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Parental involvement in a familiy mathematics programme at primary school

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ABSTRACT

Parents are a key role player in the success of students in school and mathematics through assistance with homework. However parental involvement with mathematics homework and their contribution toward progress within the subject is an ongoing topic of debate for many different reasons. This article focuses on a Family Mathematics Programme (FMP) and how it can assist parent involvement with primary students and their mathematics homework in a school in South Africa. This is a qualitative case study, involving convenience sampling of parents who completed pre- and post-workshop questionnaires, participated in a focus group interview, and produced workshop reflections based on the FMP. Data was analysed using pattern matching and linked to previous research outputs to determine results related to the research questions. Results indicate that parents do experience very real challenges related to factors such as socio-economic circumstances, but they were involved with mathematics homework and could be quite resourceful in this regard. They also show that a FMP helped these parents to increase parental involvement and their confidence when helping with mathematics homework. However, parents require continual guidance and support on teaching methods and strategies from teachers and school, and FMP can be a helpful way to encourage and improve parents' participation.

Keywords: family, mathematics, parent, student, homework, teacher

INTRODUCTION

Homework is a critical part of education and according to Ramdass and Zimmerman (2011), it fosters different aspects within students such as responsibility, strengthening comprehension of content knowledge, and promoting academic achievement, whilst helping to review classroom material and practising skills. There are also benefits for teachers as it provides feedback on areas of concern where students may need additional support. Homework helps to enhance and assist classroom teaching and learning. The use of homework can heighten the relationship between home and school by purposefully involving parents in the students' education (Bempechat, 2019; Pfeiffer, 2018). If parents want educational success for their children, especially in mathematics then learning must extend beyond the student-teacher relationship and encourage parents to become more actively involved (Mahuro & Hungi, 2016).

Parents need to be supported in this regard and should think of homework as an opportunity for them to discover more about what students are taught at school (Ndebele, 2018). By including parents in the students' mathematics education, it helps to deepen their understanding of what the students are learning and how they learn (Epstein et al., 2002). Some parents are unaware of their influence over the childrens' mathematics performance and attitude towards the subject. They can exploit this influence if they are more actively involved in mathematics learning and homework (Fu et al., 2017; Jay et al., 2017). From this perspective, parents require assistance from schools to obtain the knowledge and awareness needed to be able to improve their overall involvement and the quality thereof. One approach that can address this is the introduction of a Family Mathematics Programme (FMP) and brings us to the focus of this article which is how can a FMP assist parent involvement with Grade 4 mathematics homework? It looks at the challenges parents experienced in assisting students and the issues that emerged as they reflected on their participation in FMP.

This research is part of a more extensive study that investigated parental involvement in mathematics homework at Grade 4 (age 9 years) level in a primary school in South Africa. The focus was embedded in the experiences of parents and teachers. Teachers stated that Grade 4 students did not regularly complete homework therefore not consolidating the knowledge and skills needed to perform well in mathematics, and parents seemed disinterested. There is an expectation in South African primary schools that parents will assist their children with homework, and it is common practice in schools to assign mathematics homework on a daily basis. Parents however felt this was an unrealistic expectation given their other daily demands and teachers

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became frustrated with parents who did not see assisting with mathematics homework as a priority. In addition, parents expressed concerns about their ability to help with mathematics homework, due to their lack of familiarity with the teaching methods employed in South Africa's current education system, and the required content knowledge needed to support their children.

Over the past three decades, South Africa has seen the implementation of different family-oriented mathematics programs across the country. One of these was the Family Maths and Family Science program, a collaboration between Nelson Mandela University and the South African Department of Education and adapted from the American Equals program (Science, Mathematics and Technology Education Unit, 2008). This program was launched in 2008 with the aim of providing specialised instruction to vulnerable and disadvantaged students. It promoted transformative educational practices and introduced innovative teaching methods to teachers, parents, students, and community members. In a similar effort, the South African Numeracy Chair Project (South African Numeracy Chair Project [SANCP], 2011), in partnership with Rhodes University, focused on integrating teacher and student numeracy development in rural schools in the Eastern Cape. While the program did provide workshops that were positively received by parents, they were not the primary focus of the program. The Moms Maths website, established by Louis Wells, and author of the Moms Maths Manual (Wells, 2011), was another initiative. This platform provided online resources for parents to support their children's mathematics learning at home across various grades. It aimed to equip students and their parents with suitable tools to enhance their understanding of mathematics (Mohlala, 2011). There were some drawbacks to the program as firstly, it required parents to be able to read and implement the instructions in the manual which is a challenge for parents with poor literacy levels and secondly, not all households have internet facilities in South Africa. Another program called the Old Mutual Family Math project, introduced in the mid-2000s, offered in-service teacher professional development at the University of the Free State (2013) and included resource materials to conduct activities with students in their classroom and to host workshops for the students' parents (University of the Free State, 2013).

The FMP that was part of the current study shared similar aspects with the other programs but also addressed issues that were not covered by previous FMPs. In this FMP, parents were provided with workshops and resources for home practice, as well as internet resources for consultation and use. The aim of the program was to increase parental involvement with mathematics homework and to encourage parents to assist their children with competence and confidence. The parents in the current study did not come from a rural background but rather from lower to middle class families in a Cape Town suburban area. Despite the accomplishments of earlier FMPs, the FMP in this study was not concerned with improving teaching practices that include teachers and parents in the students' learning of mathematics. Instead, it focused on parents and how to improve their involvement with mathematics homework. It aimed to highlight the aspects of parental involvement that needed the most attention and how best to support parents to address these issues. This included a focus on non-content related attributes (e.g., parents' view of mathematics, eagerness to assist with mathematics homework, etc.) that restrict or prevent parents' involvement with mathematics homework and what assistance could be given to participating parents to improve these attributes, which was not addressed by past FMPs.

LITERATURE REVIEW

Active parental involvement provides parents an opportunity to motivate their children, offers structure at home with regards to homework routine, can reinforce what was taught in class, and help improve student academic performance (Henning et al., 2020). However, Kohn (2007) and Vatterott (2018) argue there is insufficient evidence of how beneficial homework is for primary school students and advocates for the reduction or the possible elimination of homework in primary school, especially in the early grades. The purpose and value of homework remains debatable and whether or not it holds purpose at a primary school level. According to Hoeke (2017), parents and students do recognise the benefits of homework but there are several factors that can hinder parental involvement. Research conducted by Jafarov (2015), Fu et al. (2017), and Chophel and Choeda (2021) state that these factors include but are not limited to parents' level of education, parent-teacher communication, parental availability, and family structure (dynamics).

Parental Involvement

Parents generally want to be involved with and support students with mathematics homework. However, much parents' knowledge concerning the mathematics content that students are exposed to at school is rather limited, and this influences how parents can be involved with mathematics homework (Dettmers et al., 2019). This means that parents may not have the necessary skills to assist and support the students with mathematics homework (Tamboto et al., 2021). According to Jay et al. (2018), parental involvement in mathematics is influenced by two factors, one of which is communication. Dettmers et al. (2019) found that effective family-school communication is a key performance factor that helps parental involvement in homework if two-way communication is implemented and practised. Notwithstanding the above statements Tabaeian (2016), found the language in which the information is given is pivotal. Many schools share information with parents in the language of learning and teaching (LOLT) of the school. This may differ from the parents' home language in South Africa, causing challenges concerning the comprehension of the information and can lead to uncertainty amongst parents of how best to assist the students with mathematics homework.

According to Mahuro and Hungi (2016), time, availability, resources, and effort impacted parental involvement. Due to parents having multiple jobs and working long hours reduces parent availability to spend time assisting and supporting the students with homework. Tamboto et al. (2021) agree with the statement made by O'Sullivan et al. (2014) that time and availability are a crucial part of parental involvement. Nonetheless, Jafarov (2015) found that when it comes to parents with tertiary education, time is the main reason for their lack of involvement with the students' homework because these parents could have more time-intensive

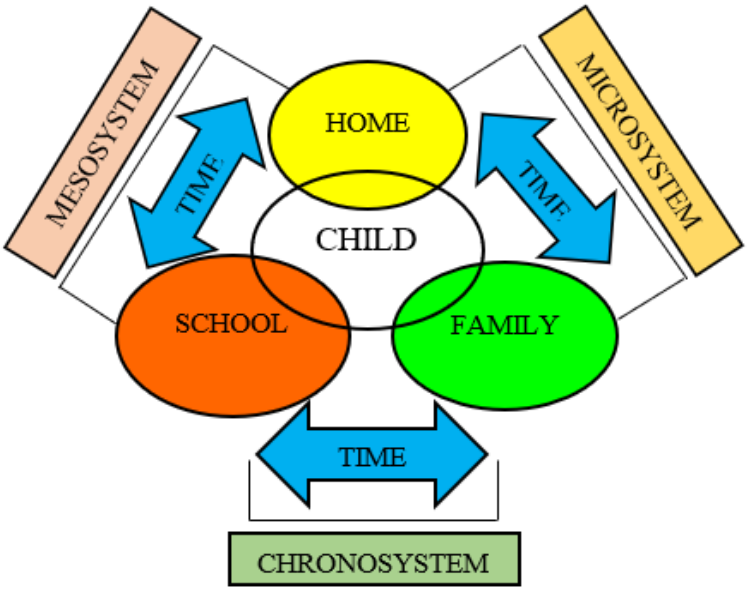

Figure 1. Diagram of human ecology systems theory (Adapted from Bronfenbrenner, 1994; Epstein, 2002)

and time-consuming careers and lives, preventing them from being involved with mathematics homework. Family structure (dynamics) also has been highlighted as an issue for parental involvement. O'Sullivan et al. (2014) proposed that family dynamics (single-parent status, etc.) may impact underprivileged students and families as they may face many difficulties that place stress on the family, especially single-parent families. These parents frequently must work long hours and have multiple jobs resulting in parents being away from home most time. Students from this family type may not receive the needed homework parental supervision which can result in students' underperformance academically (Davids & Roman, 2013).

Parents are often an under-utilized resource with the potential to influence the students' education greatly (Modisaotsile, 2012). When parents are involved in the student's education it can help provide a sense of ownership. Parents experience a sense of satisfaction when they can assist and support with mathematics homework and view it as a positive aspect of parenting. Homework creates an opportunity for parents to provide a supportive environment at home, encourage learning, and discuss problems in the subject. Parents can monitor the student's activities, help improve their study habits and build a positive disposition while advising the students (Abah et al., 2018).

Family Mathematics

FMP are not unfamiliar nor is it a new practice within the mathematics education community and in South Africa. FMP is a programme designed for parents to inform them about subject content, current teaching methods, and issues in mathematics teaching and learning usually in primary school. According to Brown et al. (2022), schools need to design homework activities and intervention programmes that allow parents to be more fully engaged in the learning of mathematics at home. Different FMPs and materials have been made available to parents in South Africa over the past number of years, such as the Family Maths and the Family Science programme at the Nelson Mandela University (Science, Mathematics and Technology Education Unit, 2008) This programme extended support to the teachers, parents, students, and community members providing a series of structured materials and parent workshops offering various activities and games for young students using hands-on material that can often be found at home. A different parent support programme emerged from the South African Numeracy Chair Project (SANCP, 2011) in association with Rhodes University in Grahamstown. This programme was designed to promote mathematics development and provide resources for families to use at home. Another development is the ongoing Moms Maths website, founded by Louis Wells and author of the Moms Maths Manual (Wells, 2011) and provides online resources for parents to assist students with mathematics at home.

Theory

The theoretical framework is the structure that can hold or support a theory of a research study. Within the current study, two theories, Bronfenbrenner's ecological systems theory and Epstein's theory of overlapping spheres of influence were used to guide the research in terms of parental involvement and mathematics homework, as illustrated in **Figure 1**.

According to Bronfenbrenner's (1994) ecological systems theory, also referred to as the Human Ecology theory, diverse environmental systems have an impact on human development. These systems include the microsystem (student's immediate environment such as family, neighbourhood, and peer group), the mesosystem (the connection between immediate environments such as home and school), the exosystem (wider social systems that impact indirectly such as the parental workplace), the macrosystem (wider cultural contexts such as government and economy) and the chronosystem (time and environments: patterns of events and changes in the student's life) (MacBlain, 2018). This theory helps us to understand how the different environmental systems can impact the student's development and highlights the important connection between the student, the family, and the school.

Epstein et al. (2002) expanded the work of Bronfenbrenner further in her theory of overlapping spheres of influence which suggests that students learn more effectively when parents, teachers, and others in the community collaborate to promote and support learning and development. This theory places focus on the parents, their contribution to the student's development, and the influential power they have over the students to develop healthily (Epstein et al., 2002). This theory emphasises the shared responsibility between home and school (Epstein et al., 2002). Epstein et al. (2002) developed a framework that identifies six types of family involvement:

1. Parenting,
2. Communicating,
3. Volunteering,
4. Learning at home,
5. Making decisions, and
6. Collaborating with the community.

While all six types of involvement in the framework are relevant, the focus was placed only on three out of the six types, namely parenting (supporting parents by training them in parenting techniques, providing guidance, help parents create a setting at home that facilitates learning, and schools to make greater efforts to understand the backgrounds, beliefs, and expectations of families for the student), communication (notifying families about educational interventions and learning outcomes, providing pathways for two-way communication between the home and school), and learning at home (engages families with the students in academic learning at home, such as homework and other activities about the curriculum. Teachers should create homework assignments that allow parents and students to collaborate and discuss activities), as these aspects relate more directly to parental involvement in mathematics homework.

Both theories help to communicate how parents are an important part of the environmental systems of developing students and need to be provided with the opportunity to be more involved in the students' education (Epstein et al., 2002). The theory of Epstein is embedded within the theory of Bronfenbrenner. If the six types of parental involvement (Epstein et al., 2002) as stated above, are practiced and promoted as part of the school ethos then parents will shift from being spectators of the students' mathematical learning to active participants and facilitators of their learning of mathematics within the home setting. This active involvement will, therefore, contribute to their mathematics development as they progress through the grades. Strengthening the relationships presented within Epstein's theory, resulting in a greater overlap of the spheres.

The increasing overlaps of the spheres will cause a dispersion that will carry over into Bronfenbrenner (1994) different systems of human development as mentioned above. With stronger and improved developmental systems, it can be presumed that the student's mathematical development could have a positive impact on their mathematical performance and success within the subject. It is for these reasons that these theories were most suitable for the study as parents within the current study were unable to assist adequately and by not interacting with the teachers, resulted in the spheres drifting further apart. This causes the relationships that are supposed to be supporting and enhancing the students' different systems of development to be weakened. Retarding the students' mathematical development which then affects the students' mathematical performance and success in the subject.

MATERIALS AND METHODS

This is a qualitative case study of a group of parents at a primary school in South Africa who participated in a short Family Mathematics programme. I was interested in understanding why parents were reluctant to assist students with mathematics homework and the issues that emerged while they participated in FMP.

Data Collection

The study took place at the school where I currently teach, as there was a perceived need for parents to be more involved in helping the students with mathematics homework. This need was identified following an informal discussion with the Grade 4 teachers about the poor students' mathematics results in the provincial systemic mathematics tests. Due to the focus of the study being on Grade 4 parental involvement in mathematics homework at my school, I decided to use convenience sampling to recruit participants (Cohen et al., 2018). Participating parents were required to complete a pre- and post-workshop questionnaire. While most of the participants (23 participants) indicated they would make themselves available to be part of the interview process, only 5 parents (3 mothers and 2 fathers) volunteered to be part of the focus group interview. This provided a deeper way of probing some of the challenges experienced when assisting with mathematics homework. 7 parents which included the 5 parents with the students (their children) took part in the FMP. The parents completed workshop reflections during the programme to provide feedback on how well they understood a topic that was presented. The parents reflected on what their thoughts, feelings, and experiences were about the workshops. The reflection slip helped participants to critically and constructively reflect on the FMP and their involvement.

The FMP Design

This FMP design was informed by two of Epstein's types of parental involvement: parenting and learning at home, as well as Bronfenbrenner's human ecology theory which seeks to improve the quality of the student microsystems (parents and their influences on the student development) and mesosystem (parents and the schools as well as the home–school relationship and

how it influences the student's development). Epstein et al. (2002) suggest that workshops and materials are useful tools for parents to support and encourage students' academic development. The FMP consisted of 4 workshops for 90 minutes held over 4 Saturday mornings. It covered some of the content topics in the South African Grade 4 national curriculum which included mental maths, addition and subtraction, multiplication and division, and fraction activities. The workshops had two parts: firstly, what students needed to know according to the curriculum and, secondly, how parents can reinforce these needed skills at home using everyday objects. The reason for the curriculum focus was to provide parents with information to make them aware of what students are being taught in class and what knowledge and skills need to be practised and reinforced at home. The second part of the workshop focused on information and communication technology (ICT) in which parents were shown what online packages are available to help reinforce the mathematics skills needed, without consuming too much of a parent's time. This allows the student to work independently and helps to improve student self-regulation with parents monitoring their progress (Epstein et al., 2002).

Data Analysis

Data was collected from questionnaire responses, focus group interviews and workshop reflections. The pre-workshop questionnaire (pre-WQ) and a post workshop questionnaire (pst-WQ) were used to obtain information about the parents' involvement prior to the workshops and after participating in the workshops. The parents focus group interviews (FGI) were used to provide a deeper insight into their involvement with mathematics homework and were recorded and transcribed. Parents also completed workshop reflection slips (WRS) at the end of each workshop session to give insight into their experience of the workshops. After the information from the questionnaires, interview transcripts, and reflection slips was compiled and processed, the next step involved reducing the data into manageable and understandable texts. This was achieved by grouping the data into themes guided by the literature and theoretical framework, with a particular emphasis on Epstein's six types of parental involvement. Three specific types of parental involvement were emphasized: parenting, communication, and learning at home. Each one of these themes were assigned a colour code: parenting was yellow, communication was blue, and learning at home was red.

After the questionnaires were carefully examined, tags based on colour codes were applied to highlight data relevant to the identified themes. Keywords such as 'assist', 'help', 'speak', 'involvement', 'advice', and 'methods', along with phrases describing how assistance was provided, and the type of assistance given, were all color-coded accordingly. For example, this is a quote of how one of the parents who completed a pre-questionnaire explaining the type of assistance that was provided to help the student with mathematics homework.

> I prefer to re-explain it to him and because he sometimes gets lost in class then when I explain it again, he gets it .... Especially one on one works for him.

(P10-Pre. WQ, parent 10, pre-workshop questionnaire)

This was tagged with red (learning at home) as it explains how the assistance was given and the type of assistance provided to the child. I followed the same approach with the interview transcripts. Data related to above-mentioned themes were colour coded depending on the theme. This is a different example of another mother who explained how she managed her daughter's homework routine and the approach to be used when it comes to homework.

> I prefer her to do her English and those things. So, she can get those easier things out of the way then I sit with maths in the evening, which is also after six.

(M1-FGI, mother 1, focus group interview)

This transcription would be given a yellow tag and was grouped under the theme parenting.

The same color-coded system was applied to the workshop reflection slips, with data highlighted in yellow, blue, or red before being categorized under its respective themes. One of the parents explained how the workshops helped her to better comprehend the terms used within the current mathematics curriculum:

> Getting to know all the terminology used in mathematics makes it easier to understand when my child comes with homework. Implementation is better now because I understand more and better.

(P2WRS, parent 2 workshop reflections slip)

This was tagged red (learning at home) as it focuses on one of challenges that occurs with assistance at home.

An additional layer of coding was applied to capture non-content-related attributes that emerged from the data, including parent motivation, the language used in mathematics, and parents' beliefs about mathematics. This involved using a different coloured tag system so the quote above would be coded red (learning at home) and green to indicate that it also addressed the category of language used in mathematics. The responses related to parent motivation and parent beliefs were colour tagged purple and orange respectively. This is an example of the coding where a parent expressed her eagerness to participate in the FMP this type of statement from the focus group interview and was tagged purple (motivation):

> When I found out about this I was like, let's do this.

(M2-FGI, mother 2, focus group interview)

Once the analysis was completed, all the data from the respective sources were grouped together based on the colour code and matching themes, including non-content-related attributes. This grouping helped develop a deeper understanding of parental involvement, specifically in terms of parenting, communication, and learning at home. Next, similarities and differences between the current study and previous research were identified using pattern matching, a technique outlined by Yin (2009) as one of five key analytical processes. Finally, the data were examined in relation to Bronfenbrenner's Human Ecology theory, focusing on the micro, meso, and chronosystem, as well as Epstein's theory of overlapping spheres and types of parental involvement.

RESULTS

The following sections will present the results of the study. The results will be highlighting the challenges that parents are confronted with when assisting the students with mathematics homework and parents' reflections after participating in the FMP.

Challenges for Parents

Although literature such as Jafarov (2015) highlights several challenges that parents can experience when helping students with mathematics homework, in the context of this study it was found that the content taught in class and methods used to teach the content were a challenge for parents. They also had difficulty with the solution methods and strategies used in class to solve problems. These are some of the parent responses who completed the Pre-Workshop Questionnaires:

> Not the same maths we did at his age. Some of the work is different from what I was taught when I was younger.
>
> (P4-Pre. WQ, parent 4, pre-workshop questionnaire)

> It's sometimes quite difficult. Because the methods used now and that were used in my time are very different.
>
> (P5-Pre. WQ, parent 5 pre-workshop questionnaire)

Another aspect of parental involvement found to be a challenge for some parents was time and availability. The findings indicated that both single parents and married parents found time and availability to be a challenge. When I asked if time and availability is a challenge for the parents, they did not hesitate to respond:

Mother one (single parent):

> Yes.
>
> (M1-FGI, mother 1, focus group interview).

> We are parents and we have responsibilities, and we are not always available at the best moment, we must find a moment.
>
> (F2-FGI, father 2, focus group interview).

From the questionnaires and interview data, it was found that communication between teachers and parents and vice versa was identified as another challenge. Some parents do not communicate with the class teacher when they struggle with mathematics homework. The parents who indicated they always communicated with the teacher when they struggled did so that the student may be advantaged. Some parents indicated that assisting with mathematics homework does not pose any challenges for them and, if any challenges should arise, they will resort to either finding an alternative way to gain the needed understanding or will ask their spouse or a relative for additional assistance.

> Because I don't struggle. I make a way to understand.
>
> (P12-Pre. WQ, parent 12, pre-workshop questionnaire)

> If I can't assist with his homework, his father assists.
>
> (P13-pre-WQ, parent 13, pre-workshop questionnaire)

Despite the efforts made by parents to regularly communicate with teachers, teachers mostly communicated with parents only when the students perform poorly in mathematics.

> What I found was that I only get communication from the teacher when the child does poorly. The teacher calls me in, and every term the teacher would tell me she is not doing well. I'm not sure what to do I'm not a teacher.
>
> (M2-FGI, mother 2, focus group interview)

Parents want to be communicated with, and parents want to fulfil their duties as parents and be involved in the students' learning.

> I feel because we have all these communication tools available to us why not use it? You can WhatsApp me, you can phone me, and you can email me. You can communicate on any level.

(M2-FGI, mother 2, focus group interview)

There are several challenges for parents when assisting with mathematics homework. Firstly, one of the greatest challenges parents' experiences is the solution methods applied in mathematics classes. When they want to assist, they feel that the teaching and solution methods have changed since their time at primary school. Secondly, parents have problems with time and availability; they do not always have the time to sit with the students and assist them with the mathematics homework and must create opportunities to do so due to their other parental commitments. Finally, there are challenges in communication between the parent and the teacher. Parents believed that there was no two-way communication between them and the teachers when assisting students with mathematics homework. They received minimal or no assistance from teachers which means Epstein et al. (2002), forth type of parental involvement (learning at home) is often absent because Epstein et al. (2002) second type of parental involvement (communication) is compromised.

Reflections on the FMP

There were many issues identified when parents reflected on their participation in FMP such as motivation, mathematics language, and beliefs and attitudes about mathematics. Parents showed eagerness and motivation to start and participate in the FMP and wanted to assist the students with their learning of mathematics at home. One parent had this to report:

> I think it is a good thing because it is a long time coming, I have been asking for something like this for years. You speak to certain teachers about it then it's, oh it's a good idea, but it never happens.

(M2-FGI, mother 2, focus group interview)

> I think this is a good thing; this way teachers can understand from a parent's point of view, where we are coming from, especially when our kids are struggling.

(M3-FGI, mother 3, focus group interview)

Their eagerness to participate in the programme was motivated by their perceived inability to adequately assist students with mathematics homework resulting in frustration growing among the parents (Fu et al., 2017).

> Yeah, for me it's to take the frustration out for myself. If I know how to do it, I'm not going to be frustrated, and then I'm going to be able to help my child better.

(M1-FGI, mother 1, focus group interview)

Their eagerness increased as parents participated in the FMP. The FMP also allowed parents to see how the student's viewed mathematics, how they approach the subject, and how they think mathematically. As one of the parents explained:

> It was very informative and allowed me to see my child's strengths and weaknesses. It made it fun and easy to show the child how to do maths.

(P1-FMPR, parent 1, family maths program reflection slip)

During the FMP, it was found that some parents were unfamiliar with the terminology used in the current mathematics curriculum. This can lead to parents not fully understanding the homework task requirements (Vukovic & Lesaux, 2013). The FMP addressed this by defining the terms used in the classroom to the parents with brief explanations.

> I can understand better and can explain better to my child because I know now what certain things mean.

(P2-FMPR, parent 2, family maths program reflection slip)

Some of the participants in the FMP held a perception that how mathematics is taught within the current curriculum is different from the mathematics in their years at primary school. This can influence parents' attitudes towards the subject negatively giving a feeling of incompetency when assisting students with mathematics homework due to unfamiliarity with how mathematics is taught within the current curriculum.

> Sometimes I feel it is the method in which things are done because what I did in class in my schooling is different to theirs. I need to go back and think and just see what I did.

(P3-FMPR, family maths program reflection slip)

> Not the same maths we did at his age. Some of the work is different from what I was taught when I was younger.

(P4-Pre. WQ, parent 4, pre-workshop questionnaire)

According to Gunur et al. (2019), parents' attitudes toward mathematics can either show students that mathematics is a valuable and understandable subject or something to be feared and misunderstood. When the parents in the FMP were made aware of the language used within mathematics, they showed a better understanding of what had to be done regarding the homework activities and the methods used within the mathematics classroom. Parents appeared to be more confident when they were assisting with mathematics homework, and their willingness to assist increased. This is like the research of Monson (2010)

and Page (2016) illustrating that if parents are confident and knowledgeable in mathematics, their involvement with the students' homework can increase. From the post workshop questionnaire (Pst. WQ) this is what some of the parents had to report.

> The methods were very useful. I can understand better and can explain better to my child.
>
> (P5-Pst. WQ, parent 5, post-workshop questionnaire)

> I could even assist relatives.
>
> (P3-Pst. WQ, parent 3, post-workshop questionnaire)

> I'm excited to help her because I understand it when I see it in her books.
>
> (P3-Pst. WQ, parent 3, post-workshop questionnaire)

The data collected from the reflections during the FMP indicated that parent motivation, mathematical language, beliefs and attitudes, and curriculum expectations were the dominant issues that emerged from the data. Cao et al. (2019) argue that when parents lack content knowledge and confidence due to being unfamiliar with methods of how to assist students, this could affect parent eagerness and motivation. This can cause student motivation to also be impaired, and academic achievement can be compromised. Supporting students with homework provides parents the opportunity to promote beliefs, attitudes, and behaviours that promote effective study skills and mathematical achievement when they have a favourable attitude and belief about the subject of mathematics (Bempechat, 2019; Pfeiffer, 2018). This suggests that the belief and attitudes that parents hold about the subject can be changed.

Vukovic and Lesaux (2013) propose that language proficiency contributes to mathematical development. They discovered that students' language skills pose a challenge to their ability to do well in mathematics since they are unable to comprehend the task requirements. This lack of understanding can mean that parents need to help students in comprehending the requirements of the homework activity and the terminologies used within mathematics. When the parents in the FMP were made aware of the language used within mathematics, they seemed to develop a better understanding of what had to be done regarding homework activities. Furthermore, some parents were unaware of the curriculum expectations the students had to fulfil by the end of the academic year. According to Epstein et al. (2002), second type of parental involvement (communication), this type of information needs to be made available to parents at the beginning of the academic year. This helps parents in knowing what students need to do according to the curriculum and the requirements students need to fulfil by the end of the academic year. When this information was presented to the parents during the FMP, parents had a greater understanding of why certain skills and methods were taught within the grade as well as how the methods taught within the grade linked to the next grade.

DISCUSSION

The purpose of this paper is to explore how FMP assisted parental involvement in mathematics homework by looking at the challenges parents experienced in assisting children and the issues that emerged as they reflected on their participation in FMP. This is particular to a small group of Grade 4 (age 9) parents in a primary school in South Africa but may have relevance for other parents and schools with similar experiences. The discussion that follows will focus on what challenges parents identified when helping the students with mathematics homework and the issues that emerged when parents reflect on their involvement in an FMP.

Challenges

As previously mentioned, parents were sometimes confused when dealing with the mathematics content and the teaching methods used in class. They were unfamiliar with methods used in the teaching of mathematics in the current curriculum which caused a lot of time wastage. We know from previous studies that if parents are familiar with the methods and the content taught in class and have the necessary skills to reinforce what was taught in class, the time spent on homework was reduced (Jafarov, 2015). Some parents indicated their availability was a challenge, and this included both single and married parents. According to O'Sullivan et al. (2014), parents' responsibilities and having to provide for their family can consume their availability leaving them with limited time to sit and assist with mathematics homework. Being unfamiliar with the content and methods led to time wasting trying to establish what needed to be done within the homework activities. This further limited the already restricted time they must sit and assist with mathematics homework. In this study, it was found that being more prepared and having the necessary skills and knowledge about the content and methods accompanied by an understanding of the mathematical language used to teach the content helped parents and led to less time being wasted trying to comprehend the requirements of the homework task.

Another challenge identified was communication with both the parent and learner and with the parent and teacher. The results showed that parental involvement must not just be limited to assisting with mathematics homework and parent encouragement but regular communication with the students about the importance of the subject, and the benefits that it poses for the student's education and future career helped. Al-Mahdi (2010) argues that regular parent-teacher communication is essential and when homework is assigned, parents must be given adequate information about the assignment. Page (2016) added that consistent communication between parents and teachers ensures that parents are aware of what the students are going through in mathematics class, have a variety of ways to voice their concerns, and can provide useful information to the students' teachers about their mathematical development. The results from this study indicated that parents seldom discussed the

difficulties they experience when helping the students with mathematics homework with the students' teachers. Parents in the FMP agreed they should talk to the teachers about the difficulties they encounter when helping the students with their mathematics homework since the teacher may be able to provide advice on how to best help the student.

Family Maths Programme Reflections

Parents acknowledged they often lack motivation when it comes to assisting with mathematics homework. This could be because parents lack the knowledge of the methods and strategies used in the mathematics class and are not sure how to assist students adequately (Jay et al., 2018; O'Sullivan et al., 2014). According to Epstein et al. (2002), schools should hold workshops for parents and give them appropriate information about the subject as well as how to reinforce the mathematical concepts learned and set up the ideal learning environment at home. The FMP led to parents being more motivated to assist with mathematics homework and had a higher degree of confidence. They felt more equipped to provide a better quality of parental involvement after being provided with the necessary knowledge and skills to assist students better at home with mathematics.

These results are like Al-Mahdi (2010) who suggests that homework tasks must not just have clear and sufficient information on the task but must include information on how parents can assist the students. According to Ahmed and Bora (2018), there is little to no correlation between parents' communications with teachers or schools about the students' education and mathematics. However, according to Page (2016), regular communication between parents and teachers can assure that parents are aware of what the students are going through in the mathematics classroom and should be able to express their concerns. Some of the results showed that parents hardly ever discussed their difficulties when helping with mathematics homework with the teachers. Yet, parents are in favour of speaking to the teachers concerning the challenges they face when assisting with mathematics homework because guidance on how best to assist the students can be given.

Parent reflections also indicated that assisting students was often a challenge due to being unfamiliar with the terminology used in the current mathematics curriculum which made understanding mathematics activities difficult. This lack of understanding affected the effectiveness of their involvement with mathematics homework. This is consistent with that of Moschkovich (2012), who discovered that students need parental assistance when they interact with the challenging language used in mathematics classes and at home; however, if parents lack the understanding of the meaning of the terminologies used in mathematics homework tasks, providing adequate support may not be possible. This links to Epstein's second type of parental involvement: communication (Epstein et al., 2002) which highlights that consideration must be given to parents who do not speak English as their first language because these parents may not be able to comprehend the requirements of the homework task. This includes the terminologies used in mathematics and language proficiency which can be a hindrance to mathematics success (Vukovic & Lesaux, 2013).

During the FMP, this was addressed by providing parents with the definitions of the terminology used in the current mathematics curriculum. This further increased parents' confidence as they could better comprehend the requirements of the homework tasks because they now understood the terms they were reading.

Parents' belief and attitude toward the subject of mathematics was another issue that emerged from parents' reflection on their participation in FMP. The results showed that some parents who participated in the FMP held a belief that the way mathematics is done within the current curriculum is different from the mathematics that they did when they were at primary school. This belief could result in parents having a negative attitude toward the subject of mathematics. According to Bempechat (2019) and Pfeiffer (2018), homework is a critical part of the learning process as it allows parents to cultivate beliefs and behaviours within the student. Abah et al. (2018) agree that parental involvement is more than just monitoring the students' activities and helping improve their study habits. Parents' involvement can also help the student to build a positive temperament toward schoolwork and especially mathematics.

Parent knowledge of the Grade 4 mathematics curriculum was insufficient, and they did not know the curriculum expectations for students. Furthermore, they had not received any such information. When they received this information during the FMP, they reflected a better understanding concerning why certain methods were taught within the grade as well as why it had to be reinforced in a particular way at home. This again aligns with Epstein et al. (2002), second type of parental involvement: communication, when parents are aware of the curriculum outcomes for the students, they can better assist to reach the outcomes and meet the expectation set out by the curriculum. The parent reflections showed that when parents are aware of the curriculum expectations for students, they had a greater understanding of the purpose of the knowledge and skills taught in class. They saw the expectations as goals that need to be met by the end of the academic year and appeared to be more willing to want to assist with mathematics homework.

CONCLUSION

FMP has the potential to assist parents and change their view of mathematics homework, by providing the much-needed knowledge, skills, and supporting resources with regular parent-teacher communication (Epstein et al., 2002; Otani, 2019). This sample of parents appeared to be more motivated, after a short FMP, to assist students with homework and had a greater level of confidence. Being confident seemed to help parents to develop a more positive attitude towards mathematics as their beliefs about the subject changed, a mind-set that will hopefully be shared by students (Epstein et al., 2002; Gunur et al., 2019). This could have an overall positive effect on parental involvement with mathematics homework and the quality of the assistance which will benefit the students. Mathematics homework is the opportunity for parents to cultivate the needed attributes within students to

develop academically and, in the case of this study, mathematically as well (Bempechat, 2019; Bronfenbrenner, 1994; Pfeiffer, 2018).

FMP can be an opportunity for parents to be exposed to the content and methods dealt with in the mathematics classroom (Otani, 2019). Hoeke (2017) argues that parents can confuse students by using alternative methods to those taught in class, FMP can decrease this possibility. It can provide an opportunity for the improvement of both parental involvement and students' understanding of mathematics and enhance their overall mathematical development (Bronfenbrenner, 1994). Additionally, it is an opportunity for teachers to introduce parents to the mathematical terminology used in the classroom. It gives parents the chance to enhance their mathematics vocabulary so that it is easier to understand the homework tasks. This will not be possible if there is no communication between parents and teachers. Parents need to communicate their expectations to the teacher and vice versa for the student to achieve academic success. Together, parents and teachers need to collaborate to achieve the goals set out for the student regarding the curriculum outcomes as it will influence the future development of the student (Bronfenbrenner, 1994).

There are some limitations associated with this study in terms of sample size and duration of the FMP. The sample size could have been larger as the projected sample size was not achieved due to COVID complications. Many parents were reluctant to come to school and interact in groups. The duration of the FMP could have been longer as there were only 4 sessions in this study, however many of the issues that emerged resonated with results from previous studies. These are important for teachers to understand and to try to involve parents more actively using social media as an example.

This research can be extended in several ways involving parents, students and teachers. A more comprehensive FMP could be developed, which includes interviewing parents before, during, and after their participation in the FMP. This would provide a deeper understanding of how the FMP supports parental involvement in their children's mathematics homework. Interviews with students before and after the FMP could also be conducted to gain insights into how parental assistance impacts their homework process. Additionally, the FMP could incorporate pre- and post-program content tests to monitor students' mathematical performance. This would help teachers determine whether increased parental involvement positively influences students' mathematical achievements. It is important to determine whether parental involvement in homework enhances students' performance and attitudes towards the subject; helps to maintains the status quo or potentially hinders their mathematical progress. In conclusion, this research aims to provide a more holistic understanding of the parental involvement in mathematics homework, thereby guiding future strategies for effective home-school collaboration in mathematics education.

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REFERENCES

Abah, J. A., Age, T. J., & Okoronkwo, M. O. (2018). Returning responsibility to the home: Outcomes of background checks on low and high achievers in middle basic mathematics in north bank suburb of Makurdi, Nigeria. *Journal on Efficiency and Responsibility in Education and Science, 11*(2), 29-37. https://doi.org/10.7160/eriesj.2018.110202

Ahmed, S., & Bora, A. (2018). Effects of parental involvement on secondary school students' mathematics achievement in Assam, India. *Research Review Journals, 3*(7), 275–281. https://doi.org/10.2139/ssrn.2156413

Al-Mahdi, O. (2010). A qualitative investigation of home-school relationships and children's mathematics learning in and out-of-school in Bahrain. *Procedia-Social and Behavioural Sciences, 8*, 427-438. https://doi.org/10.1016/j.sbspro.2010.12.059

Bempechat, J. (2019). The case study for quality homework: Why it improves learning, and how parents can help. *Education Next, 19*(1), 36-68.

Bronfenbrenner, U. (1994). Ecology of human development. *International Encyclopaedia of Education, 3*(2), 33-37. https://doi.org/10.1037/0033-295X.101.4.568

Brown, J. C., Bradbury, K., Burke, M. A., Graves, E., & Triest, R. K. (2022). Involvement, engagement, and community: Dimensions and correlates of parental participation in a majority-minority urban school district. *Urban Education, 57*(5), 899-934. https://doi.org/10.1177/0042085920902245

Cao, Y., Feng, X., Gao, L., Gong, S., & Xie, K. (2019). Effects of parental autonomy support and teacher support on middle school students' homework effort: Homework autonomous motivation as mediator. *Frontiers in Psychology, 10*(612). https://doi.org/10.3389/fpsyg.2019.00612

Chophel, T., & Choeda, U. (2021). Impact of parental involvement in homework on children's learning. *Journal of Education, Society, and Behavioural Sciences, 34*(6), 35-46. https://doi.org/10.9734/jesbs/2021/v34i630334

Cohen, L., Manion, L., & Morrison, K. (2018). *Research methods in education* (8th ed.). Routledge. https://doi.org/10.4324/9781315456539

Davids, E. L., & Roman, N. V. (2013). Does family structure matter? Comparing the life goals and aspirations of students in secondary schools. *South African Journal of Education, 33*(3), 1-12. https://doi.org/10.15700/201503070745

Dettmers, S., Yotyodying, S., & Jonkmann, K. (2019). Antecedents and outcomes of parental homework involvement: How do family-school partnerships affect parental homework involvement and student outcomes? *Frontiers in Psychology, 10*(1048). https://doi.org/10.3389/fpsyg.2019.01048

Epstein, J. L., Jansorn, N. R., Salinas, K. C., Sanders, M. G., Simon, B. S., & Van Voorhis, F. L. (2002). *School, family, and community partnerships: Your handbook for action* (2nd ed.). Sage Publications.

Fu, M., Yuan, T., & Xue, Y. (2017). Parental absence accompanies worse academic achievements: Evidence-based upon a sample of left-behind children in rural China. *Frontiers in Education, 2*(38). https://doi.org/10.3389/feduc.2017.00038

Gunur, B., Makur, A. P., & Prahmana, R. C. I. (2019). How mathematics attitude of mothers in rural areas affects their children's achievement. *Journal of Physics: Conference Series, 1188*, Article 012009. https://doi.org/10.1088/1742-6596/1188/1/012009

Henning, J. E., Liu, Y., & Sulaimani, M. F. (2020). The significance of parental involvement in the development in infancy. *Journal of Educational Research and Practice, 10*(1), 161-166. https://doi.org/10.5590/JERAP.2020.10.1.11

Hoeke, C. (2017). *Homework practices: Teacher and parent perceptions of efficacy and purpose* (Unpublished doctoral dissertation, East Tennessee State University). United States. https://dc.etsu.edu/cgi/viewcontent.cgi?article=4725&context=etd

Jafarov, J. (2015). Factors affecting parental involvement in education: The analysis of literature. *Khazar Journal of Humanities and Sciences, 18*(4), 35-44. https://doi.org/10.5782/2223-2621.2015.18.4.35

Jay, T., Rose, J., & Simmons, B. (2017). Finding "mathematics": Parents questioning school-centred approaches to involvement in children's mathematics learning. *School Community Journal, 27*(1), 201-230.

Jay, T., Rose, J., & Simmons, B. (2018). Why is parental involvement in children's mathematics learning hard? Parental perspectives on their role in supporting children's learning. *SAGE Open, 8*(2). https://doi.org/10.1177/2158244018775466

Kohn, A. (2007). *The homework myth: Why our kids get too much of a bad thing*. Cambridge, Massachusetts, United States: Da Capo Press.

MacBlain, S. (2018). *Learning theories for early years' practice.* SAGE Publications.

Mahuro, G. M., & Hungi, N. (2016). Parental participation improves student academic achievement: A case of Iganga and Mayuge districts in Uganda. *Cogent Education, 3*(1). https://doi.org/10.1080/2331186X.2016.1264170

Modisaotsile, B. (2012). The failing standard of basic education in South Africa. *Africa Institute of South Africa, 72*.

Mohlala, T. (2011). Maths manual for moms. *The Teacher*, September, 6. http://momsmathsmanual.co.za/in-the-press/

Monson, J. E. (2010). *Parent involvement in mathematics education: Parents and teachers working together to improve student self-confidence in mathematics* (Unpublished master's thesis, University of Minnesota Duluth). United States. https://core.ac.uk/download/pdf/83128794.pdf

Moschkovich, J. (2012). Mathematics, the common core, and language: Recommendations for mathematics instruction for ELs aligned with the common core. *Proceedings of the Understanding Language Conference*. Stanford University.

Ndebele, M. (2018). Homework in the foundation phase: Perceptions of principals of eight public primary schools in Johannesburg. *South African Journal of Education, 38*(2), Article 1461. https://doi.org/10.15700/saje.v38n2a1461

O'Sullivan, R., Chen, Y., & Fish, M. C. (2014). Parental mathematics homework involvement of low-income families with middle school students. *School Community Journal, 24*(2), 165-188.

Otani, M. (2019). Relationships between informative school outreach and parental involvement for elementary and middle school children. *Educational Research for Policy and Practice, 18*, 141-166. https://doi.org/10.1007/s10671-018-9237-3

Page, R. D. (2016). *The role that parents play in their children's academic progress at a previously disadvantaged primary school in Cape Town* (Unpublished master's thesis, University of the Western Cape). South Africa. https://etd.uwc.ac.za/bitstream/handle/11394/5462/Page_rd_med_edu_2017.pdf?sequence=1&isAllowed=y

Pfeiffer, V. (2018). Homework policy review: A case study of a public school in the Western Cape Province. *South African Journal of Education, 38*(1), Article 1462. https://doi.org/10.15700/saje.v38n1a1462

Ramdass, D., & Zimmerman, B. J. (2011). Developing self-regulation skills: The important role of homework. *Journal of Advanced Academics, 22*(2), 194-218. https://doi.org/10.1177/1932202X1102200202

Science, Mathematics and Technology Education Unit. (2008). *The Family Maths and the Family Science Programme*. Nelson Mandela University.

South African Numeracy Chair Project. (2011). *South African Numeracy Chair Project Annual Report.* Rhodes University. https://www.ru.ac.za/sanc/

Tabaeian, M. (2016). The effect of parental over-involvement on educational attainment. *Proceedings of the 1st National English Language Conference*. ResearchGate.

Tamboto, H., Lengkong, J. S. J., Rotty, V. N. J., & Tambingon, H. N. (2021). The involvement of students' parents in organizing learning from home at elementary schools in Tomohon City. *The Asia Pacific Journal of Management and Education, 4*(1), 35-51. https://doi.org/10.32535/apjme.v4i1.1044

University of the Free State. (2013). *Family math and science: The old mutual math programme*. https://www.ufs.ac.za/fams/family-math-and-family-science-home/unlisted-pages/all/news-archive-1

Vatterott, C. (2018). *Rethinking homework: Best practices that support diverse needs*. Alexandria, United States: ASCD.

Vukovic, R. K., & Lesaux, N. K. (2013). The language of mathematics: Investigating the ways language counts for children's mathematical development. *Journal of Experimental Child Psychology, 115*, 227-244. https://doi.org/10.1016/j.jecp.2013.02.002

Wells, L. (2011). *Mom's math manual*. http://momsmathsmanual.co.za/in-the-press/

Yin, R. K. (2009). *Case study research: Design and methods* (4th ed.). Sage Publications.