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ELEMENTARY SCHOOL STUDENTS' PERCEPTION TOWARDS THE USE OF GAMIFICATION IN REALISTIC MATHEMATICS EDUCATION-BASED MATHEMATICS LEARNING

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Abstract *Additionally, this study examines how gamification affects students' motivation and comprehension of mathematics while also analyzing the variables that affect their perspectives. This study combines a case study methodology with a qualitative approach. Interviews, observations, and open-ended surveys with elementary school pupils who have engaged in gamification and RME-based arithmetic instruction were used to gather data. To guarantee the validity of the results, data reduction, data presentation, and triangulation* were used in the data analysis procedures. *The findings demonstrated that, according to RME, pupils had a favorable opinion of the application of gamification in mathematics instruction. This method increases students' motivation, engagement, and comprehension of mathematical ideas. Additionally, it was discovered that by making learning more engaging and enjoyable, gamification in RME boosts students' willingness to learn. A balance between challenges and mathematical idea development is necessary, though, as some students find the competitive aspects of gamification to be stressful. Gamification of RME-based math instruction has a major positive impact on students' motivation and comprehension. Its efficacy is contingent upon the appropriate learning design, the role of educators in promoting constructive interactions, and the harmony between idea exploration and competitiveness. According to this study, educators should create gamification tactics that suit the needs and traits of their students and assess how they affect learning outcomes in mathematics over the long run.*

Keywords: *Student Perception, Gamification, Realistic Mathematics Education, Elementary School*

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Abstrak *Penelitian ini mengkaji bagaimana gamifikasi memengaruhi motivasi dan pemahaman siswa terhadap matematika, sekaligus menganalisis variabel-variabel yang memengaruhi persepsi mereka. Penelitian ini menggabungkan metodologi studi kasus dengan pendekatan kualitatif. Data dikumpulkan melalui wawancara, observasi, dan survei terbuka dengan siswa sekolah dasar yang telah mengikuti pembelajaran matematika berbasis gamifikasi dan RME. Untuk memastikan validitas hasil, prosedur analisis data menggunakan reduksi data, presentasi data, dan triangulasi. Hasil penelitian menunjukkan bahwa, menurut RME, siswa memiliki pandangan positif terhadap penerapan gamifikasi dalam pengajaran matematika. Metode ini meningkatkan motivasi, keterlibatan, dan pemahaman siswa terhadap konsep matematika. Selain itu, ditemukan bahwa gamifikasi dalam RME meningkatkan kemauan siswa untuk belajar dengan membuat proses belajar lebih menarik dan menyenangkan. Namun, keseimbangan antara tantangan dan pengembangan konsep matematika diperlukan, karena beberapa siswa merasa aspek kompetitif gamifikasi menimbulkan stres. Gamifikasi dalam pengajaran matematika berbasis RME memiliki dampak positif yang signifikan terhadap motivasi dan pemahaman siswa. Efektivitasnya bergantung pada desain pembelajaran yang tepat, peran pendidik dalam mendorong interaksi konstruktif, dan keseimbangan antara eksplorasi konsep dan kompetisi. Menurut studi ini, pendidik sebaiknya mengembangkan strategi gamifikasi yang sesuai dengan kebutuhan dan karakteristik siswa mereka, serta mengevaluasi dampaknya terhadap hasil belajar matematika dalam jangka panjang.*

Keywords: *Persepsi Siswa, Gamification, Realistic Mathematics Education, Sekolah Dasar.*

A. INTRODUCTION

One of the core courses taught in elementary school that contributes to the development of logical, analytical, and problem-solving thinking abilities is mathematics. (Zubainur et al., 2020);(Wiraprana & Surya, 2022). In reality, though, students frequently view mathematics as a challenging and dull subject. Numerous factors contribute to this challenge, including too theoretical teaching strategies, low student enthusiasm for learning, and a lack of student involvement in the learning process (Stoeffler et al., 2020)(Sailer et al., 2017).

Realistic Mathematics Education (RME), which stresses the use of real circumstances in mathematics instruction to make it more meaningful for pupils, is one strategy that can assist in resolving this issue (Zubaidah et al., 2023). Instead of merely

learning formulas, RME enables students to develop a grasp of mathematical topics by investigating real-world scenarios (Puspitasari & Airlanda, 2021).

However, the use of gamification in mathematics teaching has been made possible by technology advancements in education (Hayati et al., 2025). The use of game features like points, badges, levels, and challenges—in non-gaming environments to boost student motivation and engagement is known as gamification (Stoeffler et al., 2020);(Agus & Kusuma Wardhani, 2023). It has been demonstrated that gamification makes learning more engaging, enhances student concentration, and promotes active engagement.

The integration of gamification and RME in elementary school mathematics instruction has, however, seldom ever been thoroughly examined, despite the fact that both strategies seek to improve student involvement and comprehension. Thus, it's critical to investigate how students react to gamification in RME-based math instruction and whether this strategy actually enhances their comprehension and motivation for arithmetic learning.

A number of educational phenomena point to difficulties in teaching mathematics in elementary schools, such as students' disinterest in the subject, which results in low learning engagement. When opposed to traditional teaching techniques, students typically favor digital and interactive learning, such as instructional games. There is still little use of the Realistic Mathematics Education approach in elementary schools, particularly when it comes to gamification and technology.

Prior research has extensively employed RME as a teaching strategy and demonstrated its efficacy in enhancing students' comprehension of mathematical ideas (Hayati et al., 2024). Research on the combination of gamification and RME is relatively scarce, nevertheless. Numerous studies have been conducted on gamification in education, particularly in relation to digital learning (Kartika et al., 2023);(Fitriani et al., 2022). However, there hasn't been much discussion on how it's used in the RME technique based on real-world exploration (Ratinho & Martins, 2023). According to theories of learning motivation like the Self-Determination Theory, gamification components can increase students' intrinsic motivation. However, how this theory works

in the context of RME-based mathematics learning is still a question that needs to be explored (Meganta P et al., 2023)

The lack of research that specifically examines students' perceptions of gamification in RME learning. Most previous studies have focused more on the effectiveness of gamification or the effectiveness of RME separately, without looking at the interaction of the two from the student's perspective. Lack of studies on how gamification elements can be adapted in RME to improve the understanding of number sense or mathematical thinking skills of elementary school students.

This study aims to Describe the perceptions of elementary school students towards the use of gamification in mathematics learning based on Realistic Mathematics Education (RME). Analyze the factors that influence students' perceptions of the use of gamification in mathematics learning based on RME. Explore the impact of the use of gamification in RME learning on students' motivation and understanding in learning mathematics. Based on the problems above, the researcher wants to examine how elementary school students perceive the use of gamification in mathematics learning based on realistic mathematics education. The results of this study are expected to provide insight for educators about how students respond to RME and gamification-based learning approaches. Provide recommendations for curriculum and learning media developers in optimizing gamification in the RME approach. Fill the research gap related to the integration of gamification and RME in mathematics learning in elementary schools.

B. METHOD

This study uses a qualitative approach with phenomenology, which aims to understand the perceptions of elementary school students towards the use of gamification in mathematics learning based on Realistic Mathematics Education. This study uses a qualitative approach and Phenomenology Type. Qualitative Approach is used to understand students' experiences and perceptions in depth without using numerical data. Phenomenology Focuses on students' subjective experiences in gamification and RME-based learning, including how they interpret the learning process.

The subjects of this study were sixth grade elementary school students who had experienced learning with gamification and RME and mathematics teachers as additional informants to provide perspectives related to the application of gamification in RME. The criteria for selecting participants were based on students who had been involved in gamification and RME-based mathematics learning, willing to participate in interviews or discussions. Teachers who have experience in teaching mathematics using the RME and gamification approaches.

Data Collection Techniques in qualitative research are in-depth interviews. Students will be interviewed to explore their experiences and perceptions of learning with gamification in RME. Teachers are also interviewed to understand how they implement gamification in RME learning and how students respond to it. Next, there is Participatory Observation Directly observing the process of learning mathematics using gamification in RME. Paying attention to student engagement, their expressions, and how they respond to gamification elements in learning.

Document Analysis Analyzes learning materials, student assignments, and gamification media used in learning. The data obtained will be analyzed using the Miles & Huberman model which includes: Data Reduction → Filtering and selecting relevant data from interviews, observations, and documents. Data Presentation → Arranging data in narrative or diagram form to find main patterns and themes. Conclusion Drawing → Analyze emerging patterns and draw conclusions related to student perceptions of gamification in RME. To ensure the validity and validity of the data, triangulation techniques are used, namely: Source Triangulation → Comparing data from students, teachers, and observation results. Method Triangulation → Using various data collection methods to obtain more accurate information. Member Checking → Reconfirming the results of interviews with participants to ensure the accuracy of data interpretation.

C. RESULT AND DISCUSSION

Elementary School Students' Perceptions of the Use of Gamification in Realistic Mathematics Education (RME)-Based Mathematics Learning. Based on interviews and observations, students' perceptions of gamification in RME-based mathematics learning tend to be positive. Students feel that gamification elements such as points, levels, challenges, and awards make learning more fun and interesting than conventional methods.

Some student responses related to learning with gamification in RME: "Exciting because there are challenges and you can get prizes!" "Easier to understand because the questions are like real stories, not just numbers in a book." "Happy because you can compete with friends, so you are enthusiastic about learning." However, there are some students who have difficulty adjusting to the gamification system, especially for those who are not used to game mechanisms or prefer to learn individually without competition.

Factors Influencing Students' Perceptions of Gamification in RME-Based Mathematics Learning. Several factors that influence students' perceptions of gamification in RME learning include: Internal Factors (From Students) including Initial Interest and Motivation, Students who like games or challenge-based activities tend to be more enthusiastic about gamification learning. Students with low interest in mathematics feel more motivated because learning feels like playing. Learning Style Students who prefer to learn through real or visual experiences enjoy the RME approach combined with gamification. In contrast, students with conventional learning styles who prefer to memorize formulas face challenges in adapting.

External Factors (From the School and Learning Environment) include Teacher Support. Teachers who actively provide motivation and explain game concepts well contribute to students' positive perceptions of gamification. Conversely, if gamification is not explained well, students can feel confused or less interested. Next is Technology Support and Learning Media. If digital-based gamification is implemented, the availability of devices and internet access are important factors. Students enjoy it more if gamification elements are supported by visual and interactive media, such as applications or story-based games. Next is the Classroom Environment and Interaction with Friends factor

where students who like to compete with friends are more enthusiastic in completing gamification challenges. However, some students feel stressed if they focus too much on the ranking system (leaderboard) in gamification.

The Impact of Using Gamification in RME-Based Mathematics Learning on Student Motivation and Understanding (Hakeu et al., 2023). Based on the results of observations and focus group discussions (FGD), it was found that gamification in RME has a positive impact on student motivation and understanding in learning mathematics. The Impact on Student Motivation can be seen from Increasing enthusiasm for learning → Students are more active in following lessons because they feel like they are playing. Encouraging the desire to complete challenges → Elements such as points, levels, and prizes make students more enthusiastic. Increasing social interaction → Students discuss and work together more often in completing math challenges. However, several obstacles were also found, some students felt disappointed if they did not achieve certain targets in gamification. Students with low self-confidence sometimes feel inferior when they see their friends' scores are higher.

Impact on Students' Understanding, improving logical thinking and problem-solving skills → With the RME approach, students better understand mathematical concepts in real-world contexts. Helping students understand abstract concepts more concretely → Students find it easier to understand story problems because they can imagine real situations in everyday life. Improving number sense skills → Students are better trained in understanding numbers and their operations through activities involving gamification (Wang et al., 2024). However, some students still face challenges in adjusting to the gamification system, especially those who are not used to the challenge and competition-based approach.

CONCLUSION

Based on the results of the research and discussion, several main points can be concluded regarding students' perceptions of the use of gamification in mathematics learning based on Realistic Mathematics Education (RME), factors that influence students' perceptions, and the impact of gamification on students' motivation and

understanding. In general, students have a positive perception of the use of gamification in mathematics learning based on RME. They feel more motivated, actively involved, and happy in learning because of the game elements applied. Learning becomes more interesting, interactive, and not boring compared to conventional methods. However, in order for gamification to remain effective, there needs to be a learning design that is in accordance with the needs and characteristics of students and a balance between game elements and learning objectives. Based on the conclusions above, there are several implications that can be applied in mathematics learning in elementary schools. Teachers need to design gamification with a more inclusive approach, so that all students can participate without feeling burdened by competition. Gamification elements must be in line with the principles of RME, so that they not only increase motivation but also deepen students' understanding of mathematical concepts. Support from schools and learning facilities needs to be considered, especially in the use of technology in gamification. There needs to be further research regarding the long-term effectiveness of gamification in improving student learning outcomes, as well as the best strategies for overcoming challenges in its implementation.

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