Integration of Real-Life Scenarios in Mathematical Literacy Learning in Middle Schools in Parepare, Indonesia

Marwati Abd. Malik, Mas'ud Balodo, Ammang Latifa, Rafi'ah Nur

Universitas Muhammadiyah Parepare, Parepare, Indonesia

marwati.pare63@gmail.com, umpar.masud@gmail.com, ammanglatifa70@gmail.com, rafiahnur@yahoo.com

Abstract: The study investigates the integration of real-life scenarios into mathematical literacy education in the Middle school in Parepare, Indonesia. The study's objectives are to examine the effectiveness of integrating real-life scenarios into mathematical literacy learning at middle schools and evaluate the students' activeness during the interventions. Using one group pre-test post-test design, this study involved 32 students who participated in pre-tests, interventions, and post-test. Two instruments were used: a test to measure mathematical literacy and an observation sheet to assess the students' activeness during the interventions. Descriptive and inferential data analysis were applied to test a two-tailed hypothesis set at alpha level 0.05. The results showed a significant improvement in students' mathematical literacy scores from pre-test to post-test. Pair t-test analysis confirmed the effectiveness of this pedagogical approach, highlighting its potential to overcome gaps in traditional mathematics teaching. Based on the observation sheet, this study found that students have a high level of active participation, demonstrating their engagement and interest in the subject, and a good ability to use representations. The findings support constructivist theory, emphasize the importance of contextual learning, and provide empirical evidence for educators and policymakers to develop more effective, inclusive, and engaging math curricula.

Keywords: Mathematics Education, Mathematical Literacy, Pedagogical Approach, Real Life Scenarios

INTRODUCTION

Mathematical literacy is an essential competency that every student in middle school must have to make sure they can understand, apply, and communicate mathematical concepts in various contexts of everyday life. This ability is important for academic achievement and for the development of creative thinking and problem-solving skills needed in professional and personal life (Parker et al., 2020). However, various studies show that the mathematical literacy of middle school students in many countries, including Indonesia, is still alarmingly low (Powell et al., 2021). Therefore,

there is an urgent need to implement learning strategies that are not only effective but also innovative in order to improve students' mathematical literacy skills (Komarudin et al., 2024). These strategies must accommodate students' various learning styles, motivate them to learn mathematics more meaningfully, and increase their engagement in the learning process.

Integration of real-life scenarios in mathematical literacy learning in middle school is one of the innovative approaches that has been proven effective in improving mathematical literacy. Integration of real-life scenarios into the learning process is an approach that allows students to see the relevance and real-life applications of the mathematical concepts they learn in class. Through real-life scenarios, students can understand how mathematics is used in everyday situations, such as financial planning, measurement of household chores, and data analysis in simple research (Wisenöcker et al., 2024). The use of real-life contexts not only makes mathematics learning more interesting and meaningful for students and helps them develop better creative and innovative thinking skills (Carl et al., 2023; Putri et al., 2023). Thus, integrating of real-life scenarios in mathematical literacy learning in middle school is a very important strategy to consider in an effort to improve the quality of mathematics education and prepare students for future challenges.

Indonesian students' low mathematical literacy ability is a serious problem that needs special attention in the world of education. Based on the results of several studies, Indonesian students often need help understanding basic mathematical concepts, which results in difficulties in applying mathematical knowledge to real situations (Johar et al., 2021). This lack of understanding is further exacerbated by ineffective teaching methods that continue to rely on conventional approaches and fail to actively engage students in the learning process. In addition, the use of digital media in mathematics learning is still very limited, even though this media has great potential to increase student interactivity and involvement in learning (Hillmayr et al., 2020). As a result of these limitations in instructional practices and the underutilization of interactive and contextual learning tools, students not only have difficulty in understanding mathematical concepts, but are also less motivated to learn mathematics meaningfully. This study aims to address these problems by developing and implementing innovative and effective learning strategies, including the integration of digital media, to improve students' mathematical literacy in middle schools.

Research on mathematical literacy among junior high school students shows that classroom activities often lack authentic real-world contexts, which affects students' ability to understand and apply mathematical concepts effectively (Abaño et al., 2024; Agustina et al., 2021; Uegatani et al., 2024; Uyen et al., 2021). Although many studies have been conducted to observe classroom activities and conduct interviews with students and teachers, these studies tend to be limited to descriptive approaches and do not sufficiently explore how the integration of real-life scenarios can improve students' understanding and application of mathematical concepts. For example, a study by Costa (Costa et al., 2022) highlighted the importance of professional development for teachers but did not focus on observing the integration of real-life scenarios in improving the application of

mathematical concepts. The study by Attard and Holmes (Attard & Holmes, 2022) focused on the perception of teachers and students of mixed learning but did not observe the integration of real-life scenarios. Abaño et al. (2024) examined the integration of real-life contexts into mathematical concepts using a questionnaire to measure how well mathematics connects to the real world. Their findings suggest that integrating real-life contexts can improve students' performance. Existing studies focus on surface observations without exploring more deeply the potential of real-world context-based pedagogies that are more interactive and relevant to students. Thus, there is a significant gap in the literature on the effectiveness of integrating real-life scenarios in learning mathematical literacy in junior high schools, underscoring the urgent need for more comprehensive and experimental research in this area.

This study offers a significant new contribution by combining a real-context-based pedagogical approach that has not been widely explored in the mathematics education literature. This study seeks to fill the gap in previous studies that tend to be descriptive and less in-depth regarding the practical application of mathematical concepts through real-life scenarios. By integrating real-world scenarios into learning, this study focuses not only on improving students' conceptual understanding, but also on developing creative and innovative thinking skills that are relevant to everyday life.

This study aims to investigate the effectiveness of integrating real-life scenarios in learning mathematics literacy in middle schools and to explore and analyze how real-life scenarios can motivate students, improve understanding of mathematical concepts, and apply the knowledge in everyday contexts. The questions to be explored in this study are: (1) Is there a significant difference in students' mathematical literacy skills before and after the use of real-life scenarios in classroom activities? and (2) How did the students engage in the real-scenario activities? To answer these questions, the researchers evaluated various aspects of learning, including students' conceptual understanding, and their ability to apply mathematical concepts to real-world situations. This study also used observational data to see students' activities during the learning process and measure improvements in mathematical literacy through standardized tests. With a quantitative approach, this study aims to provide strong empirical evidence on the impact of real-life scenarios on students' mathematical literacy and offer practical recommendations for implementing more effective and relevant learning strategies as well as providing practical recommendations that educators can use to improve the quality of mathematics learning in middle schools in Indonesia. Thus, this study is expected to significantly contribute to educational literature and innovative pedagogical practices, especially in mathematics education at the junior high school level.

LITERATURE REVIEW

Mathematical literacy is defined as a person's ability to formulate, apply, and interpret mathematics in a variety of real-life contexts (Çakıroğlu et al., 2024). It encompasses essential competencies such as reasoning, representation, communication, and problem-solving (Malik et al., 2023). These skills are not only fundamental for academic success but also critical for everyday decision-making in an increasingly data-driven world. At the junior high school level, fostering mathematical literacy is especially important, as students are at a developmental stage where complex cognitive skills begin to emerge (Malik et al., 2018). In this context, innovative approaches like using visual tools to explain mathematical proofs have been shown to deepen students' conceptual understanding, ensuring the long-term sustainability of mathematics education (Sevcikova et al., 2023; Ulfatun et al., 2023). The use of holography-based visual learning applications in mathematics, particularly for shape and space topics, has also been found to be easy to use and engaging for students (Shiang Tyng et al., 2023).

Integrating real-life scenarios into mathematics education has been shown to enhance students' engagement and academic outcomes. These contextualized learning experiences allow students to see the relevance of mathematics in daily life, which can improve motivation and participation. Simulation-based interprofessional education, for instance, has demonstrated success in helping students build deeper understanding and problem-solving capabilities (Elsayed et al., 2024). Likewise, augmented reality has emerged as a promising technology to enrich learning environments, influencing students' attitudes and achievements positively (Loeb et al., 2023). However, designing authentic and meaningful tasks remains a challenge. As Wisenöcker et al. (Wisenöcker et al., 2024) emphasize, problem-solving strategies can be limited when students fail to connect mathematical problems with real-world logic. Therefore, careful instructional planning is necessary to ensure that real-life tasks are inclusive, realistic, and accessible for all learners.

Several studies have explored the impact of real-life scenario-based learning in mathematics and highlighted both benefits and implementation barriers. Wisenöcker et al. (Wisenöcker et al., 2024) reported that students who are presented with realistic problem situations tend to use more analytical and context-sensitive approaches compared to those who work on decontextualized problems. In line with this, (Thuy & Le Phuoc, 2023) developed a framework for assessing students' statistical reasoning in solving real-life medical problems, highlighting the importance of domain-specific and context-based assessment in mathematical learning. Augmented reality-based simulations in high-risk scenarios also show potential in improving learners' attentiveness and behavioral responses (Loeb et al., 2023). While technological tools like augmented reality can enhance achievement and attitudes, their effect on intrinsic motivation may vary depending on design and context (Cao & Yu, 2023). Moreover, tools that assess student self-regulation—such as combining aptitude and event-based measurements—can be instrumental in understanding and improving academic performance (Zhidkikh et al., 2023). Kirsten & Greefrath (Kirsten & Greefrath, 2024) also notes

that affective factors and the learning environment for example on-campus versus distance tutorials significantly influence mathematics learning gains, thus reinforcing the importance of designing learning experiences that actively involve students.

In summary, embedding real-life scenarios into mathematical instruction fosters greater student engagement, deeper conceptual understanding, and the development of critical problem-solving skills. Realistic contexts promote authentic problem-solving strategies and enhance students' ability to transfer mathematical knowledge to practical situations (Wisenöcker et al., 2024). At the same time, innovative tools such as AR further enrich these learning experiences by creating interactive and immersive environments (Cao & Yu, 2023). Assessing students' self-regulated learning behaviors can help educators better tailor instruction to individual needs (Zhidkikh et al., 2023). However, successful integration of real-life scenarios requires overcoming challenges related to accessibility, teacher competence, and curriculum design (Naidoo & Reddy, 2023). Addressing these issues is vital for maximizing student participation and ensuring the long-term effectiveness of mathematical literacy instruction in junior high school classrooms.

RESEARCH METHOD

The pre-experimental study design at the First Secondary School, integrating real-life scenarios into mathematical literacy learning, aims to assess the effectiveness of interventions without a control group. By utilizing pre-tests and post-tests, researchers can directly evaluate changes in student understanding and application of mathematical concepts (Björkhammer et al., 2024). The interventions were conducted in five meetings. Statistical analysis, such as the t-test for paired samples, was employed to determine the significance of improvements resulting from the interventions. This approach is expected to offer initial valuable insights into the impact of real-life scenarios on enhancing mathematical literacy, serving as a foundation for more intricate research designs in the future.

The study was conducted at SMPN 1 Parepare, South Sulawesi, Indonesia. the research population comprised the eighth-grade students of SMPN 1 Parepare in the academic year 2023-2024. There were 320 students distributed across ten classes. The sample was selected using a cluster random sampling technique. One class was randomly selected as the sample, namely class VIIIC, which consisted of 32 students. Cluster random sampling is a method where clusters of individuals are randomly selected as the sampling units, rather than individual subjects within those clusters. This technique is known to be less efficient than completely randomized design due to the randomization being applied at the cluster level (Ozturk et al., 2023).

The research instruments utilized in the study encompass a student's mathematical literacy test and an observation sheet of student activity, aiming to quantitatively evaluate the enhancement of student mathematical literacy through real-life scenario approaches. The mathematical literacy tests

focus on middle school statistics and practical applications, assessing students' grasp of statistical concepts in everyday contexts before and after the intervention. This test was a teacher-made test developed based on the content measured in this study. The test was evaluated by two independent PhD-level experts in mathematics education using Gregory's content validity procedure (Gregory, 1992), yielding a validity score of 1 and a reliability score of 0.85. Based on the criteria of content validity by Gregory, the tests are valid if the calculated value is equal to or more that 75%. There was no change made from the initial draft because the tests were deemed valid.

The observation sheets capture positive student engagement, teacher and peer interactions, and the integration of real-life scenarios into classroom activities, providing a holistic view of the learning process. Through the integration of these methodologies, the research guarantees the accuracy, dependability, and inclusiveness of the gathered information, thereby enabling a meticulous evaluation of the efficacy of the applied pedagogical approaches. Combining these two instruments also ensures comprehensive quantitative data collection to assess the effectiveness of the applied learning methods (Wisenöcker et al., 2024).

In the learning process of real-life scenarios, the teachers implemented materials relevant to the student's real life, such as family monthly spending, favorite colors, and school buildings. An example of conducting real-life scenarios in teaching statistics for the eighth-grade students of middle school in Parepare is described in Table 1. The real-life scenario described in Table 1 is designed to teach middle school students in Indonesia basic statistical concepts through the analysis of family monthly expenditures. The objective is to help students understand and apply these concepts by collecting, organizing, analyzing, and interpreting real-world data on household spending. The scenario involves students working with their parents or guardians to collect data on their family's monthly expenditures.

In the classroom, students organize the data into tables and create visual representations such as charts and graphs. They learn to calculate basic statistics like total monthly expenditure, mean expenditure per category, and the percentage of total expenditure for each category. Students identify spending trends and suggest areas where spending could be reduced. They present their findings to the class, discussing the implications of their data and comparing it with their classmates to understand different spending patterns and lifestyles. The activity concludes with a class discussion on the importance of budgeting and financial planning, and students explore external factors such as inflation or unexpected expenses on family budgets. An extension activity involves students creating a hypothetical monthly budget, considering various financial scenarios. This scenario teaches statistical concepts and equips students with practical financial literacy skills, making learning practical and relevant.

No	Indicator	Descriptions
1	Topic:	Analyzing Family Monthly Expenditures
2	Objective:	To help students understand and apply basic statistical concepts such as data collection, organization, analysis, and interpretation by examining and analyzing family monthly expenditures.
3	Learning Outcomes:	- Students will learn how to collect, organize, analyze, and interpret real-world data. - They will understand the importance of budgeting and financial planning. - Students will develop skills in teamwork, communication, and critical thinking. - They will gain insights into economic concepts and the cost of living.
4	Scenario:	Understanding household expenditures is essential for budgeting and financial planning. Students will collect and analyze data on their family's monthly expenditures to gain insight into budgeting and the cost of living.
5	Activities in the classroom:	
	Data Collection:	Ask the students to work with their parents or guardians to collect data on their family expenditures. The students then categorize expenses into categories: groceries, utilities, transportation, education, entertainment, and savings
	Data Organization:	Once the data is collected, students organize their data into tables. They can create a table with those categories. They can also add charts or graphs to represent the distribution of their family' monthly expenses visually.
	Data Analysis:	Students learn how to calculate the basic statistics of total monthly expenditure, mean expenditure per category, and the percentage of total expenditure for each category. Students also identify any trends or patterns in their family's spending, such as which category has the highest expenditure. In addition, they can suggest what categories spending should be reduced.
	Data Interpretation:	Each student presents their findings to the class, discussing the implications of their data. They may discuss how their family can adjust their budget to save more money. The students compare their data with their classmates to understand different spending patterns and lifestyles.
	Discussion:	The students are facilitated to have a class discussion on the importance of budgeting and financial planning. They may also explore external factors such as inflation or unexpected expenses on family budgets.
6	Extension Activity:	The students are asked to create a monthly hypothetical budget, considering different scenarios such as an increase in utility bills or a special event requiring extra spending

Table 1. An example of real-life scenarios

During the learning session, quantitative data were collected through observation sheets to record student activity, reflecting indicators like involvement, interaction with material and peers, and participation level (Ketonen et al., 2025). These indicators were scored on specific scales for

quantitative processing. After the intervention, students underwent a post-test to assess improvements in mathematical literacy skills. A paired-sample t-test was employed to determine the statistical significance of the difference between pre-test and post-test scores. The use of this test is justified as it is appropriate for comparing the means of two related groups to evaluate the effect of an intervention. The observation data were also analyzed by calculating average scores and frequency of engagement indicators, ensuring the validity and the reliability of the collected data (Zhidkikh et al., 2023). This comprehensive approach provides insights into the effectiveness of real-life scenario interventions in enhancing student mathematical literacy (Ruiz-Palmero et al., 2023).

RESULTS

Mathematical Literacy Data

The purpose of this study was to examine the effectiveness of using real-life scenarios in classroom activities to improve the mathematical literacy of middle school students in Parepare. The researchers, therefore, applied pretest and post-test to evaluate the students' mathematical literacy before after the intervention of the real-life scenarios. In addition, the researchers conducted observations during the interventions in the classroom. Based on the results of the statistical analysis of the pre-test and post-test, Table 2 presents the descriptions.

DESCRIPTIVE STATISTICS	PRE-TEST	POST-TEST
Count	32	32
Mean	54.69	77.81
Std	12.01	6.84
Min	45	65
25%	45	75
50%	50	80
75%	60	80
Max	80	90

Table 2: Descriptive statistics of pre-test and post-test data

The descriptive statistics in Table 2 show that the participants' performance improved significantly from the pre-test to the post-test. The mean score increased from 54.69 to 77.81, and the range of scores (as indicated by the minimum and maximum values) shifted upwards. The standard deviation decreased, indicating that the scores in the post-test were more consistent and less spread out compared to the pre-test scores. The fact suggests an overall improvement and reduced participant performance variability after the intervention or instructional period. Based on the data in Table 2

above, a graph can be made to show a quantitative comparison of the pre-test and post-test results. As for the chart, it is as follows.

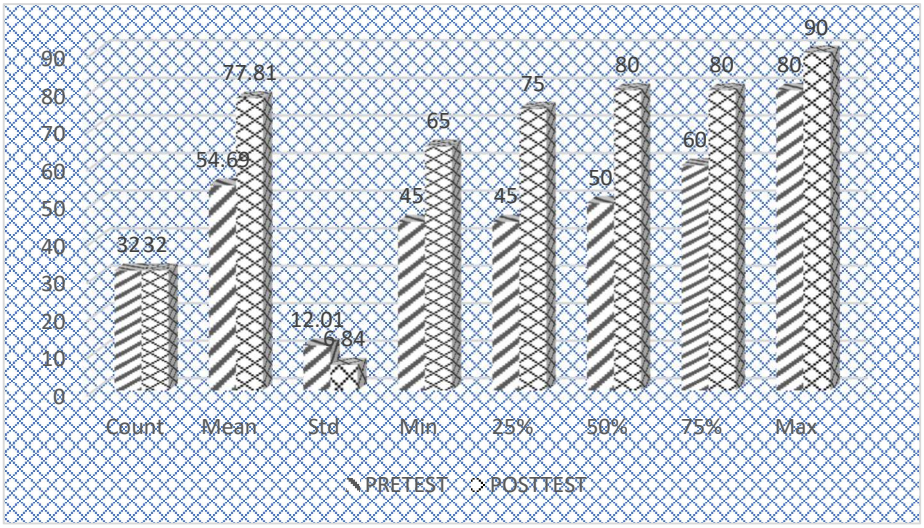

Figure 1: Pre-test and Post-test Comparison Graph

Figure 1 shows a significant improvement from the average score of the pre-test to the post-test for the mathematical literacy of middle school students. This means that there is a substantial improvement in respondent performance after following the integration of real-life scenarios. The decrease in the standard deviation from pre-test to post-test also indicates that post-test values are more consistent among respondents, which may indicate more uniform intervention effectiveness. The quarterly and median values also support the findings that most of the above respondents provide a comprehensive frame on the results of the descriptive analysis of pre-test and post-test data, which can be used as a basis for further interpretation in the context of research for significant improvements in their score after the post-test.

Results of Inferential Statistical Analysis

To measure the effectiveness of using real-life scenarios to improve the students' mathematical literacy, the researcher applied a paired t-test as an inferential data analysis. A two-tailed hypothesis was set at α=0.05. The results of the analysis were presented in Table 3.

		Paired Differences					t	F	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	before being treated - after having been treated	-22.063	9.857	1.742	-25.616	-18.509	-12.662	31	<0.001

Table 3: Paired Samples Test

The paired t-test results reveal a significant and substantial effect of the treatment on the participants' scores, as evidenced by a mean difference of -22.063 with a standard deviation of 9.857. The negative mean difference indicates a notable decrease in scores post-treatment, suggesting that the intervention had a measurable impact. The 95% confidence interval for the difference, ranging from -25.616 to -18.509, reinforces the reliability of this finding, as the interval does not include zero, thereby confirming the statistical significance of the observed difference. Furthermore, the t-value of -12.662 and a p-value of <0.001 indicate a highly significant result, well below the conventional threshold of $p < 0.001$, signifying that the likelihood of this outcome occurring by chance is extremely low. These results strongly suggest that the treatment effectively reduced the measured outcome, underscoring the practical importance of the intervention in altering the participants' performance or condition. The consistency of these findings, as shown by the narrow confidence interval and large t-value, provides robust evidence supporting the treatment's efficacy, making a valuable contribution to the relevant academic discourse.

The practical implications of these findings are significant. The substantial reduction in scores after the intervention suggests that the treatment could be a valuable tool for improving outcomes in similar populations or settings. This has potential applications in clinical practice, educational programs, or other areas where such interventions could be implemented to achieve measurable improvements. The robustness of the statistical significance ($p < 0.001$) also implies that future implementations of this treatment are likely to yield consistent results, thereby supporting its broader adoption in real-world contexts.

Theoretical implications of the findings are also significant. The study contributes to the existing body of literature by providing empirical evidence of the treatment's efficacy, thus supporting its underlying conceptual framework. This study could inform future research by encouraging the exploration of similar interventions or the development of enhanced treatments based on the demonstrated effectiveness. Additionally, the clear and significant impact of the treatment highlights the importance of using evidence-based approaches, reinforcing the need for rigorous evaluations in program development. Overall, these results open pathways for further research and

practical applications, emphasizing the potential to scale the intervention across different settings and populations.

Students' Activity During Intervention

To complement the descriptive and inferential data analyses, the researchers also analyzed observation data collected during the interventions involving real-life scenarios. The descriptive statistical analysis of this observation encompasses 14 indicators and includes responses from 32 respondents. The finding provides additional insights into students' activities during the interventions.

Indicators	Mean	Std Dev	Min	25%	Median	75%	Max
Active Participation	4.13	0.61	3.00	4.00	4.00	4.25	5.00
Emotional involvement	3.97	0.18	3.00	4.00	4.00	4.00	4.00
Concept Understanding	4.03	0.18	4.00	4.00	4.00	4.00	5.00
Problem Identification	3.69	0.64	3.00	3.00	4.00	4.00	5.00
Troubleshooting Strategy	3.72	0.68	3.00	3.00	4.00	4.00	5.00
Justification of Solution	3.88	0.66	3.00	3.00	4.00	4.00	5.00
Writing ability	3.53	0.62	3.00	3.00	3.00	4.00	5.00
Verbal ability	3.78	0.75	3.00	3.00	4.00	4.00	5.00
Representation Usage	4.03	0.31	3.00	4.00	4.00	4.00	5.00
Interactions in Groups	4.00	0.44	3.00	4.00	4.00	4.00	5.00
Individual Contribution	3.75	0.51	3.00	3.00	4.00	4.00	5.00
Conflict Resolution	3.75	0.44	3.00	3.75	4.00	4.00	4.00
Learning Reflection	3.97	0.18	3.00	4.00	4.00	4.00	4.00
Metacognitive consciousness	3.50	0.51	3.00	3.00	3.50	4.00	4.00

Table 4: Descriptive statistics of student activity observation data

The data reveal several distinct trends in the participants' engagement, skills, and performance across different indicators. First, there is a clear trend of higher scores in areas related to *active participation* (M = 4.13), *concept understanding* (M = 4.03), and *representation usage* (M = 4.03). This fact suggests that participants are highly engaged in learning and effectively utilize conceptual and representational tools to enhance their understanding. The relatively low standard deviations for these indicators, especially *concept understanding* (SD = 0.18), point to a consistent level of performance across the group, indicating that most participants are well-engaged and competent in these areas.

A second trend emerges in areas where variability is higher, such as *troubleshooting strategy* (M = 3.72, SD = 0.68) and *justification of solutions* (M = 3.88, SD = 0.66). The higher standard

deviations suggest that while some participants perform well in these areas, others may struggle with problem-solving and providing clear, logical justifications for their solutions. This trend indicates a need for more targeted support to help students develop consistent critical thinking and problem-solving skills.

Thirdly, areas like *writing ability* (M = 3.53, SD = 0.62) and *metacognitive consciousness* (M = 3.50, SD = 0.51) reflect a downward trend compared to other indicators. These lower mean scores and moderate standard deviations suggest that participants may require additional instruction or practice in articulating their thoughts in written form and becoming more aware of their cognitive processes during learning. This trend points to potential gaps in skills that could impact students' ability to engage fully with more advanced academic tasks.

Lastly, the consistent performance across indicators related to group dynamics, such as *interactions in groups* (M = 4.00, SD = 0.44) and *conflict resolution* (M = 3.75, SD = 0.44), suggests that participants are generally proficient in collaborative settings. However, while group engagement is strong, there is some variability in *individual contribution* (M = 3.75, SD = 0.51), hinting that some participants may not contribute equally within group tasks.

In summary, the data reveal high engagement in active learning and conceptual understanding while highlighting areas such as problem-solving, writing, and metacognitive awareness where more individualized support may be necessary. These trends provide critical insights into participants' strengths and challenges, informing future instructional strategies that can enhance overall learning outcomes.

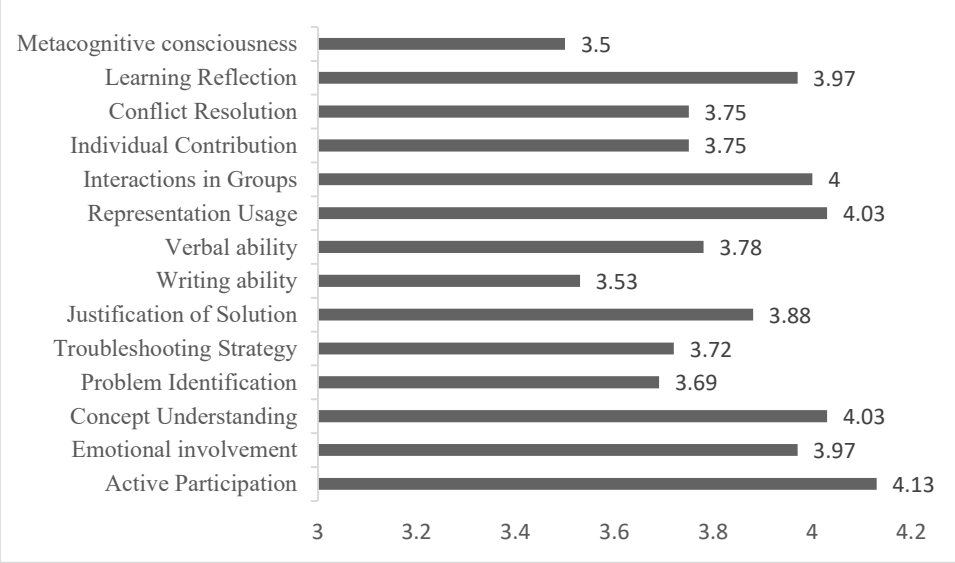

Figure 2. Student Activity Observation Outcome Graph for Each Indicator

The graph highlights the areas where participants excel, such as active participation and conceptual understanding, and areas that may benefit from further instructional support, particularly in metacognition, writing, and problem-solving skills. These findings can inform future pedagogical approaches to enhance student performance across broader skills.

The graph offers more comprehensive insights as follows:

1. *Balance Between Group and Individual Performance*. While participants show strong performance in *group interactions* (M = 4.00) and collaborative learning environments, the slightly lower scores in *individual contribution* (M = 3.75) suggest a discrepancy between group and individual effort. These data indicate that some participants may rely more on the group dynamic, potentially contributing less individually. Highlighting this insight could inform the need for balanced group work that encourages equitable individual contributions.

2. *Disparity Between Cognitive and Metacognitive Skills*. The high scores in cognitive-based skills like *concept understanding* (M = 4.03) and *representation usage* (M = 4.03) contrast sharply with the lower score in *metacognitive consciousness* (M = 3.50). This disparity implies that while students are proficient at understanding and applying concepts, they may need more awareness of their learning processes, which is crucial for self-regulated learning and long-term academic success. This fact points to the need for integrating metacognitive strategies into the curriculum, encouraging students to reflect on their thinking and problem-solving approaches (Tuononen et al., 2023).

3. *Consistency in Emotional and Reflective Engagement*. The consistently high scores in *emotional involvement* (M = 3.97) and *learning reflection* (M = 3.97) indicate that students are emotionally invested in their learning and actively reflect on their experiences. This condition is a positive indicator of student engagement, which often correlates with improved learning outcomes. Encouraging further emotional engagement and structured reflection activities could reinforce these aspects, leading to deeper, more meaningful learning experiences.

4. *Underperformance in Problem-Solving and Writing Skills*. Areas such as *problem identification* (M = 3.69) and *troubleshooting strategy* (M = 3.72), alongside *writing ability* (M = 3.53), suggest underperformance in critical thinking and written communication. These skills are essential for higher-order cognitive tasks and academic success. Highlighting this insight could emphasize the need for pedagogical adjustments to strengthen these competencies, such as problem-based learning approaches and writing-intensive assignments to build problem-solving abilities and improve articulation in written form.

5. *Addressing Variability in Scores*. Certain indicators, such as *justification of solution* (M = 3.88) and *verbal ability* (M = 3.78), show moderate performance but exhibit variability. This variability might suggest a gap in how consistently students perform across cohorts. Identifying the underlying factors contributing to this variability, such as differences in prior knowledge,

confidence in problem-solving, or communication skills, could help devise tailored interventions to address these inconsistencies.

Integration and Support for Student Activity Data Analysis with Pre-test and Post-test Statistical Results

The results of student activity observations and statistical analysis showed a strong correlation between student engagement in learning and improvements in students' mathematical literacy skills. The increase in average scores from the pre-test to the post-test indicates the effectiveness of the learning approach using real-life scenarios. In addition, the distribution of scores that were more concentrated around the average on the post-test than the pre-test indicated homogeneity of results after the intervention, reflecting that this method successfully reached students with various levels of initial ability.

The t-test results showed a significant difference between pre-test and post-test scores, strengthening the evidence that integrating real-life scenarios in mathematics learning significantly improved students' mathematical literacy skills. This result aligns with the findings that active participation and the use of good representations contribute to deeper understanding and better performance in mathematics. However, metacognitive awareness, which had the lowest mean score, suggests a need to improve students' awareness of their learning strategies. However, the increase in homogeneity of post-test scores suggests that this intervention is effective across a range of students' initial ability levels.

DISCUSSION

The results of this study indicate that learning with real-life scenario integration significantly improves students' mathematical literacy skills. Descriptive statistical analysis revealed an increase in the mean score from the pre-test to the post-test, with a decrease in the standard deviation from the pre-test to the post-test, indicating consistency of post-test results among respondents. Increased minimum and maximum scores and higher quartiles and medians on the post-test indicated overall performance improvements. Furthermore, inferential analysis using paired t-tests strengthened these findings by showing a significant difference between pre-test and post-test scores, confirming that intervention through real-life scenario integration in mathematics learning effectively improve students' mathematical literacy skills. These findings provide strong empirical evidence that a contextual learning approach that is relevant to students' real-life experiences can improve their understanding and performance in mathematics, and demonstrate the efficacy of this intervention across a range of students' initial ability levels.

The second finding is based on the observation sheet. Observational data collected during the intervention showed high levels of student engagement and participation. Students demonstrated a strong capacity for conceptual understanding and frequently used various representations to express their mathematical thinking. However, while the students were active in classroom discussions and tasks, certain areas, such as problem-solving, writing skills, and metacognitive awareness, still required further development. Despite the overall high engagement, these areas highlight the need for continued emphasis on reflection and articulation in mathematical literacy to ensure well-rounded skill development.

The findings of this study show significant improvements in students' mathematical literacy skills through the integration of real-life scenarios, which align with several recent studies and offer extensions in a broader context. For example, a study by Palinussa et al. (Palinussa et al., 2021) found that realistic mathematical education improved mathematical literacy such as reasoning and communication skills in the island-based rural context. The findings also support a study by Samuelsson et al. which demonstrated that a fraction intervention focusing on real-world applications improved students' conceptual fraction knowledge, particularly in measurement aspects (Björkhammer et al., 2024). In addition, a study by Nurlinda et al. (2024) confirmed that contextual learning can improve understanding of mathematical concepts and applications in everyday life. Similarly, a study by Smith et al. (2023) published in KnE Social Science supported that mathematical literacy can be improved by problem-based learning, in which real-world contexts in learning can be applied to improve student engagement and understanding. However, these findings also showed a significant reduction in post-test score variation, indicating higher homogeneity of results after the intervention, furthering the knowledge of the effectiveness of contextual learning in reaching different levels of students' initial abilities. In contrast to what Hu (Hu, 2024) explains that conventional methods often fail to address disparities in student ability, the results of this study showed that the integration of real-life scenarios not only improved average performance but also narrowed the gap between students. Thus, this study strengthens and extends the understanding of the benefits of contextual learning in mathematics education, demonstrating its relevance and effectiveness in modern educational contexts.

The findings of this study support and extend constructivist theories in mathematics education, particularly those of (Piaget, 1972; Vygotsky & Cole, 1978) by demonstrating that real-life-relevant learning enhances student understanding and engagement. The integration of real-life scenarios increased average mathematical literacy skills and reduced performance disparities among students, challenging the assumption that traditional approaches are less effective in reaching all students equally. This study contributes to theory development in mathematics education by offering empirical evidence on the effectiveness of contextual approaches, creating inclusive and equitable learning environments (Wijaya et al., 2015). It also emphasizes the importance of integrating real-life scenarios into the mathematics curriculum, providing a basis for further theory development on the implementation of real-world contexts in mathematics instruction to improve student

learning outcomes (Björkhammer et al., 2024; Nurlinda et al., 2024; Palinussa et al., 2021; Smith et al., 2023).

However, unlike some previous studies that focused on merely improving problem-solving skills, the current findings also emphasize the increased *engagement* of students during the intervention. For instance, a study by Ingram (Ingram et al., 2024) pointed out the challenge of promoting active learning in mathematics, especially when incorporating real-life contexts. This study's findings expand the literature by highlighting improvement in mathematical literacy and students' heightened participation. This finding aligns with the work of (Elgrably & Leikin, 2021), who argued that active engagement is a crucial, yet often under-reported outcome of real-life problem scenarios in math education. These current findings demonstrate that with proper guidance, students from varying levels can benefit from such interventions. This study, therefore, expands on previous research by suggesting that even without prior high levels of mathematical proficiency, students can still exhibit both improved literacy and active engagement when provided with carefully designed and supported real-life scenarios.

The findings from this study offer valuable contributions to existing theories on mathematical literacy and active learning, with notable implications for theory support and expansion. One of the key theoretical frameworks related to mathematical literacy is the socio-constructivist theory of learning (Gravemeijer, 2020), which emphasizes that students construct knowledge through interaction with real-life contexts and active engagement. This study's results strongly support the socio-constructivist perspective by demonstrating that real-life scenarios significantly improve students' mathematical literacy. Moreover, the heightened student engagement observed during the real-life scenario interventions challenges traditional views that passive, lecture-based approaches are sufficient for teaching mathematics. Instead, these findings support theories of active learning, such as Piaget's theory of cognitive development, which posits that learning is an active process of discovery. The increased activeness among students in this study reinforces the argument that hands-on, contextualized activities encourage deeper cognitive processing and active participation, thus contributing to the theoretical discourse around constructivist learning environments.

In terms of theory development, this research expands on existing frameworks by emphasizing the dual impact of real-life scenarios, improving both mathematical literacy and student engagement. While prior studies have primarily focused on the cognitive outcomes of mathematical literacy, this study contributes to the broader theoretical understanding by incorporating the affective and participatory dimensions of learning. It suggests that real-life scenarios not only enhance cognitive outcomes but also foster a more active, student-centered classroom environment, which could be integrated into theories that explore the relationships between cognition, affect, and active participation in learning.

Several limitations to this study that should be acknowledged. First, the sample size was relatively small which may limit the generalizability of the findings to a larger population of middle school

students. A larger, more diverse sample might produce different results and provide a more comprehensive understanding of the effectiveness of real-life scenarios in improving mathematical literacy. Second, the study was conducted in a specific geographic location (Parepare), which may have cultural or contextual factors that influenced the results. The impact of real-life scenarios in mathematical literacy learning might vary in different educational contexts or with students from different backgrounds.

Another limitation is the reliance on pre-test and post-test scores as the primary measure of improvement. While these scores provide valuable quantitative data, they may capture a partial range of cognitive, emotional, and social benefits that real-life scenarios might offer. Additional qualitative data, such as student interviews or classroom observations, could provide richer insights into how these scenarios influence learning processes and student engagement. Lastly, the duration of the intervention was relatively short, and the study did not assess the long-term retention of mathematical literacy skills. Future studies could examine whether the improvements observed are sustained over time, offering a more complete picture of the intervention's lasting effects.

Based on the identified limitations, further research is suggested to involve larger and more diverse samples to increase the generalizability of the findings and expand the geographic scope to test the effectiveness of contextual learning in different cultural and educational settings. In addition, research with a longer intervention duration is needed to evaluate the long-term impact of this method. It is also important to control for external variables such as the quality of instruction and students' socio-economic background to obtain more accurate results. More comprehensive assessment methods can provide a more in-depth picture of students' mathematical literacy abilities. Finally, further research should consider and mitigate the Hawthorne effect to ensure more valid and reliable results.

This study makes significant contributions to the field of mathematics education, particularly through its methodology and theoretical and practical implications. Its methodology, which integrates real-life scenarios in mathematics learning, proves the effectiveness of contextual approaches in improving students' mathematical literacy skills. The findings support and extend constructivist theories that emphasize the importance of hands-on experience and relevance in learning, and suggest that this approach can reduce performance disparities among students with varying levels of initial ability. Practically, this study provides empirical evidence that can be used to inform the development of more inclusive and effective curricula and teaching strategies, assisting educators and policymakers in designing more relevant and applicable learning programs. Overall, this study strengthens the argument for the importance of contextual learning and provides a strong foundation for further research in an effort to improve the quality of mathematics education at various levels of education.

CONCLUSIONS

This research reveals that integrating real-life scenarios into mathematics learning significantly improves students' mathematical literacy. The increase in the average score from the pre-test to the post-test, accompanied by a decrease in the standard deviation, suggests that this method is effectively increase student understanding and performance consistently. Inferential analysis supports these findings, with t-tests in pairs showing significant differences between pre-test and post-test scores, confirming the success of these interventions. This finding supports a constructivist theory that emphasizes the importance of contextual learning and the relevance of real experiences in education. In addition, the study provides empirical evidence of the benefits of contextual learning approaches and offers guidance to educators and policymakers in designing more effective and inclusive curricula and teaching strategies.

Based on the findings and conclusions of this study, several recommendations can be made for future research. First, it is recommended that the sample size be enlarged and demographic diversity increased to extend the generalization of results to a wider population. Research in different geographical and cultural locations is also needed to test the consistency and effectiveness of contextual learning approaches in different educational contexts. Second, it is recommended to extend the duration of the intervention in order to evaluate the long-term impact of integrating real-life scenarios into mathematics learning. In addition, it is important to control external variables such as the quality of teaching and students' socio-economic background to obtain more accurate and reliable results. More comprehensive assessment methods are also recommended better to capture the spectrum of students' mathematical literacy skills. Finally, further research should consider and reduce the Hawthorne effect to ensure the validity and reliability of the results. By following these recommendations, future research is expected to strengthen and broaden the understanding of the effectiveness of contextual learning and make a greater contribution to improving the quality of mathematics education.

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REFERENCES

[1] Abaño, J. T., Binondo, J. N., Fortuna, C. M., Guinang, H., Medora, J. C., & Puyod, S. J. P. (2024). Effectiveness of Integrating Real-Life Problems into Mathematical Concepts. *International Multidisciplinary Journal of Research for Innovation, Sustainability, and Excellence (IMJRISE)*, *1*(5), 90-96. https://doi.org/https://doi.org/10.5281/zenodo.11144435

[2] Agustina, E. N. S., Widadah, S., & Nisa, P. A. (2021). Developing Realistic Mathematics Problems Based on Sidoarjo Local Wisdom. *Mathematics Teaching Research Journal*, *13*(4), 181-201.

[3] Attard, C., & Holmes, K. (2022). An exploration of teacher and student perceptions of blended learning in four secondary mathematics classrooms. *Mathematics Education Research Journal*, *34*(4), 719-740.

[4] Björkhammer, C., Samuelsson, J., Träff, U., & Östergren, R. (2024). The effects of a whole-class mathematics intervention on students' fraction knowledge in primary school. *Scandinavian Journal of Educational Research*, *68*(6), 1275-1289. https://doi.org/https://doi.org/10.1080/00313831.2023.2228818

[5] Çakıroğlu, Ü., Güler, M., Dündar, M., & Coşkun, F. (2024). Virtual reality in realistic mathematics education to develop mathematical literacy skills. *International Journal of Human–Computer Interaction*, *40*(17), 4661-4673. https://doi.org/https://doi.org/10.1080/10447318.2023.2219960

[6] Cao, W., & Yu, Z. (2023). The impact of augmented reality on student attitudes, motivation, and learning achievements—a meta-analysis (2016–2023). *Humanities and Social Sciences Communications*, *10*(1), 1-12. https://doi.org/https://doi.org/10.1057/s41599-023-01852-2

[7] Carl, J., Schmittwilken, L., & Pöppel, K. (2023). Development and evaluation of a school-based physical literacy intervention for children in Germany: protocol of the PLACE study. *Frontiers in sports and active living*, *5*, 1155363. https://doi.org/https://doi.org/10.3389/fspor.2023.1155363

[8] Costa, M. C., Domingos, A. M. D., Teodoro, V. D., & Vinhas, É. M. R. G. (2022). Teacher professional development in STEM education: An integrated approach with real-world scenarios in Portugal. *Mathematics*, *10*(21), 3944.

[9] Elgrably, H., & Leikin, R. (2021). Creativity as a function of problem-solving expertise: Posing new problems through investigations. *ZDM–Mathematics Education*, *53*(4), 891-904. https://doi.org/https://doi.org/10.1007/s11858-021-01228-3

[10] Elsayed, H., Nivala, M., & Carlzon, L. (2024). Students' and instructors' perspectives on learning and professional development in the context of interprofessional simulation. *Teaching and Learning in Medicine*, *36*(4), 454-469. https://doi.org/https://doi.org/10.1080/10401334.2023.2230562

[11] Gravemeijer, K. (2020). A socio-constructivist elaboration of realistic mathematics education. In *National reflections on the Netherlands didactics of mathematics: Teaching and learning in the context of realistic mathematics education* (pp. 217-233). Springer

International Publishing Cham. https://doi.org/https://doi.org/10.1007/978-3-030-33824-4_12

[12] Gregory, R. J. (1992). *Psychological Testing: History, Principles, and Applications*. Allyn and Bacon.

[13] Hillmayr, D., Ziernwald, L., Reinhold, F., Hofer, S. I., & Reiss, K. M. (2020). The potential of digital tools to enhance mathematics and science learning in secondary schools: A context-specific meta-analysis. *Computers & Education*, *153*, 103897. https://doi.org/https://doi.org/10.1016/j.compedu.2020.103897

[14] Hu, J. (2024). The challenge of traditional teaching approach: A study on the path to improve classroom teaching effectiveness based on secondary school students' psychology. *Lecture Notes in Education Psychology and Public Media*, *50*(1), 213-219. https://doi.org/https://doi.org/10.54254/2753-7048/50/20240945

[15] Ingram, J., Abbott, A., Smith, K., Planas, N., & Erath, K. (2024). Experienced teachers talking about their mathematics teaching with linguistically disadvantaged learners. *Journal of Mathematics Teacher Education*, *27*(5), 785-808. https://doi.org/https://doi.org/10.1007/s10857-024-09628-4

[16] Johar, R., Zubainur, C. M., Ikhsan, M., & Zubaidah, T. (2021). Pedagogical Content Knowledge of Teachers in Teaching Decimals through Realistic Mathematics Education. *Mathematics Teaching Research Journal*, *13*(4), 150-169.

[17] Ketonen, L., Körkkö, M., & Pöysä, S. (2025). Authentic assessment as a support for student teachers' reflection. *European Journal of Teacher Education*, *48*(3), 467-488. https://doi.org/https://doi.org/10.1080/02619768.2023.2229004

[18] Kirsten, K., & Greefrath, G. (2024). On-campus vs distance tutorials in preparatory courses for mathematics student teachers–performance gains and influencing factors. *International Journal of Research in Undergraduate Mathematics Education*, *10*(2), 547-576. https://doi.org/https://doi.org/10.1007/s40753-023-00221-3

[19] Komarudin, K., Suherman, S., & Vidákovich, T. (2024). The RMS teaching model with brainstorming technique and student digital literacy as predictors of mathematical literacy. *Heliyon*, *10*(13). https://doi.org/ https://doi.org/10.1016/j.heliyon.2024.e33877

[20] Loeb, D., Shoemaker, J., Parsons, A., Schumacher, D., & Zackoff, M. (2023). How augmenting reality changes the reality of simulation: ethnographic analysis. *JMIR Medical Education*, *9*(1), e45538. https://doi.org/https://doi.org/10.2196/45538

[21] Malik, A. R., Pratiwi, Y., Andajani, K., Numertayasa, I. W., Suharti, S., Darwis, A., & Marzuki. (2023). Exploring Artificial Intelligence in Academic Essay: Higher Education Student's Perspective. *International Journal of Educational Research Open*, *5*, 100296. https://doi.org/10.1016/j.ijedro.2023.100296

[22] Malik, M. A., Badolo, M. s., & Badaruddin. (2018). Internet-Based Learning Management Model To Improve The Student's Mathematic Problem Solving Ability. Journal of Physics: Conference Series,

[23] Naidoo, J., & Reddy, S. (2023). Embedding sustainable mathematics higher education in the fourth industrial revolution era post-COVID-19: Exploring technology-based teaching methods. *Sustainability*, *15*(12), 9692. https://doi.org/https://doi.org/10.3390/su15129692

[24] Nurlinda, E., Azis, Z., & Nasution, M. D. (2024). Students' Mathematical Reasoning Ability and Self-Efficacy Viewed from the Application of Problem Based Learning and Contextual Teaching and Learning Models Assisted. *JMEA: Journal of Mathematics Education and Application*, *3*(2), 54-61.

[25] Ozturk, O., Kravchuk, O., & Jarrett, R. (2023). Models for cluster randomized designs using ranked set sampling. *Statistics in Medicine*, *42*(15), 2692-2710. https://doi.org/https://doi.org/10.1002/sim.9743

[26] Palinussa, A. L., Molle, J. S., & Gaspersz, M. (2021). Realistic Mathematics Education: Mathematical Reasoning and Communication Skills in Rural Contexts. *International Journal of Evaluation and Research in Education*, *10*(2), 522-534. https://doi.org/https://doi.org/10.11591/ijere.v10i2.20640

[27] Parker, N., Breitenstein, J., & D'On Jones, C. (2020). Literacy-Based Instructional Techniques for the Middle School Mathematics Teacher. *Journal of Curriculum and Teaching*, *9*(2), 91-94. https://doi.org/https://doi.org/10.5430/jct.v9n2p91

[28] Piaget, J. (1972). Intellectual evolution from adolescence to adulthood1. In *Cognitive and moral development, academic achievement in adolescence* (pp. 1-12). Routledge. https://doi.org/https://doi.org/10.1159/000271225

[29] Powell, S. R., Lembke, E. S., Ketterlin-Geller, L. R., Petscher, Y., Hwang, J., Bos, S. E., Cox, T., Hirt, S., Mason, E. N., & Pruitt-Britton, T. (2021). Data-based individualization in mathematics to support middleschool teachers and their students with mathematics learning difficulty. *Studies in Educational Evaluation*, *69*, 100897. https://doi.org/https://doi.org/10.1016/j.stueduc.2020.100897

[30] Putri, A. S., Prasetyo, Z. K., Purwastuti, L. A., Prodjosantoso, A. K., & Putranta, H. (2023). Effectiveness of STEAM-based blended learning on students' critical and creative thinking skills. *Int J Eval & Res Educ ISSN*, *2252*(8822), 8822. https://doi.org/https://doi.org/10.11591/ijere.v12i1.22506

[31] Ruiz-Palmero, J., Guillén-Gámez, F. D., Colomo-Magaña, E., & Sánchez-Vega, E. (2023). Effectiveness of the Flipped Classroom in the Teaching of Mathematics in an Online Environment: Identification of Factors Affecting the Learning Process. *Online Learning*, *27*(2), 304-323. https://doi.org/https://doi.org/10.24059/olj.v27i2.3239

[32] Sevcikova, A., Milkova, E., Moldoveanu, M., & Konvicka, M. (2023). Graph theory: Enhancing understanding of mathematical proofs using visual tools. *Sustainability*, *15*(13), 10536. https://doi.org/https://doi.org/10.3390/su151310536

[33] Shiang Tyng, K., Badioze Zaman, H., Hanan Mohamad, U., & Ahmad, A. (2023). Perceived ease of use on visual learning application for mathematics using holography display for the topic on shape and space [version 1; peer review: 1 approved with reservations, 1 not approved]. *F1000Research*, *12*(636). https://doi.org/https://doi.org/10.12688/f1000research.133177.1

[34] Smith, G., Liowardani, A. P., Permadi, H., & Anita, Y. (2023). Application of Problem-based Learning in Efforts to Build Mathematical Literacy Skills. *KnE Social Sciences*, *8*(10), 96–105-196–105. https://doi.org/10.18502/kss.v8i10.13435

[35] Thuy, H. T., & Le Phuoc, S. (2023). Building Framework for Assessing Students' Statistical Reasoning in Solving Real-Life Medical Problems. *Mathematics Teaching Research Journal*, *15*(4), 45-68.
[36] Uegatani, Y., Otani, H., Shirakawa, S., & Ito, R. (2024). Real and illusionary difficulties in conceptual learning in mathematics: comparison between constructivist and inferentialist perspectives. *Mathematics Education Research Journal*, *36*(4), 895-915. https://doi.org/https://doi.org/10.1007/s13394-023-00478-6
[37] Ulfatun, T., Suyatmini, S., Kusumaningtyas, A., & Setiyawan, Y. A. (2023). Teacher's understanding of teaching models and students' human literacy. *International Journal of Evaluation and Research in Education (IJERE)*, *12*(4), 1925. https://doi.org/https://doi.org/10.11591/ijere.v12i4.25618 (https://doi.org/10.11591/ijere.v12i4.25618)
[38] Uyen, B. P., Tong, D. H., Loc, N. P., & Thanh, L. N. P. (2021). The Effectiveness of Applying Realistic Mathematics Education Approach in Teaching Statistics in Grade 7 to Students' Mathematical Skills. *Journal of Education and E-Learning Research*, *8*(2), 185-197. https://doi.org/https://doi.org/10.20448/journal.509.2021.82.185.197
[39] Vygotsky, L. S., & Cole, M. (1978). *Mind in society: Development of higher psychological processes*. Harvard university press.
[40] Wijaya, A., van den Heuvel-Panhuizen, M., & Doorman, M. (2015). Opportunity-to-learn context-based tasks provided by mathematics textbooks. *Educational studies in Mathematics*, *89*(1), 41-65. https://doi.org/https://doi.org/10.1007/s10649-015-9595-1
[41] Wisenöcker, A. S., Binder, S., Holzer, M., Valentic, A., Wally, C., & Große, C. S. (2024). Mathematical problems in and out of school: The impact of considering mathematical operations and reality on real-life solutions. *European Journal of Psychology of Education*, *39*(2), 767-783.
[42] Zhidkikh, D., Saarela, M., & Kärkkäinen, T. (2023). Measuring self-regulated learning in a junior high school mathematics classroom: Combining aptitude and event measures in digital learning materials. *Journal of Computer Assisted Learning*, *39*(6), 1834-1851. https://doi.org/https://doi.org/10.1111/jcal.12842

APPENDIX

Sample Questions from Pre-test

1. The average exam score for a class with 40 students is 75. One of the students in that group got a score of 25 and was not included in the average calculation. Calculate the average exam score for that class!
2. Bu Mus recorded cloth purchases at her shop for 9 consecutive days and obtained the following data: 8, 11, 13, 9, 16, 9, 10, 11, 7. Determine the median value of the data!

Sample Questions from Post-test

1. The average exam score for a class with 40 students is 62. One of the students in that group got a score of 23 and was not included in the average calculation. Calculate the average exam score for that class!
2. Pak Dani recorded fabric purchases at his shop for 9 consecutive days and obtained the following data: 9, 10, 15, 7, 17, 8, 9, 11, 8. Determine the median value of the data!