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Workshop training to facilitate parental involvement in their children's mathematics education: parents' perceptions

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ABSTRACT

This study investigated the effectiveness of workshops on parental involvement in their children's mathematical education. The study employed a quasi-experimental with a pre-test-post-test design. This study involved 76 parents from one senior secondary school in the Kweneng Region, Botswana. The study included three steps for data analysis: thematic content analysis, hypothesis testing, and descriptive statistical analysis. The results showed that the parental involvement level before and after the intervention marked a difference with a significant increase. Parental involvement variables such as parenting style, parental expectations, home rules, parental supervision, communication between parents and children, children's home mathematics activities, and parental attitude toward school all improved significantly. The findings further indicated that parental involvement in their child's general and mathematical learning can be improved. As a result, the study recommended that all basic education schools reach out to parents through parent education programs that can assist parents in understanding the value of being active in their children's mathematics education, which will probably affect their education performance positively.

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1. INTRODUCTION

As a fundamental subject, mathematics emphasizes the importance of employing instructional methods that encourage students to solve real-life issues by using techniques, reflecting on them, and self-regulating their behavior to face challenges. Although learners are expected to act independently while studying mathematics, their behavior is usually influenced by their teachers' strategies and parent's involvement. The premise of the current study is that we could improve student results by igniting students' excitement for mathematics by encouraging parents to get involved in their children's education.

Today, nearly every educator agrees that parental involvement is significant to their children's performance in school. Parental influence on their children's educational experiences and outcomes is significant [1], [2]. According to Young *et al.* [3], parental involvement refers to the various acts that parents and other carers take to boost their child's development and academic performance at home, school, and in the community. A vast body of research has found that parental involvement is critical for their children's academic, social-emotional, and behavioural outcomes [4], [5]. Experts, politicians, and educators agree that parents play an important role in their children's learning and development [6]. Lunenburg and Ornstein [7] found that parental involvement in school promotes children's learning and development.

Over the last few decades, the belief that parental involvement improves children's academic success has gained acceptance and appeal. As a result, increasing parental engagement has been a key component of many educational endeavours and changes around the world, particularly in the United States and the United Kingdom [8]. In the case of Botswana, encouraging parental involvement has also been a prominent aspect of educational policy and planning. The Botswana Ministry of Education undertook many initiatives to increase parental involvement in various educational processes. One such initiative is the "Adopt-A-School Programme," which brought together educators, parents, and community members [9]. Furthermore, the Revised National Policy on Education (RNPE) gave legitimacy to Parents and Teachers Associations (PTAs). The PTA emphasised the need to involve the community, particularly parents, in decision-making over their children's education. The policy's declared goal was to "improve school and community partnership in the development of education" [10]. According to this concept, PTAs were formed to help schools establish good relationships with the communities and parents they serve, ensuring parental involvement in their children's education. However, these initiatives were not detailed in terms of how parents were to be involved or how they were to be motivated.

Considering this, researchers contend that the educational reforms that led to parental engagement in the majority of Botswana's public schools were partial. The reforms were implemented at a period when the majority of teachers, parents, and other caregivers lacked the knowledge, abilities, and technology required to manage the abovementioned reforms [11]. As a result, in order to effectively educate stakeholders about parental involvement in their children's education, a school's turnaround strategy must incorporate training. Parents who are made aware of the vital role that their meaningful involvement plays in that process can help ensure that their children reach their academic potential. The current study aimed to determine how parents saw their own involvement and contribution to their children's mathematical development. An intervention approach was developed to change parents' attitudes towards their role in assisting their children's maths education.

The intervention took the form of workshops, with the purpose of equipping parents with the knowledge and resources they required to create learning environments at home that encourage both general and mathematical learning. Furthermore, the intervention aimed to empower parents with information and skills that would facilitate a homeschool partnership that could improve students' mathematics learning. The specific aims of the intervention were: i) to emphasize the importance of good communication between home and school; ii) to foster and strengthen relationships that serve as a model for how to assist their children with mathematics; iii) to underline the necessity of having a rich learning environment that fosters a positive mentality and allows for improvement in mathematics learning; and iv) to emphasize the importance of parental expectations for their children's mathematics education.

The following research questions were posed. Considering the complex and broad scope of the research questions, sub-questions are employed to clarify and provide a more specific direction for each question.

a. What is the influence of parental workshops on establishing a home mathematics environment from the perspective of parents?
- From the perspective of parents, what effect do parenting workshops have on increasing parental academic expectations?
- From the perspective of the parents, what effect do parenting workshops have on encouraging parent-child relationships and mathematics activities?
- From the perspective of the parents, what effect do parental workshops have on encouraging the provision of learning resources?

b. What is the impact of parental workshops on creating good home-school partnerships for learning mathematics at a public senior high school, from the perspective of parents?
- What effect do parental workshops have on encouraging successful communication between home and school, according to parents?

2. LITERATURE REVIEW

Parental involvement is said to improve students' learning, particularly in the area of strengthening their mathematics skills [12]. Gonzalez [13], for instance, discovered that children with parents who are actively involved in their education have greater levels of academic achievement and engagement in the four main areas of science, math, social studies, and English. In a similar vein, Chiu and Xihua [14] found a connection between an increase in at-home learning activities and the availability of learning resources, such as books and discussions about common knowledge. Fan and Williams [15] also discovered a positive relationship between parents' participation in extracurricular activities such as sports and their children's self-efficacy in mathematics, as well as later performance. In addition to emphasising the importance of family

involvement in academic attainment, Hornby and Witte [16] suggested that educators utilise creative and situation-specific strategies to encourage parental involvement.

Furthermore, research indicates that parents who assist their children with their homework enhance the students' academic achievement. According to Patall *et al.* [17], establishing guidelines for homework has a significant impact on performance. According to these researchers, parental involvement in homework encouraged adolescents to practice self-regulation and increased the likelihood that assignments would be completed. However, research shows that parents' participation can sometimes go too far and harm pupils. According to Patall *et al.* [17], parental participation that does not stem from a child's request can be viewed as parental control and thus have a negative impact. In a similar vein, Toren [18] claims that excessive parental participation may put pressure on the child, leading to the child expressing disapproval.

These factors have been shown to affect students' academic achievement in a number of subject areas, including mathematics. On the other hand, the concept of parental involvement implies that there are several ways in which parents might be involved. There are a number of advantages to this that might be applicable at different times and at different intensities, in addition to negative effects. This necessitates further research to reveal the right benefits of parental participation in one's situation or strategies to maximize the benefits, such as in Botswana's public secondary schools, in the researchers' context.

2.1. Home environment

Another important effect is how the involvement of parents affects their children's learning in the home environment. Reading and mathematics achievement has been proven to be significantly influenced by the home learning environment [12]. Vygotsky's theory suggests that a child's social environment has a substantial impact on their intelligence level [19]. Therefore, parental involvement in their children's education is critical. Numerous research has shown a correlation between parents' home literacy surroundings and their children's reading achievement, which supports this claim [20]. According to Walberg and Paik [21], the home environment has a significant impact on what children learn in and outside of school. The activities children and their parents do together to improve mathematical development and accomplishment make up the home mathematics environment. These encompass and address the academic expectations of parents, learning materials, mathematics-related activities, and parent-child relationships.

Subject grades, the highest level of education a student can attain, and school attendance are important measures of parental expectations and are frequently used as a reliable predictor of how well parents expect their child to succeed in school in the future. Several research have shown a positive correlation between academic performance and this parental participation trait [22], [23]. Lee and Bowen [24] investigated the degree and impacts of five distinct forms of parental involvement at home and at school. They found that the most important predictor of academic performance, especially in reading and mathematics, was the parent's educational expectations for their children. Based on school standardised test results, Jacobs and Harvey [25] found a relationship between parents' expectations for their children's academic performance and the overall accomplishment level of the high school student who was attending. The results showed that parents of children in high-achieving schools were more expectant than parents of children in medium- or low-achieving schools. This alone shows how important it is to raise awareness of the influence that parents' expectations for their children's academic achievement have and how effective it is to take steps to improve in this area.

According to Claro *et al.* [26], having a variety of study resources at home can help to foster academic interests and stimulate learning among children. For example, Fuglestad [27] stated that a home environment that allows the use of technology is one in which it is understood that technology may improve mathematics learning. According to Adesina [28] one approach to obtaining quality education is to not underestimate the significance of technology. Consequently, many studies have demonstrated the benefits of utilizing technology [29]. Caygill and Kirkham [30] conducted a study to determine the association between school environmental characteristics and home education resources and mathematics achievement. The study's findings revealed that children who had a calculator, a computer, and an internet connection performed better in mathematics.

One of the key components of a child's growth is their social connection with peers and family. In terms of learning, Vygotsky [31] used the expression "zone of proximal development" to describe the stage in development at which a child can successfully accomplish a certain activity only in the presence of other knowledgeable others. This period determines the child's potential for collaboration. There is a vast amount of research supporting the benefits of a parent-child relationship. Suparmi *et al.* [32] discovered that collaboration between parents and children on child-related topics, experiences, and aspirations, as well as academic challenges at school, was required to increase students' creativity. Creative thinking comprises the ability to develop original ideas, different ideas, and many ideas, and the ability to notice details. Children exhibit better academic attention when their parents maintain a cheerful, polite, and responsive tone during shared studying activities [33]. The reviewed literature clearly states that parental involvement can make the

home environment favourable to learning. Students' academic performance in several disciplines, including mathematics, is found to be positively benefited when such parental involvement is effective. The question then becomes whether parents are sufficiently empowered to understand their parental involvement role in creating a suitable home environment that will positively affect students' academic success.

One element of parental involvement is involvement at the school [34], [35]. Participating in class meetings, interacting with teachers, and volunteering for school functions are examples of activities that fall under the category of "school-based involvement". Having an effective relationship between parents and teachers is one method to implement these activities effectively [36]. The advantages of home-school relationships have been demonstrated by several studies. Epstein [37] claims that successful home-school interactions boost children's motivation to learn. According to Bull *et al.* [38], parental involvement in decision-making and fast, two-way communication between the school and parents are important factors in developing a robust, functional, and long-lasting home-school partnership.

2.2. Home-school communication

Home-school communication is one type of parental involvement that is required for successful homeschool partnerships. Schools and parents frequently employ a range of communication tools to encourage parental involvement in their children's education. This can include sending out progress reports, providing parents with the teacher's contact information, or hosting workshops to encourage greater family involvement. According to Galindo and Sheldon [39], communication has a positive impact on attendance, academic performance, and family participation. In Ghana, the class average performance of elementary school students improved from 68% to 79% as a result of parental involvement with enhanced home-school communication [40]. The author claims that most students were inspired to work harder and achieve better grades because parents talked to teachers about their children's academic progress. Additionally, research revealed several significant elements that serve as barriers to effectively homeschool communication. According to Hornby and Lafaele [41], parents will be less motivated if they believe the school personnel does not value and require their participation. Parents' negative attitudes towards teachers and school requests for parental involvement in their children's education are due in part to a lack of information and communication between the home and the school [42]. Technology-related hurdles may arise when communication methods become more technology-focused. As a result, creating effective communication channels that allow for the sharing of crucial information will be crucial to creating and maintaining meaningful involvement by parents.

Governments around the world are implementing several measures to improve the delivery of educational services. Increased parental involvement in schools is one strategy for decentralising educational decision-making. The theory behind decentralising decision-making in education is that increased teacher, parent, or community involvement in school choices will result in higher student academic achievement [7]. According to research on parental participation in educational decision-making, both student behavior and performance are directly impacted by family involvement [43]–[45]. Nonetheless, Cakir's study's findings [46] made clear how important it is to recognise that parental involvement in decision-making processes needs to be increased because it is currently insufficient. It is necessary to make parents more aware of their role in decision-making [47]. Argon and Kıyıcı [47] suggest that to increase parental involvement in the educational process, conferences, seminars, and textual and visual communications should be used.

3. THE PRESENT STUDY

Many theories of child development, notably Vygotsky's [31], emphasise how much parents can help their children learn. For instance, when it comes to educational and instructional opportunities, parents are frequently the children's first and most significant influence. Furthermore, according to Vygotsky [31], parents have a unique opportunity to introduce their children to evolving educational trends, such as the use of technology, and to scaffold their learning as they develop knowledge and abilities. This study investigated the impact of providing parents with evidence-based workshops applicable to modern contexts (home learning environments and home-school partnerships). This was done because parental support is critical for children's academic success and there are several established ways for increasing academic achievement. Three seminars were offered to parents to assist them in identifying opportunities in their daily lives to further their awareness of how to enhance the home learning environment and the home-school partnership.

4. METHODOLOGY

The current study employed a quasi-experimental design with a mixed-methods approach. The parents participated in either the experimental or control groups. The study was divided into three main

phases: i) the collection of pre-test data ii) the implementation of the intervention programme and iii) the collection of the post-test data, a month following the intervention. With an emphasis on the home learning environment and home-school communication elements, two instruments were created and utilised in the first phase to: i) determine parental involvement in their children's education and degrees of parental involvement in their children's mathematics learning; and ii) to gather baseline data to assess the parents' workshop intervention's effectiveness.

To establish the status quo at the beginning of the investigation, the data from these two instruments were crucial. The study's final step required administering post-tests to gauge the intervention's effectiveness, while the study's second part involved putting the intervention programme into practice. In addition, the last stage involved compiling data regarding parents' perceptions of parental involvement in their children's mathematics education as well as their experiences with the intervention.

4.1. Participants

The population of focus of this study was form 5 double science students who lived outside school and with their parents in a senior secondary school, in the Kweneng Region, Botswana. Double science students are students who are classified as low achievers in mathematics and science in a senior secondary school. Purposive sampling was used to select parents of double science form 5-day students. A total of 80 parents were sampled (68 females and 12 males). Four parents were eliminated from the study because they were unable to attend the training sessions due to personal reasons. As a result, 76 parents-38 from the control group and 38 from the experimental group-participated in the study. The proportion of male and female parents was the same in both groups.

4.2. Instruments

Two instruments were used to assess and establish parents' attitudes toward their involvement in their children's mathematical education. The first instrument was a parent pre-and post-questionnaire constructed with questions that followed a 4-likert scale. To find out how involved the parents were in their children's education, a survey questionnaire was given to them. This was carried out both before and after the intervention. An interview with parents served as the second instrument to have a better understanding of the intervention's success.

4.3. Procedure

The whole procedure involved parents of one senior secondary school in Botswana. Firstly, the researchers had a meeting with the school management team to present them with the aims of the study. The researchers directed the training session. The intervention's execution involved three workshops with a two-hour duration each.

A PowerPoint presentation was utilized to engage the parents in the first workshop. The presentation included details about the programme's goal and what we intended for the three workshops to accomplish. The discussion included details about parental involvement in education and its value for students' academic performance. In addition to the presentation, the facilitators led an interactive session to address parents' involvement in their children's general education and mathematics. A significant portion of the talk focused on different parenting styles and how they may affect children's academic ability.

The main subjects of discussion of the second workshop included parent-child connections, at-home math activities, and parents' expectations for their children's mathematics education. The presentation, like the first session, was informed by the literature. The discussion covered ideas for improving parent-child interactions at home. Among the suggestions were doing mathematics homework together and eating supper together. Parents who participated in the session were offered strategies for being more involved in their children's academic work, particularly in activities such as supervising math assignments and practicing mathematics questions.

Two other aspects were also covered in the last workshop. The first item covered was the provision of learning resources at home, which included technology, textbooks, the internet, revision books, and study papers. By enhancing the home environment, the study hoped to identify more practical means by which parents could support their children's aspirations towards learning mathematics. The final session covered various communication styles and the need of efficient two-way communication between the home and the school for children's learning.

4.4. Data analysis

Two steps of analysis were involved in the study data analysis. For quantitative data analysis, the researchers used descriptive statistics to calculate the mean, standard deviation, and hypothesis tests. To examine qualitative data from interview questions, the researchers used the thematic content analysis technique.

5. RESULTS

5.1. Quantitative results

A homogeneity test was used to determine the comparability of the specific variables of parental involvement included in this study. An independent sample t-test was employed to see whether there was a difference between the groups. Table 1 shows the mean scores, standard deviation, and t-values.

Table 1. Parents' pre-test scores in control and experimental groups

Group	N	Mean	Standard deviation	Df	T	P
Experimental	38	2.1809	0.20373			
Control group	38	2.1765	0.20967	74	0.092	0.927

The experimental parents' pre-test results (mean = 2.1809, standard deviation = 0.20373) were comparable to the control group's parents (mean = 2.1765, standard deviation = 0.20967). The results revealed that there was no statistically significant difference in the homogeneity test between the experimental and control groups of parents ($t(74) = 0.092$; $p = 0.927$). Because the p-value was larger than 0.05, these findings show that the two groups' parental involvement in their children's general and mathematics education was comparable in terms of the overall parental involvement components examined prior to the introduction of the parents' workshops intervention. Table 2 shows the mean and standard deviation scores for the home mathematics environments of the experimental and control groups.

Table 2. Paired samples statistics on home mathematics environment

Groups	Pre		Post		N
	Mean	Std. deviation	Mean	Std. deviation	
Experimental parents	2.5031	0.20952	3.2296	0.20073	38
Control parents	2.5124	0.26586	2.5000	0.26155	38

Parents in the control group had a pre-test mean score of 2.5124, but parents in the experimental group had a mean score of 2.5531. Following the test, the mean score for the parents in the experimental group was 3.2296, whereas the mean score for the parents in the control group was 2.500. The results demonstrated that the control group's mean scores did not increase as much as those of the intervention group. Table 3 displays the analysis results for the home maths environment.

Table 3. Results of paired samples t-test on home mathematics environment

Paired sample (Post-Pre)	Paired differences			95% confidence interval of the difference				
	Mean	Std. deviation	Std. error mean	Lower	Upper	T	Df	Sig. 2sided p)
Exp-Parents	0.72649	0.22796	0.03698	0.65156	0.80142	19.645	37	< 0.001
Control-Parents	-0.01238	0.29654	0.04811	-1.0986	0.08509	-0.257	37	0.798

The experimental group's parents' pre-test and post-test scores for their home mathematics environment differed by 0.7269 points. This implies that using parent workshops could improve the home maths environment. At the 5% level of significance, the paired sample t-test revealed a significant difference in mean scores for parents in the experimental group ($t(37) = 19.645$, $p = 0.001$). The pair difference between the pre-test and post-test mean scores for the parents in the control group was -0.01238, based on the results of the paired sample t-test in Table 3. This finding indicates that the parents in the control group did not observe an improvement in their mean scores. Based on the pre- and post-test mean scores as well as the t-value ($t(37) = -0.257$, $p = 0.798$), the study concluded that there were no statistically significant changes in the increases in mean scores for the parents in the control group. Table 4 displays the results of the matched sample statistics for parental participation in terms of communication between the home and the school.

Table 4. Paired samples statistics on communication between home and school

Groups	Pre		Post		N
	Mean	Std. deviation	Mean	Std. deviation	
Experimental parents	1.3985	0.24667	2.4135	0.41055	38
Control parents	1.3609	0.18414	1.4850	0.35855	38

Parents in the experimental group boosted their mean pre-test score to 1.3985, whereas parents in the control group increased their mean pre-test score to 1.3609. In terms of score dispersion, the experimental group's parents had a somewhat larger pre-test standard deviation than the control group. The experimental group's pre-test standard deviation was 0.24667, whereas the control group was 0.18414. The experimental group's post-test mean score was 2.4135, while the control group was 1.4850. The results demonstrate that, consistent with the pre-test scores, the post-test standard deviation. The post-test standard deviation for parents in the experimental group was 0.41055, whereas it was 0.35855 in the control group, as seen in Table 4. Table 5 displays the findings of paired samples on home-school communication.

Table 5. Results of paired samples t-test on communication between home and school

Paired sample (Post-Pre)	Paired differences			95% confidence interval of the difference				
	Mean	Std. deviation	Std. error mean	Lower	Upper	T	Df	Sig. 2sided p)
Exp-Parents	1.0150	0.44905	0.07285	0.86744	1.16264	13.934	37	< 0.001
Control-Parents	0.12406	0.36861	0.05980	0.00290	0.24522	2.075	37	0.045

The results demonstrate that the experimental group's mean score increased by 1.0150, whereas the control group's mean score increased by 0.12406. For parents in the experimental group, the difference in mean scores between the pre-and post-tests on communication between the house and the school was statistically significant (0.001), but not for parents in the control group (0.045).

5.2. Qualitative results

5.2.1. Parental academic expectations in their children's general and mathematics learning

According to the interview findings, many parents from both groups said they had high hopes for their children's academic progress before the intervention. They all expressed hope that their children's education will provide them with opportunities in the future. Parents stated their desire for their children's academic success, particularly in mathematics. Parents indicated their expectations for good performance to be reached as a key component in academic achievement, but they acknowledged that the school and the subject teacher are the most significant determinants of academic performance (60%). Despite acknowledging the need to do so, the majority of parents surveyed (58%) said they do not talk to their children about the expectations they have for their education. A male participant who did not attend school at all stated, "Yes, I think my boy knows why he is in school, do we need to keep preaching the same language every year that he must do well in school?" No."

Parents' beliefs at the second measurement changed in comparison to their respective beliefs at the first measurement. The parents in the experiment maintained their expectations for their children's general and mathematical learning, but they acknowledged that the intervention had improved their comprehension of the importance of setting high but reasonable expectations for their children, the necessity of sharing those expectations with them, and the most effective strategies for getting their children excited about learning. In this regard, one mother parent who completed secondary school stated, "At the moment, I not only have expectations for my child's education, I also communicate these expectations to my child. My child is aware of my expectations from her as a result".

5.2.2. Parent-child interactions and mathematics activities at home

The majority (74%) of the parents surveyed thought they and their children got along well before the intervention. These parents, however, claimed that the extent of their interaction with their children was confined to doing household duties together and exchanging details about their day-to-day activities. The findings showed that parents were aware of their obligation to communicate with their children about matters related to their education. However, many parents (67%) stated that they usually did not sit down with their children to discuss any concerns related to school. A few (18%) parents stated that they occasionally tried to be close to their children and to involve them in a discussion about their education, but it never succeeded. On this subject, one female participant with a secondary education stated, "We don't normally have time to sit down and talk over dinner together. Most of the time, I get home late from work and head to my bedroom".

Parents who were interviewed acknowledged the value of helping their children with homework when asked about their role in assisting with their mathematics assignments. They believed that parents had a variety of duties relating to making sure their children finished their homework. The responses showed that there are two different sorts of parents when it comes to what they actually do to help with their children's homework: those who push and make sure that their children complete the assignment and those who do not

help or check their children's work at all. The majority of parents (76%) admitted that they did little to motivate their children to complete their mathematics homework. These parents also mentioned that there are several reasons why they are unable to help their children. Various issues, including parental education levels and disparate school systems, are cited as causes of this. Some parents admitted that they found mathematics difficult in school and that they lacked the subject expertise needed to help their children learn. "I'm not educated to assist my child in mathematics. My child is aware that I never went to school. As a result, she never asks me about mathematics because she believes I cannot assist her, and she is correct", remarked a woman with no formal education.

In the post-test, parents' opinions differed from their pre-test perspectives. Parents expressed that their relationship with their children should extend beyond working together on household duties. When doing schoolwork, the parents stated that it was critical to interact with their children. In general, these parents stated that they believe it is critical to be close to their children to ensure that they complete their homework. In this way, these parents demonstrated their ability to notice and assist with any educational concerns. They also expressed concern that if they do not assist or monitor their children, they will not understand the significance of or responsibility for doing their schoolwork. All the parents who were surveyed claimed that this had increased the quality and frequency of their conversations with their children. Some parents claimed that, because of the intervention, they realized that, regardless of their educational background, they could still assist their children with their schoolwork. In this regard, one of the interviewed parents, a father with a secondary education, stated:

> *I assist my child with homework whenever possible. I'm pleased I'm aware that my support can take the shape of coaching and monitoring rather than providing the correct answers. For mathematics, I examine her books, but for homework and revisions, I have hired a tutor for her.*

5.2.3. Provision of learning resources

Parents in the experimental and control groups were asked if they provided their children with educational resources to help them with their maths studies. According to the interview results, many parents (82%) did not give their children learning resources. The findings also revealed that before the intervention most parents (75%) had no idea what they might offer their children to help them study mathematics. A few parents (18%) believed that providing their children with learning resources is one method to demonstrate their support for their academic performance. These parents stated that they usually purchase materials for their children. A woman with a post-graduate degree stated that she does not give learning resources to her child, but she does provide her child with money to purchase whatever she requires. "Normally, I don't buy her anything directly related to schoolwork. I give her money to buy everything she needs, such as pens".

Following the intervention, experimental parents were interviewed to provide detailed information about their perspectives on the intervention's effectiveness. Most parents (79%) who were surveyed claimed that the intervention had changed some of their points of view, particularly regarding resources for mathematics learning. For instance, these parents stated that they had realized that secondary school students need internet connectivity tools for their education. Additionally, these parents reported that they as parents are the only ones who can make these resources available. One of the participants, a female with a primary education, stated, "I now understand the importance of some things that I took for granted. I bought my child a study table and chair, as well as a calculator and graph sheet booklet".

According to many parents who participated in the workshops, both the quality and performance of their children's academic work may suffer if there is no room set aside in the home for their studies and no place for them to study in peace. These parents claimed that getting their children to study at home by purchasing a study desk among others is a great strategy.

5.2.4. Home-school communication

Both the experimental and control groups stated that they had trouble communicating with the school before the intervention. A significant portion of parents (75%) who responded to the study stated that most communication between home and the school was one-way. More specifically, these parents stated that the only time they interacted with teachers was during yearly parent-teacher conferences. According to the findings of the post-intervention interviews done with the experimental group, nearly all of the parents believe that reciprocal communication between home and school is extremely important and useful. Parents indicated that they would prefer more information about their children's arithmetic growth, how much time they spend on maths at school, and how much time they should spend on mathematics at home, including prescribed homework and extra activities such as studying for the final examinations.

When questioned about means of communication, parents stated that the school did not use a variety of methods to convey information, such as asking parents to their offices for a talk or informing them about

their children's academic progress. Most parents who responded to the study (87%) said that the school only texts them briefly with important information. Furthermore, most parents (76%) who participated in the pre-intervention interviews said they were apprehensive about utilising digital media to enhance parent-teacher communication in the classroom. Nevertheless, some parents stated that even while they frequently use digital devices, they may not feel it is proper to use them for communication with teachers. "It is not a formal way to communicate with the school using social media platforms," a woman with a primary education noted.

After the intervention, all the parents who were subsequently questioned stated that they had come to the realization that using digital channels allowed for quick and pertinent information interchange because it allowed them to instantly catch up on the academic performance of their children. These parents acknowledged that new technological advancements support communication between the home and school, fostering a more open and transparent relationship. One parent stated, "Using technology to communicate with my children's teachers has increased the frequency and effectiveness of our interactions".

The quantitative results show that the experimental group's parents' perceptions of their home mathematics environment have changed. When the pre-test and post-test scores were compared, it was clear that the experimental group had made statistically significant changes in all three areas of the home mathematics environment, namely parental expectations, parent-child interactions, mathematics activities, and the availability of learning resources. Qualitative results confirmed the pre-test–post-test comparison's conclusion that parents' perceptions of their home's mathematics environment altered because of the intervention. Post-intervention interviews revealed a shift in parents' views toward home-school collaboration. Interviewed parents reported that the intervention resulted in some good changes in home-school partnerships in terms of communication. This backs up the general finding from comparing parental questionnaire pre-test and post-test findings on this factor.

6. DISCUSSION

This study set out to find out how parents felt about a parenting education programme. Finding out if the parental participation workshops were a helpful tool for getting parents involved in their children's maths education was of special interest. All things considered; the statistics point to a beneficial impact of the workshop on parents' involvement in their children's mathematics education. Parents said this clearly, and the results also suggested it. There was evidence to suggest that parents improved in terms of providing their children with mathematics learning materials, that parents improved the quality of their relations with their children, parents were able to have realistic and share their academic expectations with their children, and that parents were able to increase the quality of communication with their children's teachers. This outcome corroborates the work of Tobolka [48] who carried out a study on how to increase parental involvement using the Internet. Tobolka established a user-friendly website and used email as an elementary school teacher to communicate with parents. Quantitative as well as qualitative approaches were employed by the author during a six-week investigation. The author trained parents on how to swiftly access the website and emails in the computer lab before the study. The author emailed parents at the end of each week with brief letters and reminders concerning student behavior, missing work, and other matters. Tobolka's research findings revealed that digital communication gave parents greater information about typical classroom activities. Parents reported feeling more connected to the teacher and more actively participating in their children's school activities.

Before the intervention, the study's results evidently established that most parents lacked the knowledge necessary to properly support their children's academic learning in both general education and mathematics. Similarly, Porsuk and Kunt [49] claim that parents are either unaware of their children's learning issues or are unaware of how to address those issues even if they are aware of them. According to Lindle [50], educators who believe that parents do not care are not right. Her research revealed that, while parents of all social and racial backgrounds wish to support their children when they can, many of them lack the necessary skills. One of the key points emphasized in the relevant literature is that parents should be able to assist their children in contexts outside of the classroom in addition to having the essential knowledge and coordinating and integrating school and home learning [36]. The knowledge and abilities of parents are significant determinants of and influence parental participation [51]. A general interpretation of the study's findings indicates that participation in parents' workshops on parental involvement was useful in fostering a conducive home mathematics environment and effective home-school partnership.

The home mathematics environment addressed parental academic expectations, parent-child interactions, home mathematics learning activities, and the provision of learning resources. The current research shows that parental expectations were considerably raised by the parents' workshop intervention on parental involvement. Numerous previous research has demonstrated that, in the face of adversity, parental expectations for their children's academic performance act as a protective factor [52], [53]. By examining

parent academic expectations within the framework of an experiment involving parents of senior secondary school students in Botswana, the current study adds to the body of information on the subject. It demonstrates the malleability of academic expectations while also posing the possibility that raising parents' academic expectations could be a key component of an early intervention that supports children's academic improvements. The findings show that parents had high expectations for their children's education before the intervention because they wanted them to do well in school. Although many parents had great expectations for their children, there weren't many ideas from parents about real, specific actions they took to live up to those expectations. Most of these parents stated that they did not frequently let their children know what was expected of them. Additionally, they admitted that they did not do anything to help their children accomplish what they thought they were capable of. There are a few plausible causes for this outcome, such as the fact that parents only have incomplete or limited knowledge of what is expected of them as parents. However, McNeal [54] noted that educating parents through participation in conferences, PTA gatherings, and educational workshops was found to greatly raise expectations for school as well as marginally raise mathematical proficiency results.

Furthermore, the workshop facilitated a shift in parent-child interaction. Parents felt more aware and ready to support their children emotionally and academically. The findings are consistent with the reviewed literature. For instance, Clarke [55] demonstrated the value of parent education programmes, especially for parents who found it more difficult to help their children with their schoolwork or who were less inclined to attend school functions. As a result, parents' time spent doing school activities with their children increased. Additionally, parents' self-confidence improved. The post-intervention parent perspectives suggested that parents did more to improve interactions with their children to promote their education because of the knowledge and skills gained from the parents' workshops. Parents received information and confidence in how to help their children study in general and in mathematics. Parents recognized that home-based engagement entails establishing interactions between the parent and the child concerning the child's educational activities as well as support for schooling. For example, parents recognized that they needed to follow and review their children's books and test papers to have informed discussions with their children during encounters. Changing parents' views about what they should be doing through sharing knowledge and skills enhanced their participation in their children's learning.

The evidence from the results suggests that the intervention altered parents' opinion of home learning resources. Before the intervention, most parents in both the control and experimental groups claimed that they did not provide learning tools to their children. One possible explanation for such findings, which may also corroborate the conclusions of this study, is a lack of understanding. These parents claimed that discussing academic topics with their children had given them greater knowledge about the educational resources they should give their children. Parents claimed that they were able to make some beneficial adjustments to their houses in terms of the tools that could help their children learn mathematics. Parents cited the benefits of review resources (previous test papers) for their child, a study table, a set of mathematics tools, a graph pad, and a well-lit study space, among other things. These parents thought that the modifications inspired their children to concentrate on their mathematics studies. Some parents believed that giving their children access to the internet at home has made their children happier and more active. However, these parents said that increased supervision of internet usage is necessary. These parents stated that through the internet, their children have access to various informational resources and that they may connect with other students online for help when they need it. This is consistent with the work of Becta [56], who asserts that information and communication technology (ICT) increases communication and the exchange of knowledge among students as well as better student participation. ICT provides students with quick and precise feedback, which helps students feel motivated. Becta also mentioned how ICT aids constructivist pedagogy, which encourages students to use technology to study and comprehend mathematical ideas.

In addition, giving parents information about two-way contact between parents and school staff is another fundamental step in the transition progress. The study's findings indicated that parent workshops on parental involvement improved communication between the home and the school. Throughout the sessions, parents were encouraged to communicate to work together with teachers. Collaboration was defined as the process by which individuals with different backgrounds and experiences-parents and school staff, for example-cooperate and make choices to generate creative answers to problems that both parties have jointly identified. Following the workshop, parents reported that they could now effectively interact with instructors and set clear goals and expectations for their children, which was previously unheard of for them. For instance, parents said that they were able to work out a plan with their children's mathematics teachers to require them to complete two or more practice exams each week. According to Koonce and Harper [57], parents should set clear goals and objectives for their children's education. This is a collaborative decision-making process that involves both parents and teachers. Communication is critical to a team's success.

Collaboration is defined as making decisions with all relevant stakeholders involved. Parents also stated that the intervention provided them with more opportunities to talk with teachers about how they could help students establish good attitudes towards mathematics thinking and learning. Many parents reported that social media platforms had made it much easier for them to see their children's academic reports.

7. CONCLUSION

The results of the study indicate that significant progress was observed by parents who attended the workshops in several measures related to the home-school connection and the learning environment. The results of the study suggest that there may be great potential for parents to actively participate in their children's general and mathematics education in public senior secondary schools through effective and feasible means. More research on this topic is required to fully utilise parents' potential as educational partners for schools, parents, and children. This study showed that parents want to be involved. They worry about the education of their children, but they face obstacles due to things like insufficient parental involvement skills and information. It is recommended that parents be included in future interventions wherever feasible to work towards increasing children's school performance in mathematics and generally, given the substantial impact workshops had on parents in this study. Additionally, more time ought to be spent educating aspiring teachers on the advantages of encouraging parental involvement, particularly how to create and sustain fruitful home-school partnerships.

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