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Improving Fourth-Grade Students' Mathematics Learning Outcomes through Quizizz Based Classroom Action Research

Krisantus N Kantur [1], Edy M Priyono [2], Nurul Hikmah [3], Asyifa Aulia Zahro [4], Andy Ahmad[5] Ageng Triyono*[6]
[123] STKIP Kusuma Negara, Jakarta; Indonesia
Email Correspondence; ageng.triono.at@gmail.com

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Abstract

This study aimed to improve the mathematics learning outcomes of fourth-grade students at MI Sirojul Athfal in the topic of mixed operations through the use of Quizizz as an instructional medium. The study employed Classroom Action Research (CAR) conducted in two cycles. The participants were fourth-grade students, and data were collected through teacher interviews, questionnaires administered to four students, classroom observations, and documentation. The findings indicated that students experienced several difficulties in learning mathematics, including negative perceptions of mathematics as a difficult subject, low learning motivation, problems in group work, limited self-confidence, weak interest in learning, and poor mastery of basic concepts. The use of Quizizz increased students' engagement and enthusiasm during the learning process and led to a marked improvement in learning outcomes across cycles. In Cycle II, learning mastery reached 80%, meeting the predetermined indicator of success and bringing the study to an end. These findings suggest that Quizizz is effective in improving students' mathematics learning outcomes in mixed operations. The study further implies that interactive learning media can serve as an innovative alternative for enhancing the quality of mathematics instruction in elementary schools.

Keywords

Quizizz, Mathematics Learning Outcomes, Classroom Action Research, Elementary School.

INTRODUCTION

Education refers to the totality of knowledge acquired throughout life, across places and situations, that positively shapes human development. One of the most important fields of study in everyday life is mathematics (Waruwu, 2020). Mathematics is a foundational discipline learned from childhood through adulthood and is highly beneficial, especially at the elementary level (Nisa, 2023). Nevertheless, mathematics often poses challenges for learners throughout their educational journey (Pebriati, 2019).

As discussed in Alex Sihombing's article on Kompasiana.com entitled "Challenges in Learning Mathematics," mathematics is often perceived as an intimidating subject. This perception may stem from the difficulty of the material, monotonous teaching methods, or even overly strict teachers (Suswati, 2021). Difficulties in learning mathematics may arise from the belief that mathematics is inherently difficult, limited basic skills, low motivation, or health-related problems (Kholil, 2020). Dwi (2021) identifies eight major characteristics of difficulties in learning mathematics, including problems in understanding spatial relationships, concepts of time and direction, visual-spatial perception, visual-motor association, recognizing and understanding symbols, perseveration, oral and written language, and prerequisite skills.

Fourth-grade students at MI Sirojul Athfal face similar challenges. Many of them have difficulty understanding mathematical concepts, particularly the topic of mixed operations. Learning difficulties arise when students encounter obstacles in the learning process and fail to achieve optimal outcomes, indicating a gap between expected and actual academic performance. This issue constitutes the main rationale for the present study, which emphasizes the importance of addressing challenges in mathematics learning (Tuloli, 2022). To overcome such challenges, the first step is to identify the factors that cause them (Akbari, 2022).

Problems of this kind need to be addressed immediately in order to encourage students to become more active, critical, and enthusiastic learners, which in turn can improve their learning outcomes. Accordingly, teachers and researchers need to design engaging learning experiences that do not rely solely on teacher-centered instruction. Such efforts are expected to foster greater student participation in learning activities and to improve achievement.

Rapid technological development in the twenty-first century has had a positive influence on both formal and non-formal education. Advances in information and communication technology have significantly affected many aspects of human life, including the field of education (Ahmad,

2025).

Quizizz is an interactive, game-based learning platform that enables teachers and students to engage in learning through online quizzes (Citra, 2020). The application can increase student motivation through gamification features, instant feedback, and comprehensive evaluation of learning outcomes (Yunita, 2021). Quizizz also offers a range of attractive features that support teaching and learning, including the ability to create interactive quizzes with more than four answer options, insert images into question backgrounds, and customize question settings according to instructional needs.

Quizizz offers several advantages for classroom learning. Its main features include various question formats, such as multiple-choice, essay, and matching items, as well as interactive presentations, flashcards, and videos. Quizzes can be delivered in live mode or assigned individually as homework, and the platform also provides a paper mode for classrooms without digital devices. In addition, Quizizz helps teachers visualize students' levels of understanding, increase participation, and reduce test anxiety (Anugrawati, 2020). Despite these advantages, only a limited number of studies have specifically applied classroom action research using Quizizz to teach mixed operations in Grade IV Madrasah Ibtidaiyah classes.

Based on preliminary observations conducted on 17 October 2023 through an interview with the classroom teacher, only 10 out of 32 students met the minimum competency criterion (KKM) in mathematics, while the rest scored below 70. This condition was attributed to difficulties in understanding the material. Therefore, this study focused on improving students' mastery of mixed operations through Quizizz.

METHOD

This study employed Classroom Action Research (CAR). The research was carried out using the Kemmis and Taggart model, which consists of four stages: planning, action, observation, and reflection. Together, these four stages form a cycle. The study was conducted at MI Sirojul Athfal and involved 32 fourth-grade students in the 2023/2024 academic year, consisting of 16 boys and 16 girls.

Data were collected through observation and tests. Observation was used to identify students' learning behaviors during classroom instruction that could affect learning outcomes, while tests were used to measure student achievement. The action was considered successful when each

student obtained a score of at least 70 and at least 70% of the class achieved a score of 70 or above. The study was conducted in the first semester of the 2023/2024 academic year.

Table 1. Stages of the Study in Cycle I and Cycle II

Stage	Cycle I	Cycle II
Perencanaan	Preparing a lesson plan integrating Quizizz for specific material.	Analyzing the results and constraints of Cycle I, such as student participation or technical constraints.
Pelaksanaan	The teacher carried out learning using Quizizz as an evaluation medium.	Preparing revisions to the Quizizz-based lesson plan, for example by adding gamification features, improving questions, or arranging more effective working time.
Observasi	Students worked on the questions through Quizizz.	The teacher carried out interactive learning using the Quizizz application as an evaluation medium.
Refleksi	The teacher observed participation, technical constraints, and students' learning outcomes through Quizizz.	Students participated in learning and completed the questions digitally through Quizizz.

FINDINGS AND DISCUSSION

Findings

The results of this study indicate that several key factors contributed to difficulties in mathematics learning among fourth-grade students at MI Sirojul Athfal, including weak conceptual understanding, low learning motivation, and problems related to group work and self-confidence (Jayanti, 2020). Weak understanding of mathematical concepts is a major obstacle in the learning process (Ruseffendi, 2014). When students fail to grasp basic concepts effectively, they encounter difficulties in solving more complex problems (Handayani, 2020). In addition, low motivation and the perception that mathematics is a difficult subject aggravate the situation. Some students also struggle to collaborate and hesitate to ask questions or participate actively in class because they lack confidence. Therefore, teachers need to adopt more varied and interactive teaching strategies to increase students' interest and motivation. Creating a supportive classroom environment and facilitating collaboration among students are also essential for improving learning effectiveness.

During the pre-action stage, one of the key findings was that students had difficulty understanding basic mathematical concepts. Interviews with the teacher revealed that many students still struggled to understand how mixed operations work. These conceptual difficulties affected students' learning outcomes, which often did not meet the Minimum Mastery Criterion.

Classroom observations also showed that students' motivation to learn mathematics was very low. Most students reported that they were not interested in mathematics and were not

enthusiastic about learning it. This condition was reinforced by their perception that mathematics is a difficult and unpleasant subject. Students also experienced difficulties in group work. Observations indicated that some students felt that their peers did not contribute equally during group activities, which made the learning environment less conducive. In addition, students reported a lack of confidence in asking and answering questions in class.

In the next stage, the teacher first explained the material. Students were then asked to access Quizizz and complete the quiz items that had been prepared in the application. The time allocation for each item varied according to its level of difficulty, ranging from 20 to 30 seconds. A total of 25 items were administered to make the activity more time-efficient. After completing the quiz, the teacher invited students to discuss the answers together. This process made students more enthusiastic about participating in the lesson, and their quiz performance was satisfactory. The results can be seen in the table below.:

Table 1. Student Scores in Cycle I

No	Mark	Criteria	Number of Students	Percentage
1.	0-49	Very less	-	-
2.	50-59	Not enough	5	15.625%
3.	60-69	Enough	13	40.625%
5.	70-79	Good	12	37.5%
6.	80-100	Very good	2	6.25%

The table above shows that no students scored 0-49, or very poor. Five students scored 50-59, or poor. Thirteen students scored 60-69, or adequate. Twelve students scored 70-79, or good. Two students scored 85-100, or very good.

Based on the grouping of student scores in cycle I above, the learning outcomes obtained can be seen in the following table:

Table 3. Student Learning Mathematic Outcomes in Cycle I

No	Information	Pre-Action
1.	Score ≥70	43.75%
2.	Score <70	56.25%

Based on the table above, it is known that of all students, only 14 students, or 43.75% of the total number of students, obtained a score of ≥70. Meanwhile, 18 students, or 56.25% of the total number of students, obtained a score of <70. The average student score in cycle I was 64.05. This data shows that it is still below the expected target.

The low scores in Cycle I were likely due to students' unfamiliarity with the Quizizz app. Furthermore, low scores could have been due to insufficient reading of the material. Based on observations and actions taken in Cycle I for the Civics learning process, a plan for improving the learning process using the Quizizz app was developed, which is expected to improve student learning outcomes.

The researcher started the cycle II activity plan, namely by preparing a learning implementation plan (RPP) using the Quizizz application as a learning medium, preparing learning resources and carrying out learning simulation exercises using the Quizizz application as a learning medium. The test duration remained the same as Cycle I, ranging from 20 to 30 seconds per question. The quiz consisted of 25 questions. The results of Cycle II are shown below:

Table 4. Grouping of Student Scores in Cycle II

No	Mark	Criteria	Number of Students	Percentage
1.	0-49	Very less	-	-
2.	50-59	Not enough	2	6.25%
3.	60-69	Enough	5	15.625%
5.	70-79	Good	10	31.25%
6.	80-100	Very good	15	46.875%

Based on the table above, no students obtained a score of 0-49. Two students obtained a score of 50-59, or below the criteria of "less." Five students obtained a score of 60-69, or below the criteria of "sufficient." Ten students obtained a score of 70-79, or below the criteria of "good." Fifteen students obtained a score of 80-100, or below the criteria of "very good." The average student score in this cycle was 86.35. Based on the grouping of scores above, the student learning outcomes in this cycle are as follows:

Table 5. Student Learning Outcomes in Cycle II

No	Information	Pre-Action
1.	Score ≥70	78.125%
2.	Score <70	21.875%

Based on the data from cycle II above, 25 students, or 78.125% of the total student body , obtained a score of ≥70. Meanwhile, 7 students, or 21.875% of the total student body, obtained a score of <70. Based on these data, the student learning outcomes can be obtained in the following table.

Table 6. Student Learning Outcomes in Cycle I and Cycle II

No	Student Learning Outcomes	Cycle I	Cycle II
1	Score ≥70	43.75%	78.125%
2	Score <70	56.25%	21.875%

The table above shows that using the Quizizz app in Mathematics can improve student learning outcomes. The average class score, which was initially only 64.05 in Cycle I, increased to 86.35 in Cycle II. Meanwhile, the number of students who exceeded the Minimum Competency (KKM) also increased, from 14 to 25. This means the pass rate increased from 43.75% in Cycle I to 78.125% in Cycle II.

Discussion

In Cycle I, the average learning outcome score was 64.05. The number of students who obtained scores of 70 or above was 14, or 43.75% of the class, while 18 students, or 56.25%, scored below 70. These results indicate that students' mathematics learning outcomes were still far below the expected target. Therefore, it was necessary to proceed to the next cycle in order to improve the results that had not yet met expectations.

In Cycle II, the average learning outcome increased from 64.05 in Cycle I to 86.35. The proportion of students who obtained scores of 70 or above also increased from 43.75% in Cycle I to 78.125% in Cycle II. These findings indicate that the action implemented in Cycle II had a positive effect on students' mathematics learning outcomes.

The improvement in Cycle II was largely attributable to the use of Quizizz in mathematics instruction. As an educational game, Quizizz increases student engagement because it creates a game-like learning experience. The learning process becomes more enjoyable, allowing students to gain valuable knowledge, which in turn contributes to better learning outcomes.

This study also shows that the implementation of a game-based learning model through Quizizz not only had a positive impact on students' academic achievement, but also contributed to the development of affective and social aspects. Through interactive and enjoyable learning, students showed higher motivation, improved ability to follow the teacher's instructions, and better collaboration skills during group work. In addition, students began to demonstrate greater independence in completing the assigned tasks and questions. These findings confirm that the use of digital technology in learning can create a more dynamic, participatory, and contextual learning

environment. Thus, the integration of technology-based learning media such as Quizizz represents an effective strategy for responding to educational challenges in the Society 5.0 era, which requires a balance between knowledge acquisition, social skills, and learner autonomy.

Overall, these findings confirm that the use of Quizizz in game-based digital learning can be an effective solution to address the low learning outcomes and limited student participation often associated with conventional teaching methods. Therefore, digital learning innovations such as Quizizz are strongly recommended for broader implementation in order to improve the quality of education in the current digital era.

CONCLUSION

Based on the research results, it can be concluded that learning Mathematics using the Quizizz application can improve learning outcomes. This is evidenced by the average class score, which was initially only 64.05 in cycle I, increasing to 86.35 in cycle II. Meanwhile, the number of students who have exceeded the Minimum Competency also increased, from 14 students to 25 students. This means that the percentage of passing has increased, where in cycle I it was 43.75% and in cycle II it was 78.125%.

The findings of this study have several important implications for educational practice, particularly in elementary mathematics instruction. First, the successful implementation of Quizizz as a game-based learning platform indicates that integrating digital technology into classroom activities can significantly enhance students' engagement, motivation, and overall learning outcomes. Therefore, teachers are encouraged to incorporate interactive and technology-supported media to create more dynamic and student-centered learning environments.

Second, the improvement not only in cognitive achievement but also in students' social and affective skills suggests that instructional strategies should not focus solely on academic performance. Game-based learning tools like Quizizz can foster collaboration, increase self-confidence, and promote independent learning, which are essential competencies in the 21st-century learning context.

Third, this study highlights the importance of addressing students' initial difficulties in understanding basic mathematical concepts. Teachers should design learning experiences that are more engaging and adaptive to students' needs, especially for abstract topics such as mixed operations. The use of immediate feedback and interactive quizzes can help students identify and

correct their misconceptions more effectively.

Finally, the results imply that educational institutions should support the integration of digital learning tools by providing adequate training and infrastructure. In the context of the Society 5.0 era, the use of innovative learning media is not only beneficial but necessary to improve the quality of education and to prepare students with both academic knowledge and essential life skills.

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