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WHEN RELIGION MEETS MATHEMATICS: FROM MATHEMATICAL ANXIETY TO MATHEMATICAL WELL-BEING FOR MINORITY GROUP STUDENT

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ABSTRACT

The mission of positive psychology is to mitigate negative emotions while bolstering positive ones, thereby influencing student engagement in classroom learning activities, including mathematics. This study elucidates the Realistic Mathematics Education (RME) approach within the framework of Islamic teachings—specifically, inheritance law and charity—in the context of fractions and number operations. Its objective is to alleviate mathematics anxiety, a prevalent negative emotion, and enhance well-being during mathematical learning. Drawing upon flow theory from positive psychology, the research endeavors to optimize mathematical well-being by crafting appropriately challenging questions. Employing a descriptive qualitative methodology, the study focuses on an Indonesian mother and her ten-year-old son, residing in Uithoorn, Amsterdam, Netherlands, belonging to minority groups in ethnicity and identity, with religion being a significant aspect of their lives. Data collection involves observation, interviews, tests, and documentation, with analysis employing data reduction, presentation, triangulation, and verification techniques. The study utilizes socio-religious problems as a context, one of the characteristics of RME, such as inheritance division, to design mathematical challenges. The findings demonstrate a marked transition from math anxiety to math well-being, manifested through heightened enthusiasm and cheerfulness in learning mathematics, particularly by the mother. Noteworthy transformations include increased engagement, generous gestures towards the teacher, and frequent smiling, contrasting with previous instances of math anxiety during learning sessions. Furthermore, the results indicate that RME facilitates comprehension of mathematical concepts and fosters understanding of the intersection between mathematics and Islamic life among minority groups, as detailed in this article.

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1. INTRODUCTION

Minority groups are prevalent worldwide and vary by region and context. In the United States, minority groups are commonly identified by race and ethnicity, including Black (Keum & Cano, 2021; Riggle et al., 2021), Hispanic (Hildebrand & Cordes, 2024; Weinberger et al., 2018), Asian American (Hildebrand & Cordes, 2024; Li et al., 2023), and Latinos. In Europe, common minority groups include Turkish (D'hondt et al., 2016), Moroccan (Bertran Tarrés et al., 2016; Vázquez-Flores et al., 2023), and Bangladeshi (Brüß, 2008). Minorities can also be defined by religious affiliation (Sabato & Kogut, 2020) and gender (Hilgeman et al., 2007). These groups face issues such as well-being (Vázquez-Flores et al., 2023), education (Sheikh et al., 2022), and negative behavior, including prejudice (Bruneau et al., 2018), stereotyping, and stigma. The well-being and academic achievement of minority groups are often areas of concern (Civitillo et al., 2023). However, some minority groups are underrepresented in academic literature. An example is the Indonesian minority group, which has not been extensively studied. This research aims to address this gap and bring greater focus to the experiences and challenges faced by the Indonesian minority group in various contexts, contributing to a broader understanding of minority groups worldwide.

Well-being is a universal goal, with individuals striving for a comprehensive sense of well-being, as described by Netemeyer et al. (2018), or specific aspects of it. This can encompass various domains such as psychological well-being (Chamizo-Nieto et al., 2020), emotional well-being, career well-being, environmental well-being, financial well-being, and well-being in academic contexts (Bücker et al., 2018; Donohue & Bornman, 2021). A notable subset is mathematical well-being, referring to the positive experiences and a sense of joy during mathematics learning.

Despite the broader focus on well-being, studies on mathematics frequently examine math anxiety, which is often found across various groups, including minority groups. This focus on anxiety rather than well-being highlights an opportunity for research to explore how learners can experience enhanced well-being within the realm of mathematics, particularly for minority populations where math anxiety may be more pronounced. By shifting the focus from anxiety to positive experiences, research can contribute to developing strategies to foster a positive learning environment in mathematics.

Many minority or ethnic groups face a range of negative behaviors that can adversely impact their quality of life and psychological health (Cobb et al., 2019). These behaviors include violence, aggression, stereotyping, and stigma, which can lead to significant psychological issues and reduced well-being (Birtel et al., 2017; Lin & Tsang, 2020). Stigma experienced by minority groups manifests as prejudice (Nelson & Olson, 2023; Yao & Yang, 2017), adaptation problems (Skowron, 2004), and various forms of discrimination. Other common issues among these groups are acculturation challenges, stereotyping, and low academic achievement (Makarova & Birman, 2015; Rabiner et al., 2004; Trieu & Jayakody, 2019).

Research has shown that the salience of minority status can contribute to poorer academic outcomes and lower motivation (Hartley & Sutton, 2013; Maloney et al., 2013; Spencer et al., 2016). The consistent experience of stereotype threat in educational settings can erode students' sense of belonging, diminish their interest in academic pursuits, and negatively impact women and minority groups' inclination toward science and technology fields (Schmader & Hall, 2014). Researchers in France found that activating counter-stereotypes can improve test performance for male and female students. Similar studies have been conducted to assess the impact of stereotype threat on math performance in Uganda and East Africa (Picho & Schmader, 2018). In China, promoting cooperation and focusing on achievement helped reduce stereotype threat among Chinese students (Wen et al., 2016).

One academic area often associated with anxiety and performance issues is mathematics. Math anxiety is a prevalent problem that affects people of all ages globally (Luttenberger et al., 2018). About 93% of adult Americans report experiencing some degree of math anxiety. The issue is well-documented, with a meta-analysis demonstrating its prevalence (Antony-Newman, 2019). Despite this, mathematics is an essential skill for everyday life, from formal and informal work to trade and social life, including religious practices like zakat and infaq (Hodaňová & Nocar, 2016). The European Parliament and the Council of the European Union have identified mathematical skills as a core competency in lifelong learning. Thus, early school experiences are critical in shaping children's future skills and comfort with mathematics.

Several factors contribute to children's ability to learn mathematics in elementary school. These math achievement determinants encompass biological, cognitive, emotional, and personality traits, as well as environmental factors such as culture, family, and school (Maxwell et al., 2017; Minarni et al., 2018). Math anxiety in children, parents, and teachers is believed to be a significant predictor of low math achievement (Barroso et al., 2021; Szczygieł et al., 2024), indicating that it is an issue requiring attention from educators and researchers to help students reach their academic potential (Ramirez et al., 2018). Additionally, a child's math anxiety is often associated with their parents' math anxiety (Casad et al., 2015), with parental anxiety and low motivation contributing to the problem (Parhiala et al., 2018).

The impact of math anxiety extends beyond children to include parents and teachers, who may also feel anxious about their children's math performance. This anxiety can influence a child's mathematical abilities, potentially leading to increased anxiety and lower academic achievement. Peer influence is another crucial factor in shaping children's emotional and educational well-being. Peers can positively or negatively impact each other's math learning (Maass et al., 2019; Mazana et al., 2019).

Recent studies reveal that even young children with limited math experience may experience some degree of math anxiety (Cargnelutti et al., 2017; Ramirez et al., 2016). While the average level of math anxiety among children tends to be low or moderate, some experience high levels of anxiety. This trend underscores the need to address math anxiety early, given its potential impact on a child's math achievement and overall academic success. Addressing these factors is essential to foster a supportive learning environment and help children develop confidence in their math skills.

The results of this study have contributed to the sources of students' math anxiety. Researchers cite several factors as sources of mathematical anxiety, namely cognitive factors, personality factors, social factors, and factors related to the nature of mathematics. Unresolved problems and controversies can be found in every area of mathematical anxiety research; However, this is especially evident in social sciences (Lindskog et al., 2017; Lorenzen, 2017). It was interesting to explore the social sources of students' math anxiety and math achievement: more specifically, the influence of adult math anxiety on children's math anxiety and math achievement. Researchers point to the importance of math anxiety levels in parents and early teachers in shaping children's math anxiety and their math achievement levels but often do not provide sufficient evidence to confirm this opinion. Although the math anxiety of parents and teachers is generally believed to be an essential factor in explaining children's math anxiety and achievement, little research has been done to examine this relationship. A study is planned to ascertain whether children's and adults' levels of math anxiety are directly or indirectly related to each other and whether adult math anxiety can be a factor in predicting a child's math achievement (Lindskog et al., 2017). These findings, in turn, suggest that reduced math anxiety in parents and teachers means lower levels of math anxiety in children (Szczygieł, 2020).

The importance of the family environment, family involvement in success, and parental involvement in children's math skills and educational anxiety in Europe have also been examined (Hajisoteriou & Angelides, 2016). One of the discussions related to academics in ethnic minority circles is also a mathematical problem (Butler-Barnes et al., 2021; Lamprianou & Boyle, 2004). Children's success in education is often influenced by parental involvement.

Many experts also state that children's education requires parental involvement (Houri & Sullivan, 2019; Jung & Zhang, 2016). Math anxiety in parents that helps children understand schoolwork can predict their children's math outcomes (Maloney et al., 2015). Parents' levels of anxiety about maths did not predict children's reading achievement, suggesting that the influence of their anxiety was specific to maths. Parents with high levels of math anxiety could express negative emotions when helping their children with math homework. This can lower children's motivation to learn the subject, and thus lead to their low achievement in maths and increase their maths anxiety. Parental math anxiety plays a vital role in predicting child performance but does not confirm the hypothesis of a direct link between parent-child math anxiety.

The presentation of mathematics material in the learning process at the elementary school level differs from the junior high school or high school level. This is due to differences in characteristics and mental development. Bruner's theory states that when mathematics is given to elementary school students, the teacher must first understand students' cognitive development. Mathematical material must be presented through an enactive stage first, where real objects must be involved to represent the concepts presented so that students can understand them more easily. After that, the material can be offered through iconic stages where mathematical concepts are explained by involving learning media to equalize students' perceptions of the objects described. Finally, when the enzymatic and iconic stages are successfully passed, they enter the symbolic stage, where students are in the form of symbols in mathematics. Thus, students can accept the given mathematical concepts, and learning objectives will be achieved easily (Lubis et al., 2022). Mathematical anxiety, often also called math phobia, is the fear of not being able to do math. Anxiety about maths existed long before maths was studied. Because of their performance, some students experience anxiety when facing math challenges.

Anxiety can stem from various causes, and for many children, mathematics can seem as challenging and ominous as a formidable foe. Some students might quickly lose interest or fall asleep when they open their math textbooks (Prahmana et al., 2021). Their math performance often reflects this disinterest, with poor scores and a lack of motivation (Prahmana et al., 2019). This leads many to give up on mathematics, declaring themselves incapable of completing math-related tasks. However, this avoidance ultimately reinforces the problem, reducing exposure, ability, and practice, which in turn increases anxiety and leaves students even less prepared to meet their learning objectives.

Math phobia is a severe form of anxiety characterized by intense feelings of stress, worry, or fear that interfere with mathematical performance. The condition can cause panic, disrupting a person's ability to work effectively with math-related tasks. Importantly, math phobia does not necessarily indicate a lack of mathematical ability; somewhat, anxiety symptoms can hinder an individual's optimal performance (Neelofar et al., 2022). This vicious cycle of anxiety leading to avoidance, which further exacerbates the problem, requires dedicated attention from educators and mental health professionals to help students overcome math-related anxiety and unlock their full potential in the subject.

1.1. Islam Religion Offers Comfort and Motivation

Many Indonesian Muslims in the Netherlands find comfort in Islamic values, drawing strength from Quranic verses that encourage patience in the face of adversity, such as prejudice, threats, stereotyping, and stigma (Diponegoro & Mujidin, 2018). Islamic teachings advocate prayer and seeking divine help as a means of coping with negative behaviors, reflecting the stories of prophets who sought God's guidance when confronted with hostility.

One way to reduce math anxiety and promote math well-being is through positive interventions inspired by religious teachings. Positive psychology can incorporate Islamic principles to diminish anxiety and foster a sense of well-being. Islam offers a pathway to reducing math anxiety through prayer and spiritual practices, which can enhance overall well-being and cultivate a positive outlook in learning mathematics. Islam's support for mathematical learning is demonstrated by its teachings related to inheritance law, the lunar calendar, and the calculation of zakat, all of which require mathematical knowledge. Understanding these concepts is considered a religious obligation, and mathematics serves as a tool to fulfill this requirement.

Research has shown that integrating Islamic spiritual values with mathematics instruction can positively impact young Muslims' lives (Kusno et al., 2020). Islamic teachings view mathematics as an essential tool for life. The Qur'an suggests that celestial movements are designed to help people understand the passage of time and historical events. This alignment of mathematical principles with religious teachings is significant because it underscores the spiritual importance of mathematics.

Islamic contributions to mathematics have deep historical roots, with scholars like Al-Khawarizmi, Al-Kashi, Al-Khayyam, and Al-Khazin making foundational contributions to modern mathematics (Al-Daffa', 1977; Al-Kufi & Al-Salihi, 2022). These scholars' discoveries include critical concepts like algebra and trigonometry, which are still used today. They also laid the groundwork for terms related to commerce, such as selling price, purchase price, gross, net, and tara, and terms related to family inheritance, such as father, son, husband, and wife shares. These teachings and contributions highlight the profound connection between Islamic values and mathematics, offering a unique approach to addressing math anxiety while fostering a deeper appreciation for the role of mathematics in Islamic life.

1.2. Learning Mathematics through Realistic Mathematics Education

The difficulty in learning mathematics is mainly because the learning method used is lectures, while students find it difficult to imagine how it is applied in everyday life (Fägerstam & Grothérus, 2018). On the other hand, there is a learning approach that uses the context of everyday life and focuses on student activities to rediscover and build their knowledge in problem-solving, namely the Realistic Mathematics Education (RME) approach (Risdiyanti et al., 2024; Tanujaya et al., 2017). RME is based on the philosophy of Freudenthal (2006), which states that mathematics is a human activity and must be connected to reality. This philosophy underlies the implementation of several studies related to RME that use the context of daily activities as a starting point in mathematics learning (Prahmana, 2022; Risdiyanti & Prahmana, 2020; Risdiyanti et al., 2024). Therefore, the RME approach was used in this study to solve the social arithmetic learning problem.

Because the learning process is designed based on a realistic mathematical education approach, it needs to reflect three main principles of RME, namely guided rediscovery, didactic phenomenology, and emerging models (Fauzan et al., 2013; Gravemeijer, 1994). The principle of guided reinvention is applied to sequence the learning trajectory of studying

social arithmetic topics as intended based on the RME point of view. The second RME principle is realized by using contextual problems as a starting point for students to experience horizontal and vertical mathematization processes (Gravemeijer, 1999). Contextual problems will also help students use their model (model of) to solve problems until they emerge into a formal way to solve mathematical problems (model for).

One context in the RME approach is using activities close to students as a starting point for learning (Laurens et al., 2017; Revina & Leung, 2019). This activity is part of the RME approach applied in the social mathematics learning process to improve student learning outcomes.

1.3. Mathematics Learning Environment

Math learning in children is influenced by several factors, with the learning environment and family factors playing significant roles. Parental behavior is critical among family factors, impacting children's educational outcomes. Parents can predict the intensity of their child's math anxiety and their level of math achievement. Parenting practices can either contribute to or alleviate child anxiety, but there is limited research examining the connection between parents and children's math anxiety and its effect on students' math performance.

Studies indicate that parental math anxiety can have an impact on children's math outcomes, mainly when parents with high math anxiety help their children with homework. However, this association does not hold when parents with high levels of math anxiety do not assist with homework. It suggests that the negative emotions expressed by anxious parents when helping their children with math can dampen children's motivation, leading to lower math achievement and increased math anxiety. In contrast, parents' math anxiety does not appear to affect children's reading achievement, indicating that its influence is specific to math-related subjects.

Despite the observed connection between parental math anxiety and children's math outcomes, this does not necessarily confirm a direct link between parent-child math anxiety. Other factors could contribute to the development and maintenance of math anxiety in children, including personal characteristics and environmental influences. This nuanced relationship underscores the importance of creating supportive learning environments and providing resources for parents to address their math anxiety, thus reducing its potential impact on their children.

Math anxiety in children, also known as math phobia, involves a persistent fear or worry about engaging in mathematical tasks. This fear can stem from various factors and is often linked to personal and environmental influences. Personal characteristics predicting math anxiety typically include three variables: a child's mathematical independence, math self-efficacy, and the frequency of mathematical activities at home. Among these, math self-concept—how a child perceives their ability to engage with math—is consistently the strongest predictor of math anxiety.

Math phobia can manifest in various ways. Some students become anxious when facing math-related challenges, decreasing performance and reinforcing their fear of math. This cycle of anxiety can cause students to avoid math, which reduces their exposure to math-related activities, ultimately impacting their skills and confidence. This avoidance behavior can create a vicious cycle where a lack of practice leads to further anxiety and diminished math performance.

Math anxiety can also trigger physical and emotional responses such as stress, worry, and panic, which interfere with effective math learning. A person with math phobia might not necessarily lack the ability to do math, but the symptoms of anxiety can limit their

capacity to engage with mathematical tasks to their full potential. Thus, reducing math anxiety and breaking the cycle of avoidance is critical to fostering a supportive environment where children can develop their math skills without fear or apprehension.

Environmental factors significantly influence math anxiety in children, encompassing the learning atmosphere at school, teaching practices, and parental influence. Negative experiences with math or excessive pressure to perform can intensify anxiety, whereas positive reinforcement and supportive educational practices can mitigate it. These insights underscore the importance of educators, parents, and policymakers creating environments where children feel encouraged and confident in their math learning journey.

Research by Soni and Kumari (2017) on older children, ranging from fifth to tenth grade, indicates a direct correlation between children's math anxiety and parental anxiety. This research suggests that parental math anxiety can influence a child's math anxiety, subsequently affecting their math achievement. This relationship persists even when parents with high levels of math anxiety assist with their children's homework, suggesting that their anxiety can still have an impact. However, the findings from Maloney et al. (2015) show a different connection, pointing to this relationship's complex and multifaceted nature.

Given these findings, addressing math anxiety requires a comprehensive approach that considers personal and environmental factors. Efforts to reduce math anxiety should focus on creating positive learning experiences, supporting parents in managing their math anxiety, and fostering a culture where students are not afraid to make mistakes. This way, children can develop a more positive attitude toward math, leading to improved performance and decreased anxiety-related issues.

To reduce math anxiety and cultivate a sense of comfort and prosperity in learning mathematics, it is crucial to align strategies with the principles of flow psychology, which promotes positive affectation and reduces adverse affectation, such as anxiety and fear (Csikszentmihalyi, 2014). The concept of flow involves a state of deep engagement and focus, where individuals find joy in the activity and lose track of time due to their immersion. In the context of math learning, fostering such a state can significantly benefit students who struggle with anxiety.

Family support is another crucial factor in improving student happiness while learning mathematics (Fiskerstrand, 2022). Encouragement and positive reinforcement from family members can help alleviate math anxiety and promote a positive learning experience. Families with anxious attitudes toward mathematics must transform their approach to one that encourages enthusiasm and confidence in math-related activities.

Strategies to achieve this transformation include positive interactions and creating a supportive environment where children can ask questions and make mistakes without fear of criticism. This can be achieved through encouraging words, constructive feedback, and active participation in mathematical activities. Furthermore, using Realistic Mathematics Education (RME), an approach that emphasizes practical and relatable mathematical problems, makes math learning more accessible and engaging for students. Families can foster a deeper appreciation for the subject by connecting math with real-life contexts. Lastly, parental involvement encourages parents to engage in math activities with their children playfully and positively. This approach helps reduce anxiety and reinforces the idea that math can be enjoyable.

The innovative activities described in the study were designed to promote social arithmetic learning among children and their mothers using the RME approach. The study, conducted over three meetings with a private tutor, explored how a supportive and engaging learning environment could help alleviate math anxiety and foster a sense of well-being and prosperity in mathematics. By adopting these strategies, families can work towards creating an atmosphere that replaces math anxiety with comfort and prosperity. This change can

improve math performance, as feeling cheerful and prosperous can enhance motivation and learning outcomes (Brooks, 2014).

The article's next section outlines the methodology section, which details the research methods used for data collection and analysis, providing insight into the study's design, participants, and instruments utilized. It explains how data was collected and analyzed to assess the impact of the Realistic Mathematics Education (RME) approach on student learning outcomes. The results and discussion section describes the learning stages across three meetings, each incorporating RME activities with contexts derived from social arithmetic themes in the Qur'an. The results indicate that innovative learning with the RME approach significantly improved student outcomes, showcasing increased engagement and reduced math anxiety. This section also discusses how these outcomes were achieved through innovative learning techniques and contextualized themes. The conclusion summarizes the study's key findings, highlighting the positive impact of the RME approach on student learning and suggesting its broader implications for math education.

2. METHOD

The research subject of this study is a 10-year-old boy identified by the initial "M," who was born in the Netherlands to an Indonesian mother. When researchers first met M, he could add and subtract numbers up to 20, but with some difficulty. He struggled with basic arithmetic and had trouble keeping pace with his school peers. However, M's arithmetic skills improved significantly through consistent training, starting with small, manageable numbers. He gained proficiency in addition and subtraction and began performing math tasks more confidently and quickly, particularly those involving fractions. The study's observations suggest that with tailored support and practice, even students who initially struggle with basic math concepts can achieve notable progress.

This qualitative descriptive research aims to describe innovative learning of social arithmetic with the RME approach. The procedure in this study is divided into three stages: preparation, implementation, and analysis. At the preparatory stage, we prepare all research instruments and conduct material trials using the RME approach. The formulas used are simple and have been studied in junior high and high school. At the implementation stage, the teacher conducts the learning process in three meetings, each lasting 100 minutes (for children, one meeting is about 30 minutes, but a day is repeated twice, and Questions and answers while playing). Then, the data analysis stage is carried out after the data collection process. The process of concluding refers to the results of observations, student work, learning activities, and the results of the final evaluation of learning.

Interviews were conducted to assess the initial abilities of the subject, aligning with the flow theory in psychology, which emphasizes manageable and engaging tasks (Csikszentmihalyi, 2014; Wagner et al., 2020). This qualitative descriptive research aims to detail innovative learning approaches for social arithmetic using the Realistic Mathematics Education (RME) method. The study procedure was divided into three stages: preparation, implementation, and analysis.

All research instruments were developed and validated during the preparation stage through material trials employing the RME approach. The instruments were also reviewed by lecturers specializing in fiqh mawaris (Islamic inheritance laws). In the implementation stage, the learning process occurred over three meetings, each lasting about 100 minutes. These sessions were designed for children, typically involving two 30-minute meetings in a single day, with interactive questions and answers during playtime. The analysis stage involved evaluating the collected data, referencing observations, student work, learning activities, and final evaluation results.

The study explored realistic math education, focusing on practical and family-oriented contexts. In this case, the subject's mother provided significant support for her son's math learning, although she initially felt anxious and lacked confidence in her mathematical skills. Her low interest in mathematics stemmed from needing help to keep up with school lessons. This attitude changed when she realized that religious contexts often use mathematics to address various religious matters, like inheritance distribution, zakat calculations, fasting periods, eclipse prayers, and prayer times. This realization motivated her to revisit mathematics, leading to a more positive outlook. The researcher leveraged this renewed interest to introduce the subject to realistic math problems related to religious themes, such as inheritance division, thereby creating a more engaging and meaningful learning experience. The research preparation plan, including these methodologies and their application, was summarized in Table 1.

Table 1. Research preparation agenda

Day/Date	Activity	Researcher	Boy and Mother
July 22, 2023	Informal meeting with the family and talking about the plan	Discussing time, when the researcher could take data	Make agreement, telling the schedule they have
Sunday, July 27, 2023	Consultation about a learning plan	Asking how many times a day he can do the research	They explained several free times a day.
Monday, July 28, 2023	Consultation about student books and worksheets	Requesting the books/and worksheet the boy and the mother have	Showing the books and worksheet
Tuesday, July 29, 2023	Start talking with students and ask the student and mother to translate the language	Asking about the book and worksheet and start giving pre-test, oral and written test to know the baseline	The boy explaining in Dutch, the mother translated into Indonesia
Wednesday, July 30, 2023 – August 2023	Research preparation consultation and research activities	start giving pre-test, oral and written test to know the baseline. Both for mother and boy	Mother and boy answering the questions.

After the evaluation test was tested by researchers on individuals with the same ability, the research process was carried out for three meetings held from July 30 to August 10, 2023. The following is the schedule for implementing the research reported in Table 2.

This study was conducted at a public elementary school in Uithoorn, a town between Schiphol and Amsterdam in the Netherlands, during July and August 2023. The subject, M, is a 10-year-old Indonesian boy in group six, equivalent to the fourth grade in Indonesia. The research involved M's mother as a family support figure, recognizing that parental involvement can enhance students' academic performance. The study focused on innovative learning of social arithmetic using the Realistic Mathematics Education (RME) approach.

Table 2. Research schedule

Day/date	Activity	Researcher	Boy and Mother
July 31, 2023	Understanding the child's ability in math, fractions, and multiplication. Determining the Rights of Children	Giving oral test and written test	The boy, answering, with several mistakes
August 01, 2023	Understanding parents' ability to teach and guide their child in math	Interviewing M mother's and motivated her to learn math, for teaching her sons and to understand Alloh's law	Listening, and tried to adjust and follow the instruction
02-08 August, 2023	Teaching children fractions multiplication, and teaching parents using inheritance law, fraction: ½; 2/3, 1/6 etc	Orally and written text. Understanding Surah An Nisa 11 to 12 (for mother). Giving math test, oral and written test (boy).	Both followed the instructions

The research comprised five meetings for social mathematics learning using the RME approach and one meeting for evaluation. The aim was to assess the effectiveness of RME in fostering math learning and reducing math anxiety. Observations were made during the learning process to capture dynamic interactions such as student discussions and question-and-answer sessions between students and teachers. Written tests were used to gauge student learning outcomes following the RME-based social arithmetic learning.

The intervention was implemented at the subject's home, involving a mother and her child, both requiring improved mathematical skills, especially in multiplication and division. The sessions focused on providing real-life contexts and engaging activities to promote understanding and boost confidence in mathematics. By creating a supportive learning environment and leveraging the RME approach, the study aimed to explore practical strategies for enhancing math learning in a family setting.

The data collection techniques used in this study were documentation, observation, and tests. Our documentation technique captures student activities through photos and video recordings. The video footage shows students' activities and strategies for solving problems. Observations are made during the learning process. Activities are carried out based on observation sheets. The test instrument in this study was a written test. The test determines student learning outcomes after participating in innovative social arithmetic learning with the RME approach. Last is the observation of affective or emotional changes.

Data analysis in this study took place after the data collection process, with conclusions drawn from observations and student work. The analysis aimed to assess the impact of religious understanding on learning and to evaluate the supporting data collected during the learning implementation. The implementation process was documented through observation sheets, documentation, and tests, which provided insights into student engagement and learning progress. Student learning outcomes were evaluated by analyzing test results, where scores were assigned based on the accuracy of students' answers, followed by a review of these results to determine overall learning outcomes.

The subject of this study was a 10-year-old boy identified as "M." He was born in the Netherlands to an Indonesian mother. When researchers first met M, he could count and subtract numbers up to 20, but with some difficulty. Initially, he struggled with simple arithmetic, including basic addition and subtraction, and needed help keeping pace with his school peers. However, after frequent training with simple math exercises, M's skills improved considerably, especially in fractions. The researcher stayed with the family during the study, providing more than twice-daily training sessions. Although M had learned addition and subtraction three years earlier, he was labeled "slordig" in Dutch (which means "careless" in English) by his teacher, indicating a need for greater attention to detail and accuracy. Despite these initial challenges, M's consistent practice and focused training ultimately led to improved math performance and a stronger grasp of mathematical concepts.

3. RESULT AND DISCUSSION

3.1. Results

We tried to explore M's ability to speak Dutch because M needed to learn more about Indonesian. M's mother has tried hard to make M understand her mother tongue (Indonesia). M's mother's effort is to get M to talk Indonesian all the time. M's mother never spoke to M in Dutch. M still struggles because his environment is children or people who speak to Dutch daily (see Figure 1). Daily M's ability in mathematics can be concluded that his mathematics ability can still be improved.

M is studying general studies and the Qur'an. The Qur'an was his mother's favorite book (see Figure 1). M’s mother was happier to teach M the Quran than others. Even though learning mathematics significantly contributes to Muslims' daily activities, students still need help understanding this topic. This is because teaching and learning activities still use conventional approaches to limit students' ability to imagine how it is applied in everyday life.

Figure 1. Daily activities of subject M

A mother from a minority group (Indonesia) living in the Netherlands. This mother felt anxious towards her son, who had difficulty dealing with mathematics lessons at school. According to various theories, mothers need to participate in learning with their children so that their children can follow lessons well at school.

This story revolves around M, a child who struggles with math and receives poor evaluations from his elementary school teachers. M's father, a dual citizen of the United States and the Netherlands, was born in the U.S. and lives in Amsterdam, while M's mother resides in Seattle, U.S. M's father, a non-Muslim who converted to Islam, married a Muslim Indonesian woman who is passionate about religious studies. He aspires for his son to become a professional soccer player, a career with high salaries that can exceed the earnings of academics. Conversely, M's mother, a Universitas Gadjah Mada (UGM) graduate with an anthropology major, desires her son to excel in math lessons but prefers that he follow her path in religious studies, focusing on the Quran and Hadith or pursue language studies, a field with minimal math. She envisions her son studying at Leiden University, known for its Arabic, cultural, and anthropological programs.

Given this context, the first meeting aimed to connect M's understanding of math with his religious background. The teacher emphasized the significance of mathematics in Islam, noting its connection to faith—a crucial aspect for M's mother, who actively studies Islamic teachings. At this stage, the research plan included observing M's classroom math lessons and collaborating with his mother to identify the content. Informal interviews with the family head provided additional insights to guide the research. The data collection involved examining M's math learning processes in school.

To enhance M's learning, the researchers introduced simple formulas to help understand inheritance laws from the Quran, explicitly focusing on Surah An-Nisa 11, which discusses inheritance distribution. This approach aimed to create a meaningful and culturally relevant context for math learning, encouraging M and his mother to engage more actively in the subject.

The first meeting with M and his mother obtained favorable results. Religious knowledge of inheritance fostered motivation in M's mother to learn inheritance. We got the opportunity to teach the child and his mother simultaneously. This selection is based on the fact that students have better emotions and behavior because of the moral teachings taught by M’s mother. This is important to ensure we can adapt to students learning mathematics. We also interviewed M's mother, who is a teacher at home. He always lent M reading books from libraries in the area.

We involve M's mother as an individual who is a family support that, according to various studies, can improve students' academic abilities, even during the 2023 school year. As a research subject yet to be studied, we used two meetings for social arithmetic learning with an RME approach and one for evaluation. The object of this research is innovative learning of social arithmetic with the RME approach.

At the beginning of M's assessment, it was known that M needed to be smoother in addition and subtraction operations. For this, the researcher must learn numbers in Dutch because M cannot speak Indonesian or English. Therefore, we give the assessment tests against M as follows:

één plus één is gelijk
één plus twee is gelijk
twee plus één is gelijk
twee min één is gelijk
één plus twee is gelijk
twee plus één is gelijk

M and his father sometimes correct the researchers' incorrect pronunciations during the study. M demonstrated proficiency with the number three when teaching addition and subtraction, so the researchers gradually increased the complexity of operations involving

the number four. This gradual increase in difficulty aimed to encourage M and keep the questions at an appropriate level of challenge, consistent with the academic flow theory from positive psychology (Csikszentmihalyi, 2014; Csikszentmihalyi & Larson, 2014)

The Realistic Mathematics Education (RME) approach played a significant role, focusing on real-life activities related to the family's religious and social practices. For instance, a practical math problem might involve distributing money to the poor: "If you want to distribute 12 euros among three poor men evenly, how much does each receive?" This type of problem connects math with social responsibility and religious teachings, making the learning process more relatable and engaging.

To help M master addition and subtraction up to the number four, the researchers used various question formats to maintain interest and provide ample practice. This approach aligns with positive psychology, encouraging academic engagement through flow experiences, where tasks are neither easy nor difficult. This method not only improved M's math skills but also fostered a more positive attitude toward mathematics, reducing math anxiety and creating a supportive learning environment.

één plus twee is gelijk
twee plus één is gelijk
één plus drie
twee plus twee
drie plus een
drie min twee
vier min één
vier min drive
vier min twee

The learning process involves repetition through dictation and playing to reinforce correct answers. When errors occur, questions are repeated until M can answer smoothly and accurately. This iterative approach aims to solidify understanding of basic math operations, including addition, subtraction, and division, which are foundational for solving more complex problems such as inheritance distribution.

Dividing inheritance involves fractions, with specific portions allocated depending on the family structure, illustrated in Figure 2. For example, a half share goes to the only daughter or to the husband if the wife has no children. A quarter share is given to the husband if the wife has children and a quarter to the wife if the husband has no children. Consider an example where a father passes away, leaving 12 kg of gold. He has two daughters and one son. To calculate how much gold each child inherits, the following steps can be taken:

1) Dividing by Gender: In Islamic inheritance law, the share for sons is generally twice that for daughters. Therefore, if there's one son and two daughters, the son gets twice as much as each daughter.
2) Total Shares: Since the son gets a double share, the total number of shares for this distribution would be four (two shares for the son and one each for the daughters).
3) Calculate Individual Shares:
   a) Divide the total gold (12 kg) by the total shares (4). This gives 3 kg per share.
   b) Each daughter receives one share, so each daughter gets 3 kg.
   c) The son receives two shares, giving him 6 kg.

Thus, each daughter would inherit 3 kg of gold, while the son would inherit 6 kg of gold from the 12 kg estate. This problem demonstrates how understanding fractions, division, addition, and subtraction in the context of inheritance distribution can be helpful

and meaningful, providing a practical way to apply mathematical concepts while reinforcing religious teachings.

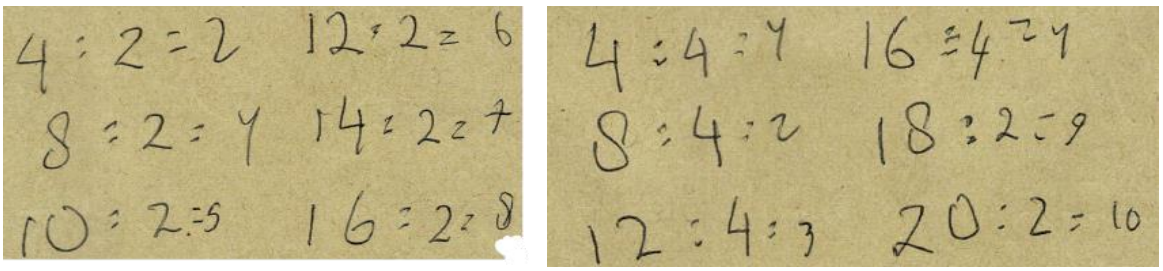

Figure 2. Children's answers to the division question

M's mathematical abilities have improved noticeably, transitioning from basic addition and subtraction operations with numbers from five to ten to more complex division and multiplication tasks. Although M has been in group six (equivalent to the fourth grade in Indonesia), his teacher previously described him as "careless," citing frequent errors in arithmetic operations. This was likely due to his tendency to make mistakes when adding, subtracting, and multiplying. However, consistent training and targeted learning approaches have resulted in marked progress.

M started learning addition and subtraction three years ago and began studying multiplication and division about a year ago. Despite his initial struggles, several rounds of focused training led to a significant improvement in his performance. This training approach involved flexible learning strategies, allowing M to practice in a way that aligned with his comfort level. When he experienced fatigue from writing, activities incorporated playful elements where he could answer calculation questions while engaging in physical activities or games. These interactive learning methods used questions that were simpler than traditional written exercises, fostering a more enjoyable and less stressful learning environment.

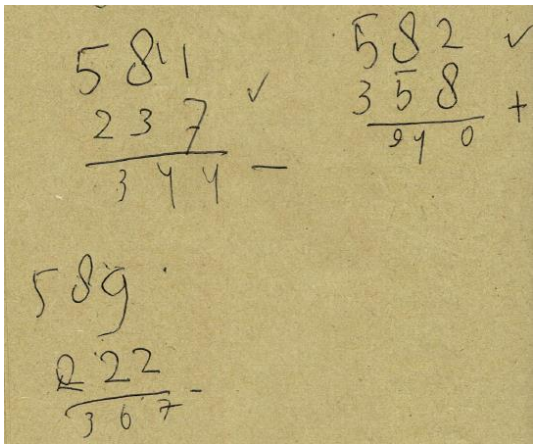

Figure 3. Children's answers to subtraction questions

Figure 3 shows that the result was an increase in M's mastery of addition, subtraction, multiplication, and division operations, with greater accuracy and reduced errors. His ability to add and subtract has expanded to include operations with numbers into the hundreds, indicating substantial progress. This flexible teaching and learning approach, which adapts to the student's pace and comfort, was crucial in enhancing M's math skills and building his confidence in tackling mathematical tasks. The improvement in his arithmetic abilities

demonstrates the effectiveness of adaptive learning methods and suggests that addressing individual needs can significantly impact a child's educational development, as presented in Figure 4.

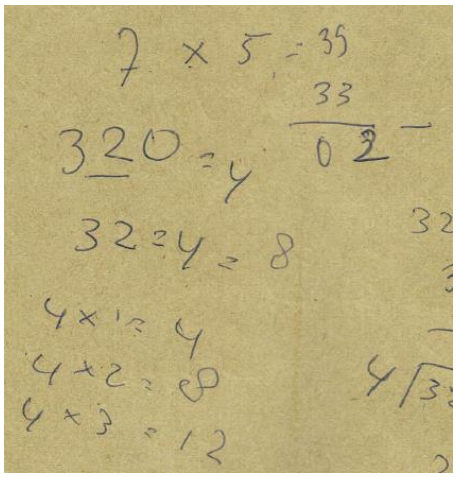

Figure 4. Children's answers to simple inheritance division questions

To maintain engagement and avoid boredom, the math exercises for M were varied with division and addition problems involving numbers less than 20. This approach provided a balanced mix of tasks to keep M interested while also helping him develop essential skills. The addition and subtraction exercises were designed to align with real-life contexts, such as inheritance practices where deductions are made for debts or wasiyat (bequests). This made the math problems more relatable to M's family and cultural background.

After M mastered addition and subtraction involving numbers in the hundreds, the complexity of the problems was increased to include numbers in the thousands. Figures 2 to 5 depict the progress made by both M and his mother, demonstrating significant improvement and growing confidence. A critical development in M's learning was his ability to understand and apply the concept of carrying (storage) in addition operations. For example, when adding four plus seven, he learned to carry the ten's value over to the next position, resulting in a correct addition operation.

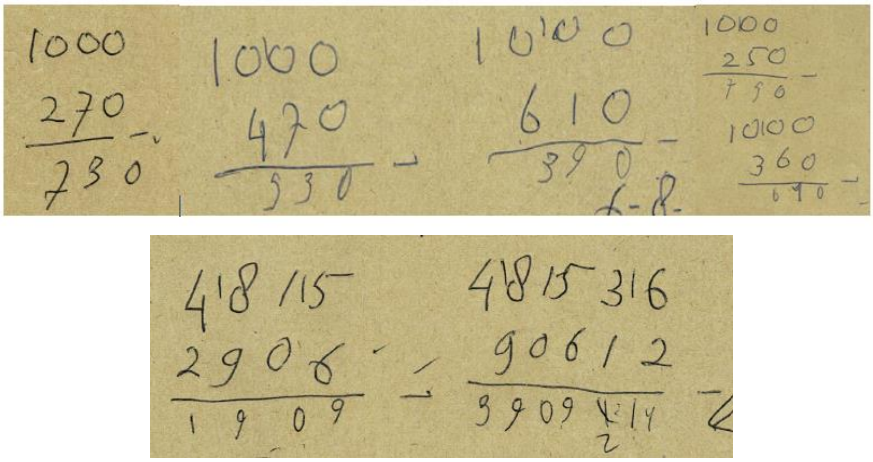

Figure 5. Children's answers to subtraction questions

These steps in M's math learning journey are encouraging, indicating that significant progress can be achieved with the right approach tailored to the student's learning style and interests. The learning process can remain dynamic and engaging by interspersing different types of math problems and gradually increasing the difficulty level. This method also fosters a deeper understanding of mathematical concepts, building a foundation that allows for continued growth and success in more advanced mathematical operations.

Mathematics can play a crucial role in helping people understand religious concepts, especially in the context of inheritance. In Islamic inheritance law, the shares for sons and daughters are predetermined by specific formulas, where the share for a son is twice that for a daughter. If a daughter's share is "x," then a son's share is "$2x$." This relationship is expressed as $y = 2x$, y representing the son's share.

The equation changes when other heirs, such as spouses, are involved. For example, if a wife dies, leaving a husband, one son, and one daughter, the husband receives a quarter of the wife's estate, with the rest distributed to the children based on the son receiving twice the daughter's share. Given an estate of 12 grams of gold, the husband would get a quarter or 3 grams. The remainder (9 grams) would be divided among the son and daughter, with the son receiving 6 grams ($2x$) and the daughter receiving 3 grams (x). Considering other heirs, this principle can be generalized, with a formula indicating that if a husband dies with children, the wife gets 1/8 of the husband's estate.

The researcher introduced the Realistic Mathematics Education (RME) approach in several meetings to connect mathematics with social and religious contexts, particularly the inheritance issue. Initially, M's mother seemed confused about the mathematical calculations for inheritance. However, after the researcher presented simple formulas and conducted practice simulations, she became enthusiastic about applying these concepts. She even expressed concern that the training might be too easy for her son, indicating a newfound confidence in her ability to understand the math behind inheritance.

This transition illustrates the impact of relating mathematics to real-world contexts. It can transform the perception of math from a source of confusion to a tool for solving social and religious problems. M's mother, who previously struggled with math but had a strong interest in religion, embraced this new understanding, highlighting how a practical and relatable approach to teaching math can bridge gaps and foster a positive attitude toward learning.

Mother : *I love teaching M to memorize suras in the Qur'an.*
Teacher : *In the Qur'an, some verses speak mathematics, so learning mathematics will support understanding the verse.*

To help M's mother overcome obstacles with essay-based questions, a smoother approach to basic math operations like addition, subtraction, multiplication, and division was implemented. The researcher introduced the concept of mathematics as a tool for solving religious problems, such as understanding inheritance laws, moon phases, and solar cycles to determine prayer times. This connection sparked her interest in learning mathematics, leading her to join her son's study sessions.

The researcher explained the formula to determine inheritance shares for boys and girls. Since boys receive twice the share of girls, the formula was $L = 2p$, where L is the boy's share and p is the girl's share. Using this formula, the distribution for a person with sons and daughters can be calculated with $2p + yp$ = remaining inheritance, where x represents the number of sons, and y represents the number of daughters. This allowed M's mother to calculate the share for one daughter and then apply it to the entire distribution.

With this approach, M's mother became enthusiastic about learning mathematics, affecting her son's attitude toward math. For two days, she solved more than ten questions about inheritance division, demonstrating significant progress in her understanding of the topic. Additionally, the researcher used examples from the Quran, highlighting the stories of good and bad people, including the prophet Ulul Azmi, to create engaging associations with mathematical concepts.

Before providing the formula to M's mother, the researcher tested it with students who had similar abilities to her, ensuring its effectiveness. Figure 6 represents a simple problem used for these trials, demonstrating the approach's success with individuals with comparable math skills to M's mother. Connecting math to religious and social contexts made the learning experience more engaging and meaningful, leading to more tremendous enthusiasm and confidence in tackling mathematical challenges.

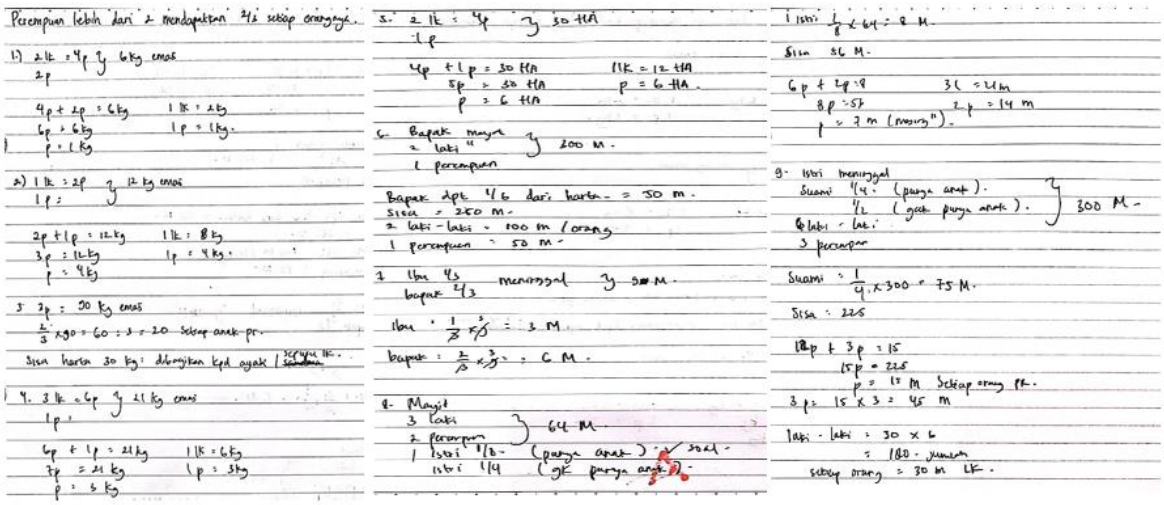

Figure 6. M's mother's answer results

Figure 6 shows that Mother's answer explained the share received by a single daughter in inheritance is denoted by *p*. If there are multiple daughters, the total share is represented by the number of daughters times *p*. Similarly, *L* denotes the share for boys, and the total number of boys is represented by *x*. When there are more than two daughters, their combined share is two-thirds of the total inheritance, distributed equally among them. M's mother, initially anxious and hesitant about mathematics, became enthusiastic and joyful about learning math, driven by her understanding of the religious significance of these concepts.

The transformation in M's mother's attitude toward mathematics was influenced by her religious beliefs and a Quranic verse from Surah An-Nahl (Verse 97), emphasizing that those who do good works and have faith will lead a good life and be rewarded in the Hereafter. This realization led her to appreciate the role of math in understanding religious knowledge, particularly in the context of inheritance laws.

Before this shift, M's mother had viewed math as unimportant and felt anxious about learning it. However, after recognizing its importance in religious contexts, her attitude changed. She saw math as a means to support good deeds and worship, which brought purpose to her learning. As a result, she became more enthusiastic about studying and teaching math to M, motivated by the religious promise of a better life for those who engage in good works.

This newfound passion for math became evident when M's mother demonstrated her ability to solve math problems without relying on scribbles or notes. Her commitment to learning mathematics and her willingness to help M with his studies at home highlights the impact of connecting math with religious beliefs and practical applications. By acknowledging math's role in facilitating good deeds and religious understanding, M's mother transformed her perspective, leading to a positive and engaging learning experience for both her and her son.

3.2. Discussion

This study discusses an intervention to evaluate the effectiveness of a mother's assistance in helping her child understand math materials that focus on the crucial role of parents, especially mothers, in supporting their children in learning math. The subject was a mother from an Indonesian minority group living in the Netherlands. This condition creates anxiety in the mother towards her child, who has difficulty learning math at school. The intervention involved the mother in her child's learning process, intending to improve her child's understanding and math skills.

The results showed that the intervention effectively improved her child's ability to count and subtract numbers up to 20 and understand the inheritance division concept. M's mother successfully connected math learning with religious contexts, giving her child a better understanding of the content. The RME method is also effective in motivating students (in this case, M's mother), as previous research has shown (Uyen et al., 2021; Zakaria & Syamaun, 2017).

The research also highlights the role of parental involvement in children's learning process. This is in accordance with previous research results, which explain that parents have a significant role in encouraging children's learning motivation (Amarnani et al., 2021; Park et al., 2023). Support and motivation provided by parents can be a strong driver for children to stay focused and enthusiastic in the learning process. In this study, M's mother, who was actively involved in helping her child learn math, provided exercises appropriate to the child's ability and offered positive reinforcement when the child successfully completed the exercise. This successfully improved the child's math learning ability. In addition, it can also improve children's well-being (Koestner et al., 2020).

Parental support is essential for students because students who live with their parents really need attention and help from their parents. Parents are the first and primary people responsible for the survival and education of their children, and parents are responsible for providing funds and other resource support for children's educational needs (Jabar, 2021). In this case, the father's role in helping M, who has difficulty learning mathematics, appears limited and is reflected in his primary focus on his son's soccer career. With M's aspiration to become a successful professional soccer player, his father prioritizes academic issues, especially the mathematics difficulties M faces. Coaching soccer is his main priority, so aspects of formal education, especially mathematics, need to receive adequate attention. The parents and M were also supported by one group in their Muslim community, so it worked better.

In resolving these issues, it is essential to emphasize that the support provided should result from a joint discussion between the mother and father, not just the mother's responsibility. Creating a conducive learning environment and giving help with math tasks should actively involve both parents. Open communication and close cooperation between fathers and mothers are crucial to supporting children's ability to learn mathematics. The role of parents in supporting children's learning is essential, especially in the context of

understanding and mastering mathematics. Parents' attention to children regarding guidance and emotional support positively impacts student learning motivation (Kong & Wang, 2021).

The intervention had several complex challenges M's mother faced in helping her child learn math. One of the main challenges was the complexity of the language, where her child needed a greater understanding of Indonesian. Therefore, M's mother had to ensure that her child could understand the math instructions and materials despite the language barrier.

The next challenge is understanding your child's interest and motivation in math. Ensuring that children have sufficient interest and motivation to learn mathematics is critical to helping children learn effectively. Next, M's mother faced the challenge of leveraging her child's interest and involvement in religion to support his understanding of the material of mathematics. While this is a challenge, capitalizing on the child's interest in religion is vital to delivering maximum impact from the intervention. By understanding and addressing these challenges, M's mother was able to provide more effective interventions to help her child learn math. Parents' involvement in their children's learning has been shown to be crucial, and this study emphasizes the need to pay attention to children's language skills, interests, and motivation, as Cheng (2017) suggests. In addition, capitalizing on interests and involvement in religion is also worth noting as an effective support strategy.

Providing this kind of practical context in mathematics learning can help students and parents see the subject's relevance in everyday life (Risdiyanti & Prahmana, 2020). In addition, the intervention results show that motivating parents to learn math with their children can create a positive learning environment at home, provide additional support for children's academic development, and strengthen the relationship between parents and children. This is in line with several studies showing that there is a relationship between parental involvement and their children's success in learning mathematics, with factors such as parental involvement in early learning (Ma et al., 2016) reducing children's math anxiety (Cai, 2003; Vukovic et al., 2013), and socio-economic background playing an essential role within the family (McLear et al., 2016; Phillipson, 2010).

In addition, learning mathematics can provide significant benefits in everyday life, especially in religious contexts. Schoenfeld (2022) explains that one of the main factors causing difficulties in learning mathematics is that the mathematical concepts taught sometimes feel abstract and complex to relate to students' daily lives. The mother, who initially felt anxious about her child's ability in mathematics, found new motivation after realizing that understanding mathematics can support solving religious problems, such as the division of inheritance. She became excited to learn and teach mathematics after realizing that mathematical skills can be used to understand religious concepts, such as inheritance calculations. For example, by understanding the inheritance division formula, she could apply it in real life to solve inheritance law problems. This improved mothers' understanding of mathematics and opened up new insights into the interconnection between science and religious values.

This research contributes to understanding the role of parents' role in improving children's math learning ability, especially mothers. In addition, the selection of the context in which parents need to educate their children, in this case, the context of Islam, which is a minority group in the country, contributes to motivating parents and children to be more serious about learning mathematics. This has a significant impact on the success of mathematics learning for parents and their children, so when the relevant religious context of minority groups meets the appropriate mathematics content, it will contribute to reducing students' mathematics anxiety and improving students' mathematics well-being in minority family groups in a country.

4. CONCLUSION

The use of various contexts from Islamic religious teachings in the Al Quran has been found to reduce anxiety. As the Quran states, "Surely in the remembrance of Allah do hearts find comfort" (Surah Ar-Ra'd 28). This principle was exemplified by M and his mother, who regularly read and memorized the Qur'an. The researcher observed that their consistent engagement with the Qur'an improved their well-being. This indicates that a certain degree of religiosity can minimize anxiety and even foster a sense of well-being, particularly in mathematical learning environments. This sense of well-being might be linked to the connection between mathematics and Islamic teachings, as specific religious commands involve mathematical concepts such as fractional numbers, mathematical equations, operations, and social arithmetic.

This study contributes to the realistic mathematics education approach by integrating religious contexts from the Qur'an, showcasing how religious engagement can change participants' attitudes and abilities after treatment. Participants who previously disliked mathematics became more motivated, enthusiastic, and happy. Two months after treatment, evaluations indicated that the subjects could solve math problems with minimal errors and consistent accuracy, reflecting the impact of incorporating religious elements into math learning.

However, interpreting the results of this study requires caution due to certain limitations. The study used only one research subject with unique characteristics, and the qualitative approach may have introduced data bias, as the researcher also acted as the teacher. Further research with a larger sample size and more comprehensive instruments is recommended to generalize the results. This includes validating research tools such as lesson plans, observation sheets, interviews, and student worksheets. Further experiments with larger samples and an expanded range of material topics could strengthen the findings' validity. The impact of this study's findings on mathematics learning suggests the need for immediate follow-up research to explore the relationship between religiosity and mathematical education further.

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