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The Role of Mathematics Goes to School in Efforts to Improve Numeracy Literacy of Grade X Students at MA Muhammadiyah 2 Yanggong

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Abstract

The level of numeracy literacy among Indonesian students is relatively low, as shown by PISA 2023, making it difficult for students to connect mathematical concepts to everyday life. This is also evident at MA Muhammadiyah 2 Yanggong, where students are often trapped in memorizing unclear formulas without understanding the meaning of the problems they encounter. This study aims to explain the implementation of the Mathematics Goes to School (MGTS) program, a work program of HMPS Pendidikan "Delta", as an effort to improve students' numeracy literacy through contextual learning. This study applies a qualitative approach with an intrinsic case study. Participants in this study were grade X students of MA Muhammadiyah 2, Yanggong, in the 2024/2024 academic year. Data were collected through direct observation, student reflections, and documentation, which were then analyzed using the Miles and Huberman model, comprising data reduction, data presentation, and conclusion drawing. The results show that the MGTS program successfully changed the way students learn, from simply calculating to analyzing and solving problems. Despite the limited timeframe, this program has proven effective in transforming students' learning attitudes, making them more critical and active. The collaboration between students as peer mentors and the school, using a realistic approach, has had a positive impact on strengthening students' numeracy literacy at the secondary level.

INTRODUCTION

Entering the 21st century, the world of education has undergone fundamental changes, with the focus of learning shifting from mastering contextual material to developing numeracy and literacy competencies. Furthermore, numeracy literacy skills have shifted from simple calculation to fundamental skills and life foundations. In an era dominated by massive information flows, numeracy literacy skills enable individuals not only to receive data directly but also to process, analyze, and draw valid conclusions from the information they encounter (Kemendikbud, 2017).

This aligns with the OECD's PISA 2022 findings: strong numeracy skills are crucial to global competitiveness, enabling individuals to make data-driven, sound-logic decisions amid the complexities of the modern world (OECD, 2023). Therefore, strengthening numeracy literacy at the secondary school level, particularly in education, is a crucial agenda for bridging academic theory and future demands.

However, national and international assessment results indicate that Indonesian students' numeracy literacy skills remain relatively low. Data from the 2023 Program for International Student Assessment (PISA) ranked Indonesia last in numeracy, with an average score of 366 points, 106 points below the average of other participating countries. In fact, approximately 82% of students are at level two, indicating they are not yet able to apply mathematical concepts in real-life contexts (Putri et al., 2024).

This low achievement often stems from the learning methods used in secondary schools, which tend to be conventional and focused solely on students' final grades. Students are encouraged to memorize formulas without understanding their everyday use (Fathani, 2016). As a result, mathematics learning is often viewed as a static and intimidating science, ultimately leading to decreased motivation to learn and to students' inability to reason mathematically when faced with literacy-based problems.

Furthermore, one cause of failure in mathematics learning is students' lack of understanding of mathematical concepts or their misinterpretation of them. Misconceptions about knowledge when presented at one level of education can result in fundamental misunderstandings that persist at higher levels. This is because mathematics is a highly interconnected subject (Novitasari, 2016).

This condition is also evident in the learning challenges at MA Muhammadiyah 2, Yanggong. At the Madrasah Aliyah level, Students often feel bored because the mathematics teaching materials are considered too theoretical and irrelevant to everyday life. This results in students' poor ability to transform story problems into mathematical models, indicating a cognitive barrier that must be addressed immediately through a more contextual approach. Students' inability to perform mathematical modeling occurs when they are unable to connect mathematical symbols to their real-life situations, resulting in the problem-solving process only remaining at the memorization stage without understanding their meaning (Putri et al., 2021). If this barrier is not addressed immediately through a more contextual learning approach, students' numeracy literacy skills will remain low.

Given these issues, innovative interventions involving parties outside the school are needed to refresh the academic atmosphere. Universities, through student organizations, have a strategic role as agents of change in community service activities. The collaboration between students and high schools, such as MA Muhammadiyah 2 Yanggong, is expected to foster harmony in improving students' abilities by simplifying difficult mathematical concepts (Abdal, 2024).

As a form of real contribution, the Student Association of the Mathematics Education Study Program "Delta" held a Mathematics Goes to School (MGTS) work program. As a form of social concern and in the context of community service, this program was implemented to have students

contribute to connecting classroom theory and real-world practice, as well as becoming peer tutors who not only act as material providers, but also as peer tutors who have emotional and age closeness with students at MA Muhammadiyah 2, Yanggong. Strengthening numeracy literacy through the Mathematics Goes to School (MGTS) program is an innovative and adaptive step in addressing challenges in the industrial revolution era that demand mastery of logic and data, in accordance with Fitria's (2021) view on the development of educational competencies in the modern era.

The MGTS work program emphasizes integrating life-relevant learning and focuses on students' real-life experiences. Students are expected to recognize that mathematics is present in every aspect of their lives (Zulkardi & Kohar, 2018). This realistic approach to mathematics education is expected to demonstrate that mathematics is a real and useful field of study. Through this work with students of mathematics education at MA Muhammadiyah 2, Yanggong, this MGTS activity is expected to increase students' numeracy literacy skills, with a positive long-term impact (Hadi, 2017).

Based on the description, this article aims to provide a detailed case study of the work program of the Mathematics Education Study Program Student Association "Delta", namely Mathematics Goes to School (MGTS), to improve students' numeracy literacy at MA Muhammadiyah 2, Yanggong. This article focuses on how student-delivered materials can stimulate students' reasoning and problem-solving abilities. The results of this study are expected to provide practical contributions and serve as a reference on the importance of collaboration between students and Madrasah Aliyah students to strengthen students' numeracy literacy at the secondary level.

METHODS

This study uses a qualitative approach to explore in detail the role of Mathematics Goes to School (MGTS) in improving students' numeracy literacy skills at MA Muhammadiyah 2, Yanggong. This study focuses on the interaction process of realistic learning strategies implemented by HMPS "Delta" and students' responses to the methods used. As explained by Amalia and Saefudin (2026), qualitative methods allow researchers to analyze in detail the success of teaching and challenges faced in the field. In addition, according to Sugiyono (2017), the main objective of this qualitative research is to gain an in-depth understanding of social phenomena or symptoms by presenting them through detailed descriptions in written accounts.

This research design uses an intrinsic case study design. This design is a qualitative research methodology that aims to explore, understand, and investigate a phenomenon thoroughly in the real world (Salsabila et al., 2025). In line with the definition of an intrinsic case study design, this design was chosen to explore in depth the unique phenomena that occurred during the implementation of the Mathematics Goes to School program at MA Muhammadiyah 2, Yanggong.

In this study, the researcher did not aim to generalize existing statistical data but rather focused on an in-depth understanding of the interaction process, student reactions, and changes in numeracy literacy behavior within the class. The case study design provided the researcher with the opportunity to capture actual events in the field (Siregar & Murhayati, 2024), starting from the initial challenges faced by students to the effectiveness of the intervention carried out by students as peer mentors, thus providing a comprehensive picture of the function of the work program in an effort to improve numeracy literacy skills.

This case study was conducted at MA Muhammadiyah 2 Yanggong, located in Setutup, Jimbe, Jenangan District, Ponorogo Regency, East Java. This Madrasah Aliyah was chosen because it is a partner school in the Mathematics Goes to School (MGTS) community service program. Referring to Salsabila et al. (2025), this location aligns with the characteristics of case studies, namely their contextual nature, which involves investigating phenomena in real-world contexts.

The subjects in this study were 24 grade X students of the 2024/2025 academic year who were actively involved in the learning process with students of the HMPS Mathematics Education "Delta". The selection of this research subject was based on students' active participation in the teaching and learning process. In this case study, students as research subjects are not only seen as recipients of material but also as sources of data, whose responses, mindsets, and learning activities are observed in depth to understand the extent of students' role in improving their numeracy literacy (Wijaya et al., 2025).

The key instrument in this study was the researcher herself, who was directly involved in the field to plan, implement, and observe the teaching and learning process at MA Muhammadiyah 2, Yanggong. As the key instrument, the researcher was responsible for determining the research focus, collecting data, selecting informants as sources of information, assessing data quality, and analyzing and drawing conclusions from the field findings (Sugiyono, 2019).

The data obtained were analyzed using the Miles, Huberman, and Saldana model. Data reduction involves selecting and focusing on relevant data, with a focus on numeracy literacy (Miles et al., 2014). First, data reduction involves sorting and removing unnecessary data to provide a clearer picture of the research focus. In this first stage, the researcher focused on information relevant to improving students' numeracy literacy at MA Muhammadiyah 2, Yanggong. The second stage is data presentation. The data are presented in an analytical-descriptive format, in which the researcher describes the interactions among students. This data presentation aims to build a logical storyline of the field process. Finally, the third stage is concluding. Conclusions are drawn based on the results of the data presentation, which are then verified by referring to theories related to numeracy literacy and the results of previous research to ensure the validity of the findings related to the role of the Mathematics Goes to School program at MA Muhammadiyah 2, Yanggong (Miles et al., 2014).

RESULTS AND DISCUSSION

The phenomenon of low levels of numeracy literacy among students remains a crucial issue and requires special attention in learning. Numeracy literacy is not just a matter of technical calculation but also an important ability for reasoning and using mathematical logic to solve complex problems (OECD, 2023). This aligns with Steen's (1999) view that numeracy literacy is very important in the modern era, as it serves as a tool for analyzing vast amounts of information in everyday life. This is similar to Teresia Aprilie (2023), who stated that students' numeracy and literacy skills in Indonesia remain low compared to those in other countries. Furthermore, the low national PISA score provides concrete evidence that Indonesia's education system continues to struggle to instill literacy skills (Yusmar & Fadilah, 2023).

In this condition, as at MA Muhammadiyah 2 Yanggong, students tend to be passive and view mathematics as a difficult subject, with many abstract formulas. As emphasized by Margayanti et al. (2024), this negative perception of students arises from the frequent presentation

of material in the form of a series of abstract formulas that do not correspond to students' real lives, leading students to view mathematics as a burden rather than a tool for their thinking. Low numeracy literacy also makes it difficult for students to connect learning materials to real-life applications. Without a strong numeracy foundation, students have difficulty connecting theories taught by teachers with applications in their daily lives. This aligns with 21st-century learning guidelines, which emphasize that mathematics should no longer be taught solely through theory but through a contextual approach, so students do not lose the relevance between what is learned in school and real life. As a result, students are often trapped in a learning pattern that focuses solely on memorizing formulas, without understanding the essence of the problems they are working on. This pattern leads to the loss of the essence behind the meaning of numbers and counting procedures (Margayanti et al., 2024).

The phenomenon that occurred at MA Muhammadiyah 2, Yanggong, shows a significant difference between formula mastery and conceptual understanding. Students often get caught up in formulas without understanding the essence of the problems they are working on. This condition causes mathematics lessons to be seen only as boring classroom activities, in which students focus solely on finding the correct final answer without understanding the process or logic underlying the problem. This is in accordance with Darmadi et al. (2023), who stated that this negative perception of students arises due to the frequent appearance of material presented in the form of a series of abstract formulas that do not correspond to students' real lives, so that mathematics is considered a burden rather than a tool for students' thinking.

Amid this growing phenomenon, the Mathematics Education Study Program Student Association "Delta", through its Mathematics Goes to School (MGTS) work program, presents an innovative solution to improve numeracy literacy at MA Muhammadiyah 2, Yanggong. This program places students as peer tutors to help improve numeracy literacy and serve as a bridge between abstract formulas and real-life events. This approach was chosen because it can facilitate communication between teachers and students and change the view that mathematics is a scary subject. The use of this peer tutor approach is relevant to the findings of F. Siregar (2022), who emphasized that it can create a more relaxed, open, and flexible teaching and learning atmosphere. With this peer tutor, communication barriers that usually arise between teachers and students can be minimized. So students feel more comfortable during learning, which will later make them more comfortable asking questions and exploring mathematical concepts without fear of being wrong. This is in line with Setyawan et al. (2022), who stated that the presence of students in schools is effective in improving numeracy literacy skills.

The implementation of the MGTS (Mathematics Goes to School) program begins with students observing directly to identify early symptoms of student learning difficulties. After that, students deliver learning materials using a more adaptive and communicative approach. Aligns with F. Siregar (2022), who showed that the implementation of peer tutoring has proven successful in improving student learning outcomes, especially for materials considered difficult to understand, because the language used by students is much easier to digest. This observation step is also reinforced by Lubis et al. (2024), who stated that teachers can conduct diagnostic investigations by directly observing how to obtain data, namely through classroom observations. Teachers can see how students respond and whether they show difficulties.

During its implementation, the MGTS activity was attended by all members of the Mathematics Education Study Program Student Association "Delta", totaling 26 people. All activities were centered at MA Muhammadiyah 2, Yanggong, and focused on class X students. This program is also a form of student service to the community in accordance with (Law of the

Republic of Indonesia Number 12 of 2012 concerning Higher Education, 2012). Students are challenged to transform the knowledge gained in lectures into concrete contributions that address numeracy literacy challenges at the secondary school level.

In the Mathematics Goes to School (MGTS) activity, students are divided into small teams, each responsible for a specific class. Each team develops a simple lesson plan (RPP) with a scientific and contextual approach. The teaching structure is varied and engaging, encompassing direct instruction, interactive discussions, practice problems, and creative learning media. This aligns with Fitria (2022), who emphasized the crucial role of teachers as innovators in creating a dynamic and effective teaching and learning environment.

In the teaching process, students use teaching aids, such as mathematical games, to foster an active, engaging learning environment and stimulate students' curiosity (Mulawarman & Mathematics, 2020). In line with the research of Rohmatika et al. (2023), which showed positive improvements through innovative mathematical learning media. Therefore, it allows for in-depth exploration of the details of material that is considered difficult by students, by shifting the learning process from mere memorization to a process of discovery, which is expected to influence students' understanding of numeracy in the Madrasah Aliyah environment while strengthening the foundation of students' thinking in facing everyday life problems.

The primary role of Mathematics Goes to School (MGTS) in improving numeracy literacy lies in shifting from simple instruction to a process of in-depth, comprehensive information exploration. The Mathematics Goes to School (MGTS) program no longer positions mathematics as a static subject, but rather as a tool for student exploration. By changing how students present the material, it is hoped that students will be directed to actively participate in the process of discovering concepts, resulting in a more active learning atmosphere and a fun discussion space for students while simultaneously improving students' numeracy literacy. This aligns with Tenny et al. (2021), who stated that the paradigm shift in numeracy literacy transforms the classroom from a simple subject into the ability to analyze information and solve problems comprehensively. In the Mathematics Goes to School (MGTS) program, students break complex problems into ones that can be reasoned about by students. The focus of learning is not only limited to technical calculations but is more focused on how students use mathematical logic or mathematical reasoning to understand the structure of the information they receive as a very important competency in the 21st century, in line with the opinion of Hidayat and Sariningsih (2021), mathematical reasoning allows students to see through numbers, helping students recognize logical relationship patterns that are crucial for solving problems in the real world.

Mathematics Goes to School (MGTS) effectively stimulates students' reasoning skills by connecting mathematical variables to real-life situations. This program also encourages students to focus not only on the final numerical results but also on interpreting the mathematical information they have found. The success of the Mathematics Goes to School (MGTS) program is reflected when students can explain the meaning of numbers and use them in decision-making, so that mathematics feels like a life skill rather than just about answering exam questions.

In the dynamics of its implementation, the Mathematics Goes to School (MGTS) program has several supporting factors, such as students' high enthusiasm as research subjects, namely the students of class X MA Muhammadiyah 2, Yanggong. Positive responses and cooperation, as well as student curiosity, help create a pleasant, interactive teaching and learning atmosphere, so that the process of transferring knowledge from student to student runs smoothly and feels natural. In addition, adequate infrastructure support from MA Muhammadiyah 2 Yanggong, so that each teaching session and group discussion session can be carried out using complete learning tools

without any significant technical problems, in line with the findings of Fitria (2019), regarding the importance of school climate to the effectiveness of the learning process. In addition to cohesiveness, the good cooperation and solidarity of the "Delta" Mathematics Education Student Association students were maintained throughout the activity. Good coordination between the teams allowed for any problems and obstacles encountered in the field to be addressed effectively, quickly, and appropriately.

The synergy between students and the full support of MA Muhammadiyah 2, Yanggong, can create a conducive learning environment. In line with the research by Hidayah et al. (2020), collaboration between universities and high schools is key to the sustainability of educational programs. This is evidence of the active involvement of all elements, both from the teaching side, namely students, learning subjects, namely class X students of MA Muhammadiyah 2 Yanggong and madrasah institutions, namely MA Muhammadiyah 2 Yanggong, is a preliminary requirement in efforts to improve numeracy literacy at the secondary school level, especially madrasah aliyah, in line with Abdal (2024), which emphasizes that collaboration between students as agents of change with the school can create a match in students' basic abilities. The presence of students not only creates a new atmosphere in the learning process but also helps teachers identify specific student learning difficulties that may be overlooked in the regular classroom routine. Similar to the findings of Fitria et al. (2021), the implementation of Mathematics Goes to School (MGTS) requires structured, collaborative management between student organizations and the Madrasah Aliyah to strengthen numeracy literacy values.

Furthermore, Abdal (2024) emphasized that the effectiveness of improving numeracy literacy is largely determined by how all elements interact within the educational ecosystem. Schools provide space and acceptance, while students simplify difficult mathematical concepts into simpler, more applicable ones. This synergy demonstrates that numeracy literacy issues cannot be solved individually but require the active, ongoing involvement of several parties, including universities, through student organizations, and secondary schools.

The success of the Mathematics Goes to School (MGTS) program at MA Muhammadiyah 2 Yanggong supports the theory above, which emphasizes enthusiasm, passion, and hard work. The interaction between students and the school's support for facilities has become a trigger for the "Delta" Mathematics Education Student Association (HMPS) to implement adaptive, enjoyable learning strategies. Similarly, in Abdal's (2024) research, harmonious interactions between teachers and students not only improve technical numeracy literacy scores but also foster students' confidence in their logical abilities. Thus, the continuity of the roles of various parties is key to more effective mathematics learning in the future. This is also in line with the evaluation of a similar program by Salsabila et al. (2024), which noted an increase in students' confidence in solving numeracy problems.

Although the Mathematics Goes to School (MGTS) program has many positive impacts, there are also inhibiting factors that limit its optimal results, primarily related to time constraints. The program's one-week implementation time is too short to grasp the complex, hierarchical nature of mathematics fully. This time constraint forces students to compress the curriculum, potentially hindering optimal conceptual understanding. This limited time also hinders students from developing deeper emotional bonds. Yet, developing numeracy literacy requires ongoing guidance and cannot be achieved in a short period of time.

In addition to time constraints, school activities are also a significant inhibiting factor. The numerous student activities within the school environment, which coincide with Mathematics Goes to School (MGTS), lead to a division of student focus and energy. This situation leads to

unstable teaching and learning interactions between students, as students are often distracted by the material presented and the demands of other school activities. This is due to a lack of communication between HMPS "Delta" and the synchronization of student programs and the academic calendar of MA Muhammadiyah 2, Yanggong.

Although the implementation of Mathematics Goes to School (MGTS) encountered several obstacles, this case study shows positive changes in learning behavior among grade X students at MA Muhammadiyah 2, Yanggong. This is evident in students who have begun to take the initiative to ask questions during learning, think critically, and actively participate in class discussions.

This success confirms that the contextual approach used by the "Delta" Mathematics Education Student Association (HMPS) students in their Mathematics Goes to School program is effective in helping students strengthen their understanding and improve their numeracy literacy. By presenting mathematical problems relevant to everyday life, students can strengthen their understanding of basic concepts and improve their numeracy literacy. This shows that psychological barriers to mathematics can be overcome when the material is presented in ways that are applicable, adaptive, and communicative. This allows students to feel that the knowledge they are learning has a practical function in their daily lives.

Overall, the Mathematics Goes to School (MGTS) program has significantly transformed students' perceptions of mathematics, from a subject filled with abstract formulas to a tool for logical and systematic thinking. The growing active participation of students has become a key asset for students facing academic challenges at the next level. In the future, the effectiveness of this approach is expected to continue to be developed and sustained by the Islamic high school (madrasah aliyah) and student organizations, ensuring that numeracy literacy becomes a sustainable life skill for students, especially within the Madrasah Aliyah environment.

CONCLUSION

Based on the research results and discussion above, it can be concluded that the implementation of the Mathematics Goes to School (MGTS) work program at MA Muhammadiyah 2, Yanggong, has had a positive impact on strengthening students' numeracy literacy. The presence of students has been proven to reduce students' learning barriers in mathematics, particularly by enhancing the learning atmosphere to be more interactive. Students who were previously fixated on memorizing formulas became more active and began to show improvements in their ability to reason and interpret learning in real-life contexts.

The success of this program is inseparable from student support, adaptive and communicative learning methods, support for facilities and infrastructure from MA Muhammadiyah 2 Yanggong, and the solidarity of the HMPS "Delta" Team. Although there are several obstacles, such as limited time and a lack of synchronization with the academic calendar of MA Muhammadiyah 2 Yanggong, the learning objectives are still conveyed effectively through the use of teaching aids and creative media. This program is proof that numeracy literacy is not only the skill of calculating the final result, but also a real mathematical reasoning competence for applying data in everyday decision-making.

As the author recommends, collaboration between universities through student organizations needs to be improved and sustained, not just temporary. In-depth time planning is needed from all parties to ensure numeracy literacy interventions run more optimally. These findings provide a clear implication that the transformation of 21st-century learning must shift

from textual methods to more adaptive, applicable, and communicative methods, to produce the next generation of the nation who are not only proficient in numeracy, but also proficient in numerical literacy skills when facing the highly complex problems of an increasingly developing world.

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