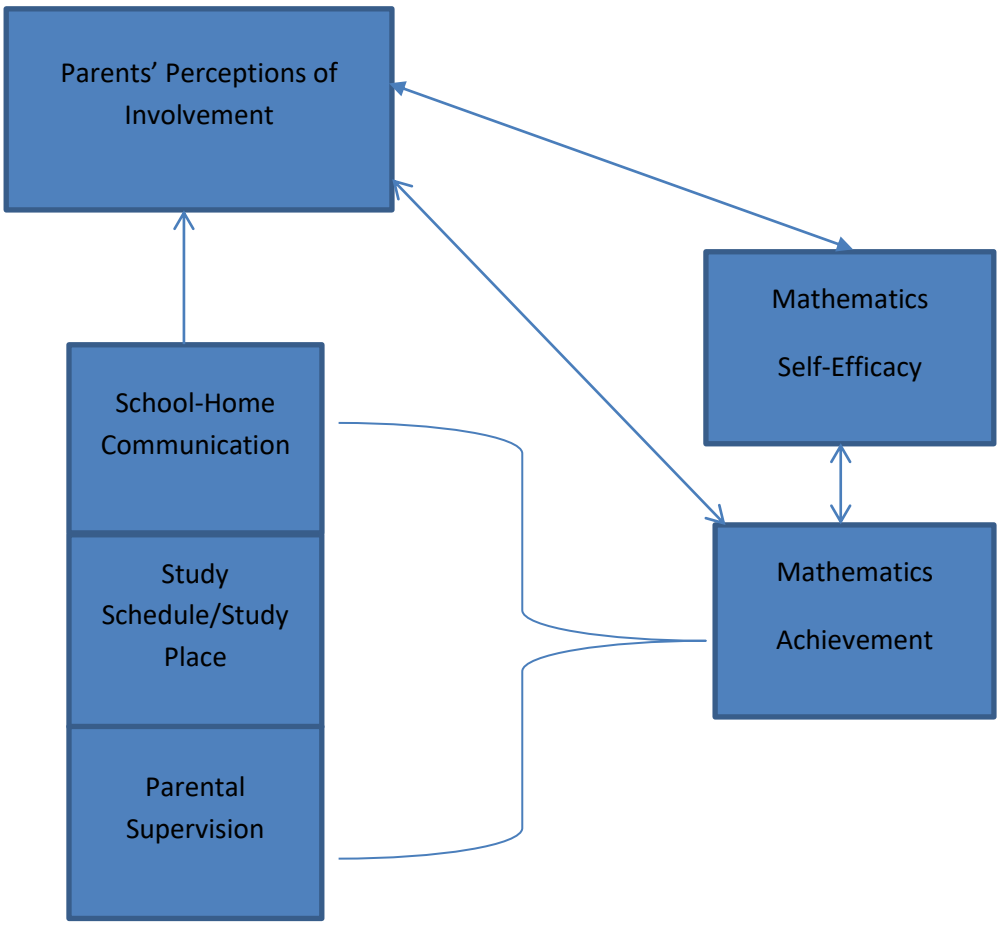

Figure 1. Visual representation of the variables in the intervention study.

CHAPTER FOUR

RESULTS

This chapter describes the results of the collected data and the statistical analyses conducted to test the research hypotheses of the study. The main objective of this study was to examine the effect of a parental involvement intervention on students' mathematics achievement and parents' perception of involvement and to investigate the relationship between parental involvement, mathematics self-efficacy, and achievement. The dependent variables were mathematics achievement and perception of involvement, while dimensions of the parental involvement intervention and mathematics self-efficacy were the independent variables.

The effect of a parental involvement intervention on students' mathematics achievement and parents' perception of involvement in their education was examined. In addition, the relationship between parental involvement and mathematics achievement, parental involvement and mathematics self-efficacy, and mathematics self-efficacy and achievement were investigated. The intervention group was subjected to an intervention treatment which involved parents undergoing parental involvement training, supervising their children's mathematics learning, communicating with children's school, and students using a study area and study schedule for mathematics learning at home. Participants in the control group underwent none of the intervention treatment. Students' scores on the mathematics self-efficacy measure and mathematics test determined their level of mathematics efficacy and achievement respectively, while parents' score on the parental involvement questionnaire determined their perception of involvement. The data collected was utilized in testing the research hypotheses.

The statistical analysis begins with the frequency distribution of some of the students' socio-demographic information. This information included the participants' age, gender and ethnicity as well as the parents' age, gender, occupation, and educational qualification. Tables 1-5 show the frequency distribution of participants' and parents' socio-demographic variables.

Table 1

Participants' Ethnicity frequency distribution

Tribes	*Frequencies*	*Percentage*
Yoruba	15	29.4
Igbo	17	33.3
Edo	4	7.8
Ibibio	2	3.9
Itsekiri	1	2.0
Egbira	1	2.0
Goema	1	2.0
French	1	2.0
Others	1	2.0
No response	7	13.7

Table 2

Participants' Gender frequency distribution

Gender	*Frequencies*	*Percentage*
Male	17	33.4
Female	34	66.7
No response	0	0

Table 3

Parents' Gender frequency distribution

Gender	*Frequencies*	*Percentage*
Male	18	35.3
Female	27	52.9
No response	6	11.0

Table 4

Parents' Age frequency distribution

Age Range	*Frequencies*	*Percentage*
31-35	3	5.9
36-40	12	23.5
41-45	12	23.5
46-50	2	4.0
51-55	1	2
No response	21	41.1

Table 5

Parents' Educational Qualification frequency distribution

Higher education	*Frequencies*	*Percentage*
Universities	44	86.3
Polytechnics	3	5.9
No response	4	7.8

From Table 1, it can be seen that the participants were from different ethnicities, therefore, confirming the diversity of the participants. Table 2 shows that a greater percentage of the participants were females (66.7%) while a smaller percentage were males (33.4%). Also,

Table 3 shows that more mothers (52.9%) were generally involved in the completing the parental involvement questionnaire compared to fathers (35.3%). From this information, it can be assumed that more mothers were involved in the intervention. Similarly, all the parents who attended the intervention training were all women. Table 4 reveals that a large percentage of the parents (41.1%) did not disclose their age. Among the parents who did indicate their age, more than half of them (80%) were between 36 to 45 years. Only 3 (10%) of them were between 31-35 years of age, while 10% were between 46 to 55 years. Majority of the parents had higher education, specifically four-year university education (86.3%), while only few parents had a two-year postsecondary education (5.9%) (see Table 5).

Socioeconomic Status

I could not get data on the parents' income level due to restrictions from the school principals; consequently the socioeconomic status of the participants could not be determined. However, given that the two schools were located in a middle-class residential neighborhood and that most of the parents (92.2%) reported they had some form of university or polytechnic tertiary education (Table 5), it can be assumed that most of the participants belonged to the middle socioeconomic status.

Eligibility/Inclusion Rate

Table 6 below shows that more than 40% of the parents in both schools did not sign or return the parental consent forms. Out of the 62 students who filled the assent forms in the first school, only 36 of them returned the parental consent forms. Only 23 (63.88%) of the students satisfied the inclusion or eligibility criteria qualifying them to be included in the intervention group. Among the 70 students in the second school who signed the assent forms, only 41 of them returned the parental consent forms and only 33 (80.49%) students met the inclusion or

eligibility criteria to become participants for the control group. Overall, only 56 students were eligible to participate in the study. The inclusion or eligibility data further confirms the majority of parents were not very involved in the intervention dimension; did not communicate with their children's school, supervise their mathematics learning and did not have a study place and study schedule for students to use at home.

Table 6

Eligibility frequency distribution

Participants	*Frequencies*		*Percentage*	
	Intervention Group	*Control Group*	*Intervention Group*	*Control Group*
Eligible	23	33	37.10	47.14
Non-eligible	13	8	20.97	11.43
No response	26	29	41.94	41.43

Attrition

Two participants in the intervention group pulled out of the study about mid-way into the study. One of the participants said her parent was no longer interested and did not want to receive the checklist and communication reports again. The participant could not continue with the study and was removed from further participation. The other participant informed me he did not want to continue with the study and wanted to opt out. Also, three students in the control group dropped out of the study before it was concluded. Two of the participants refused to continue participation about three and four weeks into the intervention respectively stating the work was too much and becoming overwhelming for them. The other participant in the control group opted out on the last day of the mathematics posttest saying she did not want to take the test.

Participation Rate

The rate at which parents implemented the intervention varied significantly one from another. From the students' responses to the checklist, it was obvious some parents personally implemented the intervention while others delegated the responsibility. For example, some parents supervised their children's mathematics work, created the study schedule and place as well as communicated with the school by signing the performance reports. Other parents instructed their older children or relatives such as students' uncles and aunts to carry out the intervention on their behalf, especially when they were not available. The use of family members in assisting students' learning at home is common in Nigeria, where people live communally and members of the extended family often live with the family.

Some of the participants, however, were very enthusiastic about the intervention such that when their parents were not forthcoming in implementing the intervention, they did so themselves improvising with what they had. A participant reported that he created his own study schedule when he perceived his parents were not going to do so and he only showed it to his parents for approval. Another participant said that she moved a chair from their dining room into her room to create her own study place after obtaining permission from her parents. Another participant said he took a table and chair from his house to a very quiet place at the back of the house to use as his study area. A couple of other participants also reported they had to invite or remind their parents to monitor their work. Although it was impossible to fully assess the level of parents' participation in the intervention, parents were nevertheless encouraged to implement and continue the intervention through the weekly text messages reminders and checklist they received from me.

Hypotheses Testing

The following hypotheses were tested in the study:

Hypothesis 1:

Participants in the intervention group will have a significantly higher mathematics achievement at posttest than those in the control group.

To determine if the intervention was effective, that is, that participants in the intervention group had a significant higher mathematics achievement in comparison to the control group, a one- way analysis of covariance (ANCOVA) was performed. Analysis of covariance removes any differential effect of age, gender, and grade on the pretest, eliminates the probability of error, and allows variables that may arise later in the study to be included. It also ensures the intervention and control groups are equivalent and comparable (Cone & Foster, 2003). The mathematics pretest of the control and intervention groups was first compared to determine if they were statistically different from each other. This comparison ascertained there were differences between the control and intervention groups in relation to the mathematics pretest. Also, the homogeneity of regression assumption was satisfied, being not significant, indicating the data was normally distributed (F (3, 47) = .133, p = .717, ns). The result of the analysis revealed there was no statistically significant difference between the control and the intervention group with regards to the mathematics pretest. F (1, 49) = .378, p = .541.

The result of the analysis of covariance revealed the mean mathematics posttest of the intervention group (X = 61.19) was higher than that of the control group (X = 53.67) and the difference between the mathematics posttest of the intervention and the control group after controlling for the pretest was statistically significant; (F (1, 48) = 9.855, p = .003). This finding suggests the parental involvement intervention was effective and it led to a statistically

significant difference in the mathematics posttest of the intervention group. In other words, the parental involvement intervention was effective in increasing students' mathematics achievement. No post hoc test analysis was conducted because the independent variable, parental involvement, occurs at only two levels, the intervention and control levels. The partial Eta Squared value which indicates the effect size was .17. When compared with Cohen's *d* guidelines on effect size, it can be seen that the effect size was small. The partial Eta Squared value of .17 implies that about 17 % of the variance in the mathematics achievement is explained or accounted for by the parental involvement intervention.

A graphical illustration of the effect of the parental involvement intervention is also depicted by the scatter plot in Figure 2. Although the figure reveals a linear increase from the pre to the posttest for both groups, the increment is more obvious for the intervention group in comparison to the control group. This illustration indicates the intervention group has a higher pre- to post-mathematics score or performance than the control group. Similarly, Figure 3 indicates the effectiveness of the intervention for the intervention group compared to the control group using a bar chart. While the difference in the mathematics means of the control group from the pre to the posttest is almost the same, there is a clear increase in the mathematics means of the intervention group from the pre to the posttest.

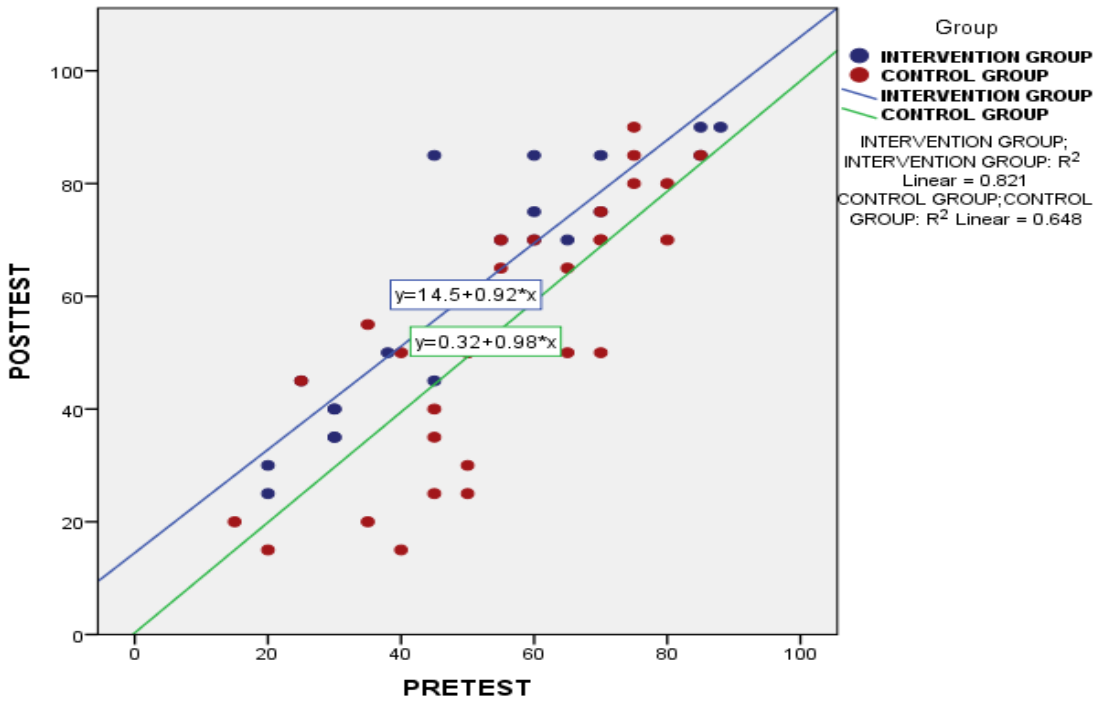

Figure 2: Mathematics pre and posttest for intervention and control group

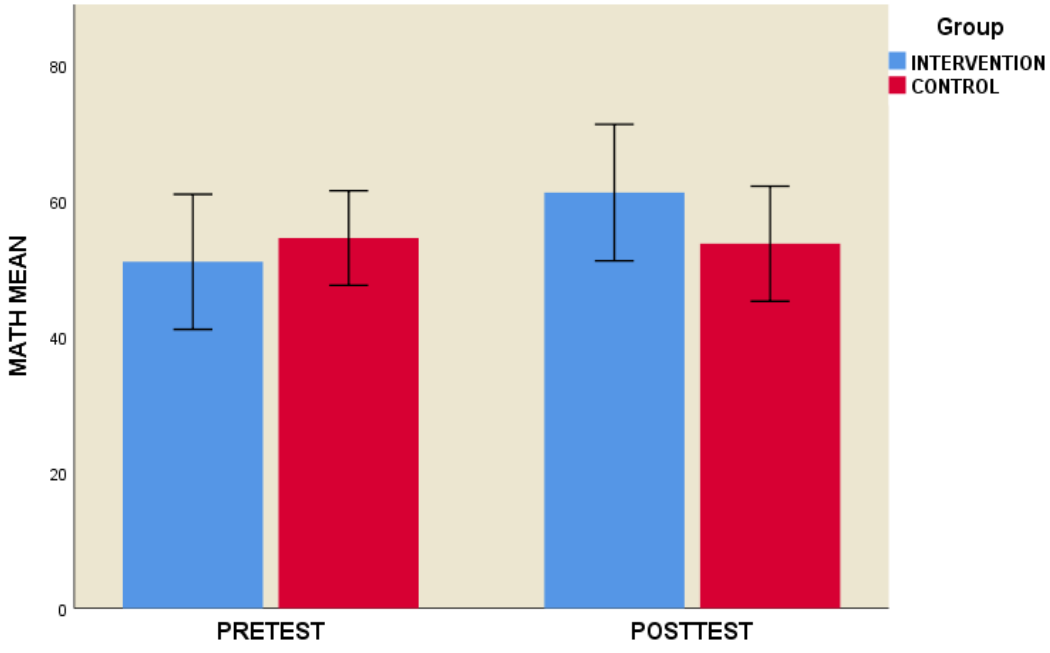

Figure 3: Mathematics means of groups by time

Hypothesis 2:

Parents in the intervention group will have a significantly higher perception of parental involvement at posttest than those in the control group

Similarly, one-way analysis of covariance was conducted to determine if the parental involvement intervention was effective in increasing parent' perception of involvement for the intervention group compared to the control group. The analysis examined if there were differences between the intervention and control groups in terms of parents' involvement in their children's learning after controlling for the first parental involvement measure. As a first step, parents' responses to the first parental involvement measure were compared to find out if the parents in the intervention and control groups were statistically different in terms of their involvement. The result revealed parents in both groups were not statistically different from one another, therefore implying that both groups were comparable and equivalent (F (1, 49) = 1.017, p = .318, ns). Thereafter, the homogeneity of regression assumption analysis was conducted and satisfied with the value not being significant (F (3, 47) = .211, p = .648, ns).

Finally, the analysis of covariance was performed on parents' second involvement measure while controlling for the first parental involvement measure. Although the mean of the intervention group (80.76) was slightly lower than that of the control group (X = 83.20), the analysis of covariance indicated the intervention and the control groups were not significantly different in regards to the parents involvement (F (2, 48) = .163, p = .688, ns). This means the intervention did not significantly increase parents' perception of involvement in their children's learning from the intervention group to the control group. Consequently, no further post hoc analysis was conducted on the result because the independent variable, parental involvement,

occurred at the intervention and control levels. Cohen's *d* effect size was obtained from the partial Eta Squared value which was calculated to be .03 which suggests a very small effect size.

From Figure 4, it can be seen there is little or no difference between the parental involvement means of the intervention and control group from the pre- to the post-parental involvement intervention. This graphical representation indicates that the parental involvement intervention was not effective enough to bring about a significant difference in parents' perception of involvement between the two groups. As can be seen from the bar chart, the pre- and post-parental involvement perceptions across the two groups was almost the same.

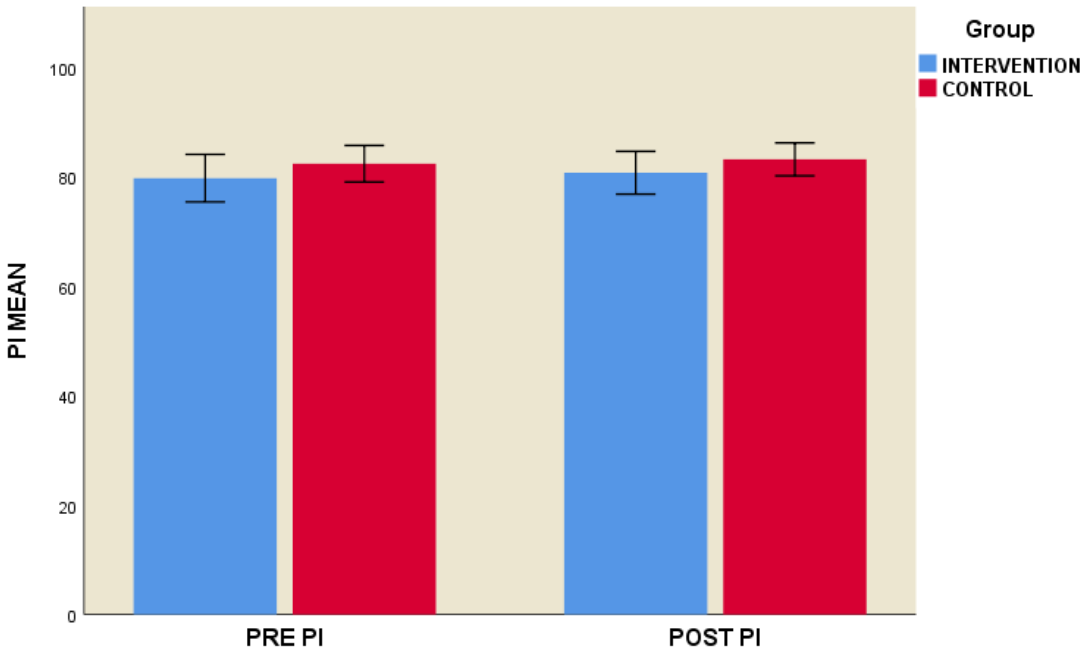

Figure 4: Parental Involvement means of groups by time

Although the intervention was not found to have any effect on parents' perception of involvement, an examination of the effect of the intervention on the different parental involvement dimensions was conducted to determine if the intervention influenced any of them. Based on the factor analysis performed by Akindipe (2015), the parental involvement measure was found to have five main factors. These include school participation, communication, extracurricular activities, home rules, structure and supervision, and educational aspiration. Therefore, the effect of the intervention on these sub-dimensions of parental involvement was investigated.

First, one-way analysis of covariance was performed to determine if there was an effect of the intervention on the school participation dimension of the parental involvement measure. As usual, one-way analysis of covariance first tested the assumptions of normality of data and the homogeneity of regression. Both were found to be non-significant. Specifically, both the intervention and control groups were found to be non-significant ((F (1, 49) = .305, p = .583) and ((F (3, 47) =.242, p = .625). Similarly, the Levene's test of equality of error variances value was not significant, p = .886. Finally the control and intervention group were examined to determine if there was a significant difference between the means. The mean of the intervention and control groups on school participation were 10.24 and 10.03 respectively, however, the difference between them was not statistically significant (F (2, 48)) = .529, p = .470). In conclusion, the intervention did not significantly impact parents' perception of school participation involvement.

Likewise, a one-way analysis of variance was conducted to test the effect of the intervention on the communication dimension of the parental involvement measure. An analysis of normality and homogeneity of regression assumptions were carried out on the dimension to determine if the intervention and the control groups were similar and comparable on this

dimension. The result of the assumption tests revealed both the intervention and control groups were comparable (F (1, 49) = .291, p = .592; F (3, 47) = 1.60, p = .212). The Levene's test of equality of error variances was also not significant, p = .767. The result of the one-way analysis of covariance showed that although the mean of the intervention (X = 19.67) and control (X =19.53) groups on communication were slightly different, the difference was not large enough to be statistically significant (F (2, 48) = .615, p = .437). The partial eta squared value was .013 indicative of a very small effect size.

A one-way analysis of covariance was also carried out to find out the effect of the intervention on the extracurricular activities dimension of the parents' involvement. The test of the normality and homogeneity of regression assumptions was satisfied indicating the intervention and the control groups were similar and comparable on extracurricular activities (F (1, 49) = .418, p = .521; F (3, 47) = .488, p =.488). Levene's test probability value was .782 meeting the condition for the analysis of covariance. The extracurricular activities mean of the intervention group (X = 6.10) was very close to that of the control group (X = 6.43). However, the analysis of covariance indicated there was no statistically significant difference between the two groups pertaining to parents' involvement in extracurricular activities. The partial eta squared was .012 suggesting a very small effect size.

To find out if there was any effect of the intervention on the home rules, structure, and supervision dimension of the parental involvement measure, a one-way analysis of covariance was likewise conducted. Levene's test of variance (p = .160) and analysis of covariance's assumptions of normality and homogeneity of regression (F (1, 49) = .029, p = .865; F (3, 47) = .601, p = .442) were all satisfied. The analysis of covariance indicated the mean of the intervention group was slightly lower than the control group but there was no statistical

difference between them (F (2, 48) = 1.52, p = .224). This result implies that the intervention was not effective in leading to a higher parents' perception of involvement in home structure and supervision for the intervention group as against the control group.

The effect of the intervention on the final dimension of the intervention, educational aspiration, was similarly tested with one-way analysis of covariance. To proceed with the analysis, the assumption of normality and homogeneity of regression were performed. The result of the assumption tests revealed the conditions of the assumptions were met (F (1, 49) = .34, p = .560; F (3,47) =.209, p = .650). The Levene's test of equality of variance was not significant at p = .836 thereby satisfying the analysis of covariance assumption. The analysis of covariance result indicated there was no statistical difference between the mean of the intervention and control group on the educational aspiration dimension of parental involvement. This finding indicates the intervention was not effective in increasing parents' involvement on educational aspiration.

Hypothesis 3:

There will be a significantly positive relationship between parental involvement and students' mathematics achievement.

To investigate if there was a positive significant relationship between parental involvement and students' mathematics achievement, a Pearson product-moment correlation analysis was performed. Participants' scores on the mathematics test were used as a measure of their mathematics achievement while parents' responses on the parental involvement questionnaire were used as a measure of their parental involvement. The result of the analysis indicated there was no significant relationship between parental involvement and students' mathematics achievements (r = .058, n = 51, p = .688). This means that increase in parental

involvement is not associated with increase in students' mathematics achievement. To calculate the effect size, the Pearson product-moment r coefficient was squared and this produced the value of .003, indicative of a very small effect size.

Hypothesis 4:

There will be a significant positive relationship between students' mathematics self-efficacy and mathematic achievement.

A Pearson product-moment correlation analysis was conducted to investigate if there was a significant positive relationship between students' mathematics self-efficacy and mathematics achievement. The result of the analysis revealed a significant and high positive relationship between the two variables (r = .683, n = 51, p < .000). Therefore, an increase in students' mathematics self-efficacy was correlated with increase in students' mathematics achievement. To get an estimate of the effect size, the r coefficient was squared thereby obtaining the value of .466, a moderate effect size. This means about 50 % of the variance in students' mathematics achievement was accounted for by students' mathematics self-efficacy.

Hypothesis 5:

There will be a significant positive relationship between parental involvement and students' mathematics self-efficacy.

Similarly a Pearson product-moment correlation was carried out to investigate if there was a significant positive relationship between parental involvement and students' mathematics self-efficacy. Parental involvement was measured using the mean of parents' responses to the parental involvement measure while students' mathematics self-efficacy was assessed by students' score on the mathematics self-efficacy measure. The result of the analysis indicated there was no significant relationship between parental involvement and students' mathematics

self-efficacy (r = .208, n = 51, p = .142). An increase in parental involvement was not associated with increase in students' mathematics self-efficacy. To calculate the effect size, the Pearson product-moment r coefficient was squared and this produced the value of .043, indicative of a very small effect size.

CHAPTER FIVE

SUMMARY, DISCUSSION AND CONCLUSION

Discussion of Findings

The effect of educational intervention programs on students' academic achievement have been examined by several studies. Although some interventions have been reported to have no direct impact on students' learning or achievement (Berkowitz et al. 2015; Ketterlin-Geller et al. 2008), several studies report interventions have been successful in improving students achievement (Fishel & Ramirez, 2005). More importantly, the benefits of parental involvement interventions have not only also resulted in positive behavioral outcomes but have also impacted students' mathematics achievement (Toney et al. 2003; Kiger et al., 2012).

Despite research studies recommending increased parental involvement in students' learning, the majority of the existing intervention studies have focused more on students' rather than parents' interventions. While many students receive interventions to improve performance or achievement, parents seldom receive interventions to improve their involvement in their children's learning. This study, therefore, provided a parental involvement intervention to parents targeting home structure, school-home communication, and supervision of children's learning at home and examined the effect of the intervention on parents' perception of involvement and the mathematics achievement of students. The intervention which also included a training session lasted for six weeks. At the end of the study, the intervention group was compared with the control group which did not receive the intervention.

Summary of Results

The frequency distribution data on the eligibility of the participants reveals that 63.88% of the intervention and 80.49% of control groups qualified to be included in the study. This percentage implies more than half of the parents who signed the consent forms were not effectively involved in supervising their children's learning, did not communicate with their children's school and did not have a study place or schedule for their children to use at home. Similarly, only 26% of parents attended the training supporting the claim that parents' involvement in their children's learning needs to be enhanced. This finding further confirms Akindipe's (2015) conclusion that many parents are interested in their children's education but might not have the corresponding practices or home structure to help their children succeed. Also, it supports Chowa, Ansong, and Osei-Akoto's (2012) conclusions that many parents do not directly help their children with their learning at home.

The results of this study revealed that mothers were more involved in helping their children with learning than fathers. More mothers (52.9%) filled the parental involvement measure than father (35.3%) and all of the six parents who attended the parental involvement training were women. This finding is consistent with the culture of the Nigerian society where mothers take care of the home, the children, and oversee their educational needs, while fathers provide for the family. Similarly, the finding aligns with the study of Chowa, Ansong, and Osei-Akoto (2012) conducted in Ghana, an African country, which reported that mothers were more involved in their children's education than fathers.

Hypothesis 1: Participants in the intervention group will have a significantly higher mathematics achievement at posttest than those in the control group.

The result of the one-way analysis of covariance performed on the data to determine the effectiveness of the parental involvement intervention on students' mathematics achievement was significant. The mathematics achievement of the participants in the intervention group was significantly higher than those of the control group. The finding suggests the parental involvement intervention was effective in improving the mathematics achievement of the participants in the intervention group in comparison to those of the control group.

Hypothesis 2: Parents in the intervention group will have a significantly higher perception of involvement at posttest than those in the control group

The result of the one-way covariance analysis found there was no significant difference between the involvement of parents in the intervention and control groups at the end of intervention. This finding indicates the intervention did not have significant effect on parents' perception of involvement in their children's learning. In addition, the one-way analysis of covariance that was performed on the five dimensions of parental involvement to determine if the intervention was effective on any of the dimensions. The results proved to be non-significant. In other words, the intervention did not have a significant effect on parents' school participation, communication, extracurricular activities, home rules, structure, and supervision, and educational aspiration. Although parents in the intervention group were involved in the specific dimensions of involvement on which the intervention focused, that is, they provided a study place, study schedule and supervision for their children's learning of mathematics, the finding suggests there was no intervention effect to other dimensions of parental involvement beyond the scope of the intervention used in this study.

Hypothesis 3: There will be a significantly positive relationship between parental involvement and students' mathematics achievement.

The result of the Pearson product moment correlation analysis conducted to examine the relationship between parental involvement and students' mathematics achievement was not significant. This finding implies an increase in parents' level of involvement was not associated with an increase in students' mathematics achievement.

Hypothesis 4: There will be a significant positive relationship between students' mathematics self-efficacy and mathematic achievement.

The result of the Pearson product moment correlation analysis performed to investigate the relationship between students' mathematics self-efficacy and mathematics achievement was statistically significant. This result suggests that increments in students' mathematics self-efficacy was directly associated with higher mathematics achievement.

Hypothesis 5: There will be a significant positive relationship between parental involvement and students' mathematics self-efficacy.

The result of the Pearson product-moment correlation that tested if there was a significant positive relationship between parental involvement and students' mathematics self-efficacy was not significant. This result indicates that an increase in the level of parental involvement was not associated with higher students' mathematics self-efficacy.

Educational Implications

Hypothesis 1: The overall result from the research revealed the parental involvement intervention was effective in significantly increasing the students' mathematics achievement. Even though the intervention was implemented for only six weeks, this finding indicates the intervention dimensions of communication, parental supervision, and the provision of home structure such as a place to learn and study schedule was instrumental to students' mathematics achievement. This finding suggests the provision of home structure might have unconsciously

informed the students that home learning was important. Also, the findings imply students need some organization and parental supervision to keep them focused and to motivate them to learn mathematics at home. This result supports Akindipe's (2015) conclusions that several Nigerian parents do not have the appropriate practices or structure at home to support their children's learning. This result, however, contradicts the Catsambis' (1998) finding which reported many parents have the necessary home structure and have rules for their children's learning at home.

Also, the school's involvement in this study might have motivated the students to treat the intervention as very important. As reported by Araujo (2009), students and parents from collectivistic countries such as Nigeria see school teachers and officials as authority figures to be revered and obeyed. Therefore, it is likely the students were motivated to adhere to the intervention because they wanted to please their teachers. Also, it is likely some of the students pressured their parents to implement the intervention or improvised by taking tables and chairs from their dining spaces to their rooms for studying because they did not want to face the wrath of their teachers at school.

Similarly, the fact that parents and the school were involved in the study likely informed the students of the collaboration between their parents and the school, showing students both systems were interested in their mathematics success thereby motivating them to take learning mathematics seriously. One significant educational implication of this finding is the need for more effective collaboration between parents and the school. When students recognize the existence of meaningful collaboration between their homes and schools, their motivation can be heightened and achievement can increased. This result further confirms Bronfenbrenner's (1989) assertion that the school and the home are the most important systems in students' life need and they need to work collaboratively for effective students' learning and positive behavioral and

academic outcomes. Although the findings did not indicate which of the intervention dimensions was most effective in impacting students' mathematics achievement, which was not part of the scope of the study, it does reveal that all dimensions of the intervention were collectively effective in increasing students' mathematics achievement.

Another significant finding from this study was that students played a very crucial role in the implementation of the intervention. Although the intervention was planned and expected to be completely parent-oriented, however, the intervention did not work as expected. The findings showed students were a significant source of parents' engagement and influenced the process of intervention implementation through the improvisation of available resources or pressure on parents to adhere to the intervention. Thus, the implementation of the intervention appeared to be the result of combined parents and students' effort and suggests that students should be more actively involved in all parental involvement training, educational activities, and programs targeted at parents. Future studies on parental involvement intervention might need to give students information on how to implement or modify interventions at home.

Hypothesis 2: The result of the second hypothesis suggests that although parents in the intervention group were involved in the specific dimension of providing parental supervision, home structure for students' mathematics learning, and communicating with the school, they were not more significantly involved in the other dimensions of involvement assessed by the parental involvement measure. This outcome suggests parents were only focused on the intervention dimensions utilized in the study and the intervention had no effect on other dimensions of parental involvement. Also, this finding indicates parents in the intervention group probably only worked on the intervention areas – supervision, home-school communication, and home structure – expected of them.

This result reveals parents might need more training and awareness about the importance of their involvement in their children's education. Specifically, parental involvement training should be a continuous and extensive process rather than a one-shot approach as conducted in the study. Moreover, continuous awareness and training on parental involvement might be necessary because the Nigerian society has become more industrialized and expensive in recent times and many parents are saddled with numerous financial responsibilities. There is a higher clamor for better and higher standards of living and because the government has not lived up to expectation in providing the basic amenities such as water, electricity and education, people have to work extra hard to provide such services for themselves. The average cost of living has increased leading parents to work longer hours and making more mothers to join the labor force to earn more money to support their families. Therefore, many parents are not effectively involved in their children's education. More parental involvement awareness and training is needed to constantly remind parents of their obligation towards their children's learning.

Naturally, it would be assumed the six weeks of parents' involvement in their students' mathematics learning should have an effect on parents' perception of parental involvement. However, the result of this study indicates otherwise suggesting that the duration of the intervention might not have been sufficient in bringing about a significant change in parents' involvement beliefs and behaviors given that it probably takes longer time to change individuals' beliefs about things and issues. Therefore, future studies should attempt to examine the reason for this result; such studies might consider longer intervention duration, between three and six months, to examine if the result will lead to a change in parental involvement perception.

Hypothesis 3: The finding that there was no significant positive relationship between parental involvement and mathematics achievement was unexpected but not altogether

surprising. This is because there are numerous parental involvement studies with conflicting results on the effects or the association between parental involvement and students' achievement. While some of them highlight the positive relationship between parental involvement and students' mathematics achievement (Fan & Williams, 2010; Gonzalez-DeHass et al., 2005; Marchant et al., 2001; Cheung & Pomerantz, 2012), others have reported that there is no relationship between the two variables (Chowa, Ansong & Osei-Akoto, 2012; 2006; Fan, 2001).

One plausible reason for no positive relationship between parental involvement and students' mathematics achievement might be that many parents are involved in other activities in trying to survive which makes it difficult for them to be effectively involved in their children's education. Oftentimes, parents only become involved in their children's education when the students are not performing well or are failing in school (Izzo et. al, 1995). Therefore, such a situation might lead to a negative correlation between parental involvement and students' academic achievement. This finding may be particularly so in the Nigeria society where many parents are saddled with numerous responsibilities of providing their own social amenities such as security, water, electricity, and housing. Also, parents do not want to be seen by the school authorities or teachers as intrusive, so they seldom visit or are involved in school activities, making many parents less likely to be involved in school-based involvement practices. In addition, parents often think that their involvement or constant visit to the school might be misconstrued as teachers or school authorities being incompetent (Araujo, 2009; Colombo, 2006). Therefore, parents avoid going to the school or being involved in school-based activities except in extreme cases where their children are failing in school or exhibiting disruptive classroom behaviors.

Hypothesis 4: The finding that students' mathematics self-efficacy had a positive significant relationship with their mathematics achievement aligns with several studies on self-efficacy. For example, Pajares and Miller (1994), Pajares and Kranzler (1995), Pajares and Miller (1994), and Kitsantas, Cheema, and Ware, (2011) found self-efficacy was positively correlated with students' mathematics achievement. In fact, several studies have also pinpointed the crucial role of self-efficacy in achievement, often indicating that self-efficacy, above other factors such as ability and previous experience was the most significant predictor of students' mathematics achievement.

This finding while confirming the positive relationship between the two variables also suggests self-efficacy is very important for Nigerian students. Furthermore, it suggests that if significant improvement must take place in students' mathematics achievement, mathematics teachers, administrators, and policy makers must develop strategies to help improve student' mathematics self-efficacy.

Hypothesis 5: The finding that there was no significant positive relationship between parental involvement and students' mathematics self-efficacy was also not expected. This finding establishes that there was no association between parents' involvement in students' learning of mathematics and students' mathematic self-efficacy. It is probable that it takes a longer period of time to change individuals' belief system. Therefore, it is likely a longer duration of intervention might be necessary to see significant changes in students' mathematics beliefs beyond the six weeks employed in this study. This result conflicts with the findings of Marchant, Paulson, and Rothlisberg (2001) who reported that parental involvement in students' learning led to higher academic self-efficacy. The finding however is consistent with that of Fan (2001) and El Nokali

et al. (2010) who reported that parental involvement is not significantly correlated with students' self-efficacy.

Limitations of the Study

One of the limitations of the study was the length of the intervention which was only for six weeks. Although Nye et al. (2012) asserts that the minimum duration to see the effect of any intervention was four weeks; the time constraint of six weeks did not permit me to implement the intervention for a longer period and to conduct an intervention follow-up on parents' perception of involvement and students' mathematics achievement. Therefore, further studies should test the effect of a longer and extended intervention on students' mathematics achievement, parents' perception of involvement, and other dimensions of parental involvement.

Another limitation of the study concerns the intervention integrity feedback report that was received from the parents as well as the participants in the intervention group. There was no way to determine if the parental supervision intervention was based on the duration of the supervision or on the quality of the supervision. One other limitation of this study was that the study was carried out in two private elementary schools in Lagos, Southwestern Nigeria. It would be interesting to find out if a replication of the study in other parts of the region or country especially those involving a more socioeconomic diverse population would yield different findings.

A different limitation that emerged as a result of time constraint was my inability to conduct an interview with the parents as originally planned. This limitation affected the strength of the study to provide triangulation of data. I hope that future studies might be able to fill this gap and possibly produce interesting findings. Furthermore, one of the limitations of the study was the few parents that attended the training session. It is possible this limitation of many

parents not attending the training might have affected parents' initial engagement and also the outcome of the study. Future intervention studies could ensure more parents attend training sessions by planning trainings to coincide with schools' open day or organizing lunch receptions for parents. Furthermore, teachers could motivate parents to become more involved through implicit support such as showing parents that they care about collaboration with them and specially inviting them to visit the schools. Finally, the study did not examine which of the parental involvement intervention dimensions was most effective. The study did not isolate any of the intervention dimensions; parental supervision, home-school communication, study place or study schedule, therefore, it could not pinpoint which of the intervention dimensions was more instrumental in impacting students' mathematics achievement. However, because this was not the scope of the study, future studies might want to investigate these dimensions to find out which of them contributes more to students' mathematics achievement.

Also, the study could not examine the effect of the parental involvement intervention on students' mathematics self-efficacy basically because only one measure of self-efficacy was conducted in this study rather than a pre and post self-efficacy measure. Similarly, given that there was no effect of the intervention on parental involvement, it is uncertain if the parents will continue to implement the intervention in the long term or if it will fade away. Therefore, other studies might need to conduct a follow-up to find out if there will be a long term effect of the intervention and if participants and parents sustain the intervention. Finally, the study was not able to examine the effects of socio-economic status on the intervention dimensions, students' self-efficacy beliefs, and academic achievement because I was restrained from collecting this information. However, future studies might need to use a more diverse student population to examine the effect of socioeconomic status.

Conclusions

In spite of the above stated limitations, this study contributes significantly to the existing literature on parental involvement interventions because there are few studies investigating the effectiveness of parental involvement interventions. In addition, few studies have been conducted on parental involvement interventions using schools or a school district in a developing country. Also, most of the existing parental involvement studies in the literature are correlational studies rather than intervention programs. Above all, the study reveals that an intervention targeting parental supervision, school-home communication, and home structure and which included a training session was effective in increasing students' mathematics achievement. Students in the intervention group performed better in mathematics compared to those in the control group. In addition, although the study did not involve a post-intervention effect, the six weeks was long enough to witness changes in the students' and parents' behaviors regarding involvement and to reflect an increment in students' mathematics achievement.

Specifically the study revealed parental involvement intervention in the areas of home structure, school-home communication, and parental supervision in mathematics learning led to significant increase in students' mathematics achievement. In particular, the findings suggest communication with the school, home supervision, and home structure is critical to improving students' academic performance, especially in mathematics. Although the study does not identify the corresponding levels of importance of the intervention dimensions, we can assume all three dimensions are paramount to improving students' mathematics achievement. Future studies might want to investigate the varying impact of these dimensions.

The finding of this study has several implications for school administrators, educators, parents, and education policy makers. One important finding of the study was that the

intervention and training led to improvement in students' mathematics achievement. Because several students lacked the structure and appropriate environment for learning at home, there is a need to assist parents with creating the home structure or practices that can significantly motivate their children towards academic excellence not only in mathematics but in other subjects.

Collaboration between the school and the home is very critical to students' learning and achievement. The roles that the school and home play in the life of students is very important, thus both are inevitable to a child's development and educational success. There must be a growing awareness and advocacy for interdependence among the two systems for students' academic success (Bronfenbrenner 1979). Though unique and distinct, each systems cannot work or be effective without the other. In other words, for the school to be successful, it needs the help and support of the parents. Likewise for the parents to be successful with helping their children academically, they need the assistance of the school.

Recommendations

To this effect, the following are some of the recommendations from the findings of this study. First, there is the need for more parental involvement awareness and training for parents. Because the most common form of school involvement for Nigerian parents is the Parent Teacher Association (PTA) (Chowa, Ansong & Osei-Akoto, 2012), school authorities should take advantage of this forum to create more awareness of parental involvement and to plan different involvement training for parents. The more awareness parents have, the more they will recognize the need for their involvement.

Also, the government and schools should develop educational programs to encourage more collaborative and strategic efforts between the school and parents. This may not only enhance mathematics learning and increase mathematics achievement but may improve learning

in all content areas. The more parents are involved in their children's mathematics learning at home, the more students will value mathematics as an important content area and pursue learning it.

In addition, parents need some form of assistance with the organization of students' learning at home especially regarding home structure and the use of study place and study schedule for students' learning at home. The governments, school administrators, and the community should train parents on establishing home structure, supervision, and communication with the school. Efforts should be made to help parents create a study place and study schedule for their children. School officials should create study schedule templates parents can adapt and disseminate them to parents. Similarly, parents from low socioeconomic class should be taught to improvise or provided with cheap furniture for students' use. Also, school authorities should initiate and encourage communicating regularly with the parents. This communication initiative should be considered a project to be spearheaded and sustained by school officials. Even if school officials are not getting the expected response from parents, they should not give up but continue with the initiative. Because it takes effort and time to change people's beliefs, school officials should continue to train parents and provide them with more opportunities for involvement.

Furthermore, the government should mandate private schools to should set aside some fund for enhancing school-home communication. This money can be used to make newsletters, telephone calls, send text messages, and communicate with parents. Similarly, the government should provide some fund for public schools to carry out effective school-home communication. This initiative will lead to better collaboration between the school and the family in the long run and will yield positive outcomes for the school, students, and their families.

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APPENDIX A

MATHEMATICS PRE/POSTTEST Grade 5

Instruction: Dear student, please answer all questions as best as you can and show your workings on the sheet provided.

1. If 5 mangoes cost N140 and 4 oranges cost N24, find the cost of 3 mangoes and 5 oranges.
2. Write in words: 5,370,894.
3. Find the Highest Common Factor (HCF) of 168 and 189.
4. What is the product of 137 and 29?
5. Subtract:

	Hr	Min	Sec
	3	15	0
	1	45	15

6. If a school begins at 8.15 am and closes at 2.05 p.m. For how many hours and minutes are the pupils in school each day?
7. Simplify ½ + $^{1}/_{3}$ – ¼ - $^{1}/_{6}$
8. What is the simple interest on N5,000 for 4 months at 1 ½ percent per annum?
9. John travelled at a speed of 20km/h for 30 minutes. How far did he travel?
10. Simplify 3 ¼ + $1^{1}/_{5}$ – 2 $^{13}/_{20}$
11. **Add** 2.04 + 0.78 + 23.1 + 0.6
12. If the area of a square is 169cm^2, calculate its perimeter.
13. Solve the following: 1,055 – 99 + 187
14. Chike travelled 360 km at an average speed of 80 km an hour. How long did the journey take him?
15. Express 360 as a percentage of 500.
16. A lesson which takes 1 hour 45 minutes starts at 10:35 a.m. What time does the lesson ends?
17. The area of a rectangular block is 135 cm^2 and the length is 15cm. Find the breadth.
18. If W +13 = 47, what is the value of W?
19. How many minutes are there in 2 ½ hours?
20. Write in figures: One million, twenty thousand and seventeen.

APPENDIX B

PARTICIPANTS' ELIGIBILITY/INCLUSION CRITERIA

<table>
<tr><td colspan="6">1.Do you supervise your child's studying math at home?</td></tr>
<tr><td rowspan="2">No_____</td><td colspan="5">Yes _____ . If yes, how often?</td></tr>
<tr><td>Always (5)</td><td>Nearly always (4)</td><td>Often (3)</td><td>Rarely (2)</td><td>Hardly ever (1)</td></tr>
<tr><td colspan="6">2. Does your child has a regular time for learning math at home?</td></tr>
<tr><td rowspan="2">No _____</td><td colspan="5">Yes _____ . If yes, how often is this time used?</td></tr>
<tr><td>Always (5)</td><td>Nearly always (4)</td><td>Often (3)</td><td>Rarely (2)</td><td>Hardly ever (1)</td></tr>
<tr><td colspan="6">3. Does your child have a study area or place at home?</td></tr>
<tr><td rowspan="2">No _____</td><td colspan="5">Yes _____ . If yes, how often is this area or place used daily?</td></tr>
<tr><td>Always (5)</td><td>Nearly always (4)</td><td>Often (3)</td><td>Rarely (2)</td><td>Hardly ever (1)</td></tr>
<tr><td colspan="6">4. How often do you communicate with your child's teacher or school about issues relating to your child's performance in math?</td></tr>
<tr><td colspan="2">Always (5)</td><td>Nearly always (4)</td><td>Often (3)</td><td>Rarely (2)</td><td>Hardly ever (1)</td></tr>
<tr><td colspan="6">5. How often does your child's teacher or school communicate with you concerning your child's performance in math?</td></tr>
<tr><td colspan="2">Always (5)</td><td>Nearly always (4)</td><td>Often (3)</td><td>Rarely (2)</td><td>Hardly ever (1)</td></tr>
</table>

APPENDIX C

Mathematics Quiz Performance Report
Participant: _____
Total Obtainable Score: _____
Student's Score: _____
Areas of Difficulty a. _____ b. _____ c. _____ d. _____ e. _____
Parent's Signature _____ Date _____ Researcher's Signature _____ Date _____

APPENDIX D

Parents' Intervention Checklist	
Monday	____ Used the regular study time today? Total minutes spent _____ ____ Used the study area today? ____ Provided supervision for your child's math learning today? Total minutes spent ____
Tuesday	____ Used the regular study time today? Total minutes spent _____ ____ Used the study area today? ____ Provided supervision for your child's math learning today? Total minutes spent ____
Wednesday	____ Used the regular study time today? Total minutes spent _____ ____ Used the study area today? ____ Provided supervision for your child's math learning today? Total minutes spent ____
Thursday	____ Used the regular study time today? Total minutes spent _____ ____ Used the study area today? ____ Provided supervision for your child's math learning today? Total minutes spent ____
Friday	____ Used the regular study time today? Total minutes spent _____ ____ Used the study area today? ____ Provided supervision for your child's math learning today? Total minutes spent ____
Saturday	____ Used the regular study time today? Total minutes spent _____ ____ Used the study area today? ____ Provided supervision for your child's math learning today? Total minutes spent ____
Sunday	____ Used the regular study time today? Total minutes spent _____ ____ Used the study area today? ____ Provided supervision for your child's math learning today? Total minutes spent ____

APPENDIX E

RECRUITMENT SHEET

PARTICIAPTE IN A MATHEMATICS STUDY

Do you love math or find it difficult? Would you like to do better in math?

Take part in a 6 weeks parent and child study that aims to find out how parents' involvement in helping their children with math at home can improve children's math performance.

Participants:

5th grade elementary school students and their parents

What you will do?

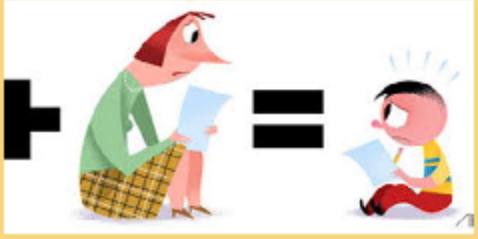
Students: Practice mathematics at home daily using a study schedule within a study area equipped with table and chair, take mathematics test at the beginning and end of the study, weekly mathematics quizzes, and complete a mathematics self-efficacy survey.

Parents: Attend 1 hour training session (weekends and weekdays can be arranged), create a study schedule and area for students' learning, supervise students' daily mathematics practice, sign weekly math report, complete weekly checklist and fill a parental involvement survey.

Benefits

The study may help parents to be more involved with their children's learning of math and may also provide information on how supporting parents' involvement of children's math learning at home may lead to better performance.

Childcare and light refreshment will be provided at the training session.
Students will receive school bags for participation



For questions or more information, please contact

Olutola Akindipe
olutolaakindipe@yahoo.com
08023138456 or 08178550058

APPENDIX F

PARENTS/GUARDIANS' CONSENT FORM

Dear Parents/Guardian,

My name is Olutola Akindipe and I am a doctoral student of Educational Psychology at the University of Georgia, United States. I am carrying out a study on 'Investigating the effect of parental involvement on students' mathematics self-efficacy and mathematics achievement: An intervention approach**'.** The main purpose of this study is to find out how increasing parents' involvement in their children' mathematics learning at home may help students to perform better in mathematics which will be assessed by a survey.

Your child's school has been selected as one of the schools to be used in our research and we are looking for parents who can participate with their children in the study. You and your child's participation, if selected, will be voluntary. You and your child can refuse to participate. Your decision about whether or not to participate will have no bearing on your relationship with the school or your child's grades in class. If you allow your child to take part in the study, he/she will take a math pretest and posttest and fill a self-efficacy survey. He/she will need about 15 minutes to fill the survey and 40 minutes for the math pretest and posttest. As a parent participant, all you will need to do is to fill a parental involvement survey at the beginning and end of the study. This will only take about 10 minutes to fill.

All the information will be treated confidentially and no information will be provided to anyone who is not a member of our research team unless required by law. All information provided will be stored in a safe place and destroyed after the study. On completion, the report of the study will be shared with the Lagos State Government for the enactment of better educational policies, however, neither your name nor child's name will not be mentioned in any report.

The primary investigator in this study is Dr. Louis Castenell of the Department of Educational Psychology, University of Georgia. His email address is lcastene@uga.edu. If you have questions or need information about the study, you may contact Olutola Akindipe at aolutola@uga.edu or on 07053811411 / 08023138456. For questions or concerns regarding your rights as a research participant in this study, you may contact the Institutional Review Board (IRB) Chairperson at 706.542.3199 or irb@uga.edu.

Kindly sign this form if you and your child are willing to take part in the study. Your signature means that you have read and understood all the information.
Thank you for your cooperation.

Child's Name ……

Parent's Name ……. Signature …….. Date ……..

Researcher's Name……... Signature …….. Date …….

Please sign and return to the researcher.