International Journal of Games in Mathematics Education Vol. 1 No. 1 (2026)

Implementasi Quizizz sebagai Media Interaktif untuk Meningkatkan Kemampuan Berpikir Kritis Siswa pada Materi Piktogram

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Received: 02 Mei 2026	Revised: 17 Mei 2026	Accepted: 18 Mei 2026	Online: 22 Mei 2026

Abstract

This study aimed to examine the implementation of Quizizz in pictograph material in the classroom and to describe its effectiveness before and after the use of Quizizz in the learning process on students' critical thinking skills. This research employed a qualitative approach with a descriptive method. The study was conducted through face-to-face learning in Grade V at SD Muhammadiyah 1 Bawean during the odd semester of the 2025/2026 academic year. The research subjects consisted of 22 students. Data collection techniques included observation sheets to assess the implementation of Quizizz in pictograph learning and tests to measure students' critical thinking skills before and after the use of Quizizz. The research was carried out over three learning sessions. The observation results, recorded by two observers across three meetings, indicated an improvement in the implementation of Quizizz, with a final average score of 71%, categorized as good. To assess students' critical thinking skills, pretests and posttests were administered. The average pretest score was 64.55, while the average posttest score reached 87.27, resulting in an N-Gain value of 0.64, which falls into the moderate category. The analysis results indicate that students' critical thinking skills improved after the use of Quizizz, demonstrating that Quizizz was sufficiently effective in enhancing students' critical thinking abilities

Keywords: Critical Thinking Skills, Interactive Media, Pictographs, Quizizz

Abstrak

Penelitian ini bertujuan untuk mengetahui implementasi Quizizz dalam materi pitogram di kelas, serta mendeskripsikan efektivitas sebelum dan sesudah penggunaan Quizizz dalam proses pembelajaran pada materi pitogram terhadap kemampuan berpikir kritis. Pendekatan penelitian ini kualitatif dengan metode deskriptif. Penelitian ini diimplementasikan di kelas V SD Muhammadiyah 1 Bawean secara tatap muka. Pada semester ganjil tahun ajaran 2025/2026. Subjek penelitian 22 siswa. Teknik pengumpulan data yakni lembar observasi, untuk memberi penilaian terhadap keterlaksanaan implementasi quizizz dalam materi pitogram di kelas, tes untuk mendapatkan efektivitas sebelum dan sesudah penggunaan Quizizz dalam proses pembelajaran. Penelitian ini dilaksanakan sebanyak 3 kali pertemuan. Hasil observasi terkait keterlaksanaan implementasi Quizizz yang diamati oleh 2 observer selama 3 kali pertemuan terdapat peningkatan selama

penggunaan Quizizz rerata total akhir 71% kategori baik. Untuk mengetahui kemampuan berpikir kritis siswa dilakukan dengan memberikan pretest dan posttest. Rerata pretest siswa 64,55 dan posttest 87,27, sehingga nilai N-Gain 0,64

Kata kunci: Kemampuan Berpikir Kritis, Media Interaktif, Pitogram, Quizizz

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How to cite this article (APA 7th Edition):

Implementation of Quizizz as an Interactive Media to Improve Students' Critical Thinking Skills on Pictogram Material

Introduction

Effective mathematics learning must foster critical thinking skills as a core competency that enables students to analyze, interpret, and evaluate numerical information [1]. This is especially true when students are faced with visual data such as pictograms. Students must be able to interpret symbols, draw conclusions, and evaluate information logically [2]. Traditional learning media often lag behind in accommodating these needs, necessitating the integration of interactive media that can increase student engagement and provide a more active learning experience [3]. Teachers' skills in designing and managing quizzes in learning are crucial [4]. Teachers need to understand engaging web features in quiz creation and how to use them optimally. Students' learning styles can also influence their effectiveness or character in learning (Ramadhani & Rukmana, 2022; Suranto et al., 2024). One interactive media that supports student engagement is Quizizz.

Quizizz, an interactive learning medium, has been identified in several studies as an effective tool for improving critical thinking skills. Quizizz, as an interactive quiz platform, offers gamification mechanisms, instant feedback, and flexible question grouping for various cognitive levels [6]. Interesting, relevant, and varied quizzes can increase student motivation and engagement. The use of Quizizz must be effectively integrated with other learning activities. Quizizz can be used as a tool to introduce new concepts, test understanding, or as a closing activity for learning. Research by Aldona Aqtoina & Rohmani, (2025) found that the use of Quizizz in game-based learning resulted in significant improvements in students' critical thinking aspects. The application of interactive media not only presents information but also stimulates higher-order thinking processes [6]. Researcher Widyantara, (2020) found an increase in student motivation and engagement after the application of Quizizz.

Critical thinking skills are able to solve problems encountered in everyday life [9]. This includes the use of strategies such as data interpretation, identification of assumptions, exploration of alternatives, and selection and implementation of appropriate next steps [10]. In the context of 21st-century education, critical thinking is considered one of the key competencies needed by students to be able to face the complexity of the world and the demands of real life [11]. This ability is not only limited to mastering facts, but rather the ability to connect knowledge, question, and formulate effective solutions based on evidence (Afanasjeva et al., 2020). The deliberate development of critical thinking through active learning such as questioning, discussion, and problem-solving has been shown to improve the quality of students' reasoning [13]. Visual materials such as pictograms allow students to interpret visual representations, compare data, and make appropriate inferences [10]. Therefore, the integration of learning strategies that support critical thinking is crucial to create meaningful learning. Students not only understand the material but are also able to think deeply and independently. More focused research is needed to examine the specific effects of pictograms.

Pictogram material presents its own challenges because effective questions must direct students to read, interpret, and make inferences from visual representations. Research by Nurdianti et al., (2024) on pictograms in teaching shows that repeated practice in visual interpretation can improve students' reasoning skills. However, when students' interaction with the material is passive (e.g., simply watching), critical thinking progress tends to be limited [15]. Actively designed pictogram learning that combines open-ended questions, real-world problems, and discussions has more potential to develop analytical skills. Therefore, a learning design that combines the visual power of pictograms and interactive quiz mechanics is needed to train critical thinking skills systematically [1]. The problem that occurred in the researcher's

school was the lack of support for the use of interactive media during learning. There was no media use during the learning process. The media used were only LKPD (Worksheet Worksheet), the use of digital media was only in the form of material displays from YouTube or PowerPoint. This can cause students to tend to be passive during learning. The inappropriate learning process leads to less than optimal results. The lack of interaction between teachers and students causes an imbalance during the learning process. Interviews with several students revealed that the classroom learning process was uninteresting and boring. This was due to teachers' lack of infrastructure and the use of interactive internet-based media. Students also stated that during learning, they only used supporting textbooks, worksheets (LKPD) for assignments, and YouTube or a whiteboard to explain the material. Furthermore, student grades on exams and end-of-chapter summative exams indicated dissatisfaction or were still below the Minimum Competency (KKM). Based on the description above, differences in the learning media used are evident. Ideal learning requires student-centered media support, and interaction between teachers and students must occur throughout the learning process. The use of media is also essential to support learning. The use of media or learning tools can maximize student learning outcomes. In contrast, the problems previously described can be detrimental to both parties. One example is the learning outcomes of the interviewed students, which are still less than satisfactory.

An alternative solution to the above problems is to manage the class with the support of learning media used during the learning process. By using interactive media that is appropriate and appropriate to the characteristics of the required learning materials, students can adapt more effectively in the learning process. Researchers Saputra et al., (2024) Quizizz can improve learning outcomes because it provides instant feedback and a fun, competitive learning atmosphere. Trisyana et al., (2021) Quizizz can foster student enthusiasm for learning and active participation. Nashar et al., (2021) Quizizz in the PBL model significantly improves students' analytical and evaluation skills. This study positions Quizizz not only as an evaluation tool, but also as a means of developing higher-order thinking skills.

Although numerous studies have demonstrated the effectiveness of Quizizz in improving learning outcomes and motivation, studies specifically examining its impact on critical thinking skills in pictogram material at the elementary school level are still very limited. Research by Nisa' et al., (2025) focused on improving conceptual learning outcomes, not on students' critical reasoning when interpreting visual data. Furthermore, research combining interactive media with visual representation content such as pictograms is still rare, even though critical thinking skills are very relevant in interpreting symbols and visual data [1]. There is a need for learning innovations that not only convey concepts but also train students to think critically from the elementary school level [17]. 21st-century education demands that students have critical thinking, collaboration, communication, and creativity (4C) as core competencies to face global challenges [18]. Mathematics learning in pictogram material has the potential to hone quantitative reasoning and data interpretation skills if integrated with an interactive approach such as Quizizz. This is important because critical thinking skills are the basis for students in making evidence-based decisions and avoiding conceptual errors in understanding visual data [11]. Therefore, this research has a high urgency to provide an effective, interactive learning implementation model that is appropriate to the characteristics of elementary school students. This research is an integration between the interactive media Quizizz with pictogram material specifically to develop critical thinking skills in elementary school students. Previous studies have focused more on the motivational aspects and general cognitive learning outcomes, rather than on the development of higher-order thinking skills in the context of visual data. The innovation of this research is also seen from the instructional design approach that emphasizes the preparation of Quizizz questions based on Higher Order

Thinking Skills (HOTS) that are adapted to the characteristics of pictograms. In addition, this research will provide an empirical model on how Quizizz can be used as a formative assessment medium that not only measures learning outcomes but also fosters students' reflection and logical reasoning [6]. Thus, this research contributes to the development of mathematics learning innovations that integrate aspects of technology, data visualization, and critical thinking. This study aims to determine the implementation of Quizizz in pictogram material in the classroom, as well as describe the effectiveness before and after using Quizizz in the learning process on pictogram material oriented towards the development of critical thinking skills. The choice of pyramidograms material stems from the fact that it is a core competency in elementary school mathematics, requiring students to interpret data through visual symbols accurately and logically. Therefore, innovative interactive learning media like Quizizz are needed to stimulate students to think, compare, and evaluate data independently through immediate feedback.

2. Methods

The research on the Implementation of Quizizz as an Interactive Media to Improve Students' Critical Thinking Skills on Pictogram Material uses a qualitative approach with a descriptive research type. The data described are data regarding the implementation of Quizizz in pictogram material in class, as well as describing the effectiveness before and after using Quizizz in the learning process on pictogram material oriented towards developing critical thinking skills. The research will be conducted in grade V of SD Muhammadiyah 1 Bawean face-to-face. The implementation time used to conduct the research is in the odd semester of the 2025/2026 academic year. The research subjects are 22 students from class V-Europe. The data collection techniques used in the research are: 1. Observation sheets, given to observers to provide an assessment of the implementation of Quizizz implementation. 2. Test method, to obtain effectiveness data before and after using Quizizz in the learning process oriented towards developing critical thinking skills. The instruments used in the research are: 1. Observation sheets in the form of 10 statements about the implementation of Quizizz in pictogram material. 2. Test, 1 item of critical thinking ability test on the adjusted pitogram material based on the indicators.

Meanwhile, for data analysis, the following formula is used:

Data analysis of the Quizz implementation was obtained from questionnaire sheets and percentages of student responses to the media. Data were analyzed using the following percentage formula (Suseno et al., 2020; Damayanti et al., 2020).

$$Pr = \frac{F}{N} x\ 100\%$$

Keterangan :
Pr = persentase rata-rata
F = skor hasil respon siswa
N = skor maksimal
Setelah dihitung kemudian dikategorikan pada tabel berikut:

Tabel 1 . Kriteria Tarif Keberhasilan Observasi

Persentase (%)	Kategori Penilaian
$85 \leq P \leq 100$	Sangat Baik
$70 \leq P < 84$	Baik
$55 \leq P < 70$	Cukup Baik
$40 \leq P < 55$	Kurang baik
$0 \leq P < 40$	Tidak Baik

[20]

Analysis of critical thinking ability data, the steps for analyzing test results are as follows: a. The test results are scored according to the scoring guideline rubric, then the total score of the test items is calculated using (total score obtained by students: maximum score) x 100%. b. Find the percentage of each category of critical thinking ability according to the category table. c. Describe the test results based on aspects of students' critical thinking abilities.

Persentase (%)	Kategori Penilaian
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Then the analysis was carried out using the N-Gain formula.

$$g = \frac{skor_{prosttest} - skor_{presttest}}{skor_{maks} - skor_{pretest}}$$

Tabel 3. Interpretasi Skor N-Gain

Rentang Nilai	Kategori
$g \geq 0,7$	Tinggi
$0,3 \leq g \leq 0,7$	Sedang
$0 < g < 0,3$	Rendah

3. Results and Discusion

Before conducting the research at the school, the researcher provided a research permit to the administration administrator, who would then submit it to the principal. After the principal's approval, the researcher met with the mathematics teacher at Muhammadiyah 1 Bawean Elementary School. An observation sheet was used to assess the effectiveness of the interactive Quizizz media implementation in pictogram learning. Observations were conducted by two observers over three sessions. The assessment scale used was:

Based on observations over three meetings, there was improvement in each meeting. Of the 10 aspects observed, 60% were achieved in the first meeting, 68% in the second, and 86% in the final meeting.

Tabel 5. Hasil Pretest dan Posttetst Siswa

No	Nama	Pretest	Posttets	No	Nama	Pretest	Posttest
1	AM	70,00	90,00	12	FS	60,00	80,00
2	AF	60,00	95,00	13	FWH	60,00	85,00
3	AA	60,00	85,00	14	GK	60,00	85,00
4	ANH	70,00	85,00	15	G	70,00	85,00
5	AN	65,00	95,00	16	IS	60,00	90,00
6	CR	70,00	95,00	17	LA	65,00	85,00
7	DDP	55,00	90,00	18	LP	70,00	90,00
8	FAP	70,00	85,00	19	NA	65,00	85,00
9	FF	60,00	80,00	20	RP	65,00	85,00
10	F	70,00	90,00	21	RA	65,00	95,00
11	FM	60,00	80,00	22	SAA	70,00	85,00

Based on the results of the pretest and posttest, students showed significant improvement. Their pretest scores before using Quizizz were below the Minimum Competency (KKM). After using Quizizz, their scores began to improve, reaching a very good 80 or above.

Tabel 6. Perhitungan N-Gain

Pretetst	64,55
Posttest	87,27
Normalized Gaid	0,64

The results of the study indicate that the implementation of Quizizz as an interactive medium in pictogram learning has a significant impact on improving the quality of learning for fifth-grade students. In the early stages of learning, classroom conditions showed that students tended to be passive, less participatory, and limited in expressing their understanding of visual data. Previous material delivery that only relied on LKPD, whiteboards, or YouTube videos did not sufficiently stimulate student activity. Aperception aspects, conveying learning objectives, and explaining the use of the application gradually increased with each meeting. In the first meeting, some students appeared to have difficulty understanding the application's mechanisms, but in subsequent meetings, student adaptation improved, as seen from the increase in observation scores in the categories of enthusiasm, interactivity, and ability to answer questions. This indicates that interactive learning media is able to facilitate a more structured learning process and make it easier for students to understand the material's concepts.

The implementation of learning with Quizizz in this study demonstrated an improvement in the quality of the learning process from the first to the third meeting. Observational data showed that aspects of apperception, goal delivery, and presentation of pictogram examples improved from adequate to excellent. This improvement occurred because teachers and students became more accustomed to using Quizizz features, such as the timer, leaderboard, and instant feedback. The classroom atmosphere, which was initially passive, changed to a more active and competitive one when Quizizz was used as part of the learning process. This is consistent with research by Cai et al., (2022), which found that digital quiz-based gamification significantly increased student engagement and participation. Furthermore, interaction between teachers and students during the learning process increased because teachers could monitor student answers in real time (Mahmud & Law, 2022). This improvement confirms that the use of interactive media can increase the effectiveness of learning implementation (Kurniawati et al., 2025; Rizki & Kurniawati, 2022). The features in

Quizizz allow teachers to provide faster and more targeted feedback on conceptual errors experienced by students (Mahendra, 2022). Researchers observed that students showed high enthusiasm when seeing their rankings appear on the screen, thus encouraging them to answer questions more seriously. Alqurashi's (2018) research explains that digital formative evaluation can increase students' intrinsic motivation and self-confidence. In addition, the interactivity presented by Quizizz provides a more personalized learning experience for students. They feel that learning is more enjoyable and not monotonous like lecture methods or using LKPD alone. Thus, the implementation of learning using Quizizz can be categorized as very good and effective in increasing learning dynamics. Significant changes were also seen from the results of the critical thinking ability test between the pretest and posttest scores. The pretest results showed that students' critical thinking abilities before using Quizizz were still in the fair to good category. Student scores ranged from 55 to 70, indicating that most still Indonesian Journal of Science and Mathematics Education (IJSME)| 8 │ Title Author had difficulty understanding information from pictograms. The weakest indicators were interpretation and reflection, where students were only able to read part of the data but were not yet able to explain its meaning precisely. This situation illustrates that students' understanding of visual representations is still limited and requires more interactive learning stimulation (Asyhar, 2023). This finding aligns with research by Neidorf et al. (2020), which noted that elementary students often experience difficulties understanding visual data without the support of digital media. Posttest results showed a significant improvement in students' critical thinking skills after using Quizizz. Student scores increased to a range of 80 to 95, indicating that all students achieved the good to excellent category. Improvements were seen in all critical thinking indicators, particularly interpretation, analysis, and evaluation. Instant feedback from Quizizz helped students understand errors and quickly correct their answers. Research by Delgado et al. (2021) found that digital formative assessment can significantly improve students' analytical skills. Furthermore, students began to be able to explain the meaning of pictogram data logically and in-depth. This proves that Quizizz can effectively develop higher-order thinking skills. Improved inference and reflection skills also indicated that students were able to draw conclusions based on data patterns more accurately. Students were more confident in providing answers and demonstrated more systematic thinking patterns than before using Quizizz. Aldridge's (2021) research supports these findings by explaining that interactive learning environments can improve students' reasoning skills. Furthermore, a healthy competitive atmosphere encourages students to study more seriously while still enjoying the learning process. They also find it easier to self-reflect because the Quizizz system provides explanations after each question. This demonstrates that the use of digital media plays a significant role in improving students' critical thinking skills.

A comparison of pretest and posttest results showed a significant increase in students' critical thinking skills after using Quizizz. In the pretest, most students were in the adequate category, but in the posttest, all students managed to reach the good to excellent category. This indicates that Quizizz is very effective in improving students' understanding of the pictogram material. The increase in the average score from 60 to 87.5 is evidence that the interactive media intervention has a real positive impact. This finding is in line with research by Wu (2024) which states that technology integration in learning can improve students' higher-order thinking. Furthermore, this increase in scores illustrates that students experienced development in both reasoning and visual understanding. Overall, these results confirm the effectiveness of using Quizizz in visual data-based mathematics learning. No students experienced a decrease in scores, which means that the use of Quizizz has a positive impact on all students without exception. Score increases occurred consistently across all critical thinking indicators, such as analysis, interpretation, evaluation, and inference. The main factors for this increase were ease

of access, interesting presentation of the material, and gamification that increased student learning focus. Research by Saur-amaral et al. (2024) also states that the use of gamification-based media can significantly improve knowledge retention and learning outcomes. Furthermore, automated grade reporting helps teachers conduct rapid evaluations and provide interventions tailored to students' needs. This makes the learning process more effective, efficient, and focused (Ho et al., 2023). Thus, it can be concluded that the use of Quizizz has been proven effective in improving students' critical thinking skills.

4. Conclusion

The results of using Quizizz were able to transform the learning atmosphere from initially passive to more active, interactive, and participatory. Improvements in learning implementation were consistently seen from the first to the third meeting, particularly in aspects of apperception, delivery of learning objectives, presentation of pictogram examples, and teacher-student interaction. In addition to improving the learning process, the use of Quizizz also had a positive impact on students' critical thinking skills. The pretest results showed that students' critical thinking skills before using Quizizz were still in the sufficient category, with main weaknesses in the interpretation, evaluation, inference, and reflection indicators. However, after implementing Quizizz, the posttest results showed a significant increase in all critical thinking indicators, with all students reaching the good to very good category. The average student score increased significantly, confirming that Quizizz was effective in helping students understand and analyze pictogram data more deeply.

5. Author Contributions

FS was responsible for the conceptualization of the study, writing the initial draft of the manuscript, editing, and visualization. SA contributed to the writing of the review and editing sections of the manuscript, the formal analysis, and the development of the research methodology. DD played a role in the validation and supervision process during the research implementation. LJ also contributed to the validation and supervision to ensure the quality and rigor of the research.

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