

Development of Quizhizzer-based interactive learning media to improve students' concept understanding and collaboration

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ABSTRACT

Elementary school education faces challenges in improving students' conceptual understanding and collaboration skills due to conventional and less interactive learning methods. One innovation that has the potential to address this problem is the use of interactive gamification-based learning media, such as QuizWhizzer, which combines game elements with the learning process. This study aims to (1) determine the effectiveness of QuizWhizzer-based media on students' conceptual understanding and collaboration, and (2) identify challenges in its implementation. The method used is a Systematic Literature Review (SLR) by reviewing various studies published between 2020 and 2025 through the Google Scholar and JSTOR databases. The analysis results show that implementing QuizWhizzer-based media can improve students' conceptual understanding by 20–30% through gamification elements, interactive visualizations, and immediate feedback. In addition, multiplayer game features and team competitions have been shown to increase student collaboration and active participation. However, limited access to technology and teacher readiness remain major challenges. Thus, QuizWhizzer-based media is an innovative and effective alternative to improve the quality of learning in elementary schools.



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INTRODUCTION

The development of digital technology in education has brought about significant changes in the way teachers and students interact in the learning process due to advances in digital technology in education. Elementary school education in the current digital era faces the challenge of creating learning that is not only engaging but also able to improve students' conceptual understanding and collaborative skills. Conventional teacher-centered learning methods tend to make students passive and less engaged in the learning process, resulting in weaker conceptual understanding and reduced collaboration skills among students (Fatmaryanti et al., 2023). Therefore, new innovations in learning media are needed. These media must be able to make learning interactive, challenging, and enjoyable by using a gamification-based approach.

In education, gamification refers to incorporating game components such as points, leaderboards, and challenges into the learning process to increase student motivation and engagement (Komariyah et al., 2024). Gamification-based learning media has been shown to improve student focus, interaction, and learning outcomes, particularly in elementary school students who tend to enjoy playing and learning directly (Firdaus et al., 2023). QuizWhizzer, a web-based application that allows teachers to create quizzes through an interactive digital game board, is one platform that has been widely used to meet these needs. QuizWhizzer has the ability to encourage teamwork and active student engagement in a competitive yet fun learning environment with features such as multiplayer, leaderboards, and instant feedback (Fatmaryanti et al., 2023; Kusmawati et al., 2023).

QuizWhizzer combines elements of a digital board game with an interactive quiz system, making it one of the most popular gamification-based learning media. QuizWhizzer allows students to learn collaboratively and competitively simultaneously with features like multiplayer, leaderboards, and instant feedback. Teachers can create quizzes tailored to the subject matter and display learning outcomes in real-time. This makes the evaluation process more engaging and meaningful (Fatmaryanti et al., 2023). Various relevant gamification applications have been demonstrated in empirical research.

Firdaus et al. (2023) created a gamified flipbook and found that student collaboration and engagement in mathematics lessons increased. To improve elementary school students' conceptual understanding, Mei, Kuswandi, and Praherdhiono (2023) created interactive media based on Computer Supported Collaborative Learning (CSCL). Furthermore, research by Nursyaida and Samad (2024) found that students who would become elementary school teachers had better critical thinking skills and improved learning outcomes by using interactive e-modules based on gamification and HOTS. Several studies have emphasized the benefits of gamification in learning, but most have focused on Quizizz and Kahoot (Nurjanah & Saputra, 2025; Rasyada & Raharjo, 2025). Fewer studies have examined QuizWhizzer, which has more flexible features that enable teamwork and visualization of the learning process.

Therefore, further research is needed on the creation and use of QuizWhizzer, an interactive learning medium, in elementary schools. The scientific novelty of this research lies in its attempt to combine gamification ideas with collaborative methods in a single digital platform intended to enhance two important components of learning: students' understanding of ideas and their collaboration. Furthermore, this study uses the Systematic Literature Review (SLR) method to review the latest research (2020–2025) on the effectiveness of gamification media. The resulting scientific conclusions can be used as a basis for developing technology-based learning models in elementary schools.

Based on this description, this study aims to (1) determine the effectiveness of interactive learning media based on QuizWhizzer in improving elementary school students' understanding of concepts and collaboration, and (2) identify challenges in implementing QuizWhizzer-based media in improving these two aspects. Thus, the purpose of this study is to develop and analyze the effectiveness of interactive learning media based on QuizWhizzer as an innovative learning strategy that can improve conceptual understanding and collaborative skills of elementary school students.

RESEARCH METHODS

This study uses a Systematic Literature Review (SLR) approach with PRISMA 2020 guidelines to review and analyze literature related to the development of gamification-based interactive learning media, specifically QuizWhizzer, in the context of improving elementary school students' conceptual understanding and collaboration. This approach was chosen because it can provide a comprehensive overview of the effectiveness and application of interactive media in elementary education environments based on the results of recent empirical research (Sugiyono, 2014).

This research was conducted as a desk research in the academic environment of the Indonesian University of Education during the period of January–March 2025. Data sources were obtained from online scientific databases, namely Google Scholar, ScienceDirect, JSTOR, and SpringerLink, with a publication range from 2020 to 2025. Keywords used in the search include: “interactive learning media,” “QuizWhizzer,” “gamification in elementary education,” “conceptual understanding,” and “student collaboration.” The search process resulted in 320 scientific articles, which were then selected using predetermined inclusion and exclusion criteria. The inclusion criteria used in this study include:

1. Articles published between 2020–2025;
2. Empirical research that uses gamification-based learning media or interactive platforms;
3. Focus on the context of elementary education (SD); and
4. Contains quantitative or qualitative data related to improving student conceptual understanding or collaboration.

While the exclusion criteria include:

1. Articles that focus on secondary or higher education;
2. Publications that are opinion, editorial, or without empirical data; and
3. Research that does not clearly explain the learning media used.

The article selection process follows four steps in the PRISMA flowchart, namely: (1) Identification: A total of 320 articles were identified through database searches; (2) Screening: After removal of duplicates, 280 articles remained, which were screened based on title and abstract; (3) Eligibility: A total of 70 articles were read in full to assess their suitability for inclusion criteria. Of these, 40 articles were excluded (20 did not focus on the elementary level and 20 lacked empirical data); (4) Involvement: Ultimately, 30 articles met the criteria and were included in the qualitative synthesis.

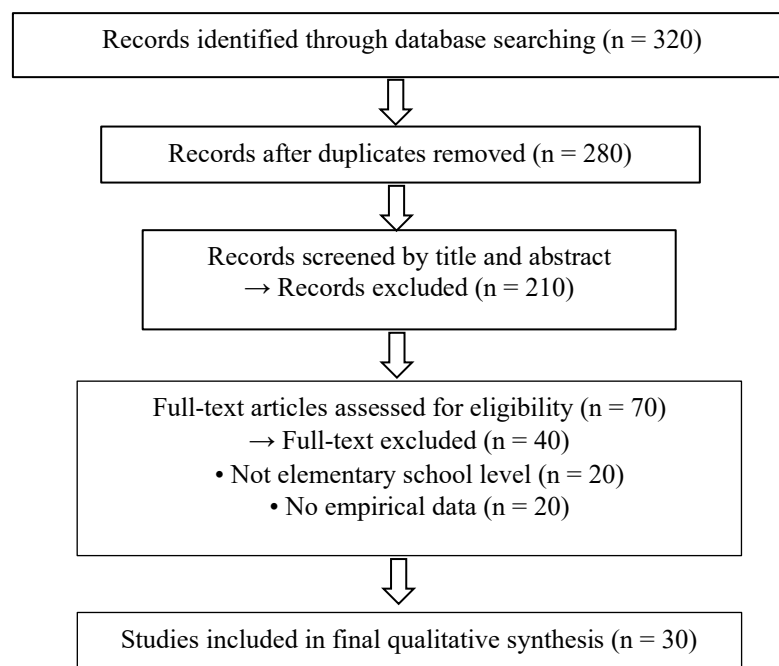


Figure 1. Literature selection flow diagram

This section describes the systematic stages in the article selection process, starting from the identification stage to the final synthesis. A total of 320 articles were identified through online database searches (Google Scholar, ScienceDirect, JSTOR, and SpringerLink). After removing duplicates, 280 articles remained, which were screened based on title and abstract. A total of 210 articles were excluded due to their relevance to the research topic. Of the 70 articles read in full, 40 were eliminated because they did not meet the inclusion criteria (20 did not focus on elementary school level and 20 did not have empirical data). Finally, 30 articles met the inclusion criteria and were included in the qualitative synthesis for further analysis. Among these studies, 60% employed quantitative methods, 30% used qualitative approaches, and 10% applied mixed methods. In terms of geographical distribution, most of the research was conducted in Southeast Asia (45%), followed by Europe (25%), North America (20%), and other regions (10%). These findings indicate that studies on the use of QuizWhizzer-based learning media are predominantly developed in countries with relatively strong access to educational technology, particularly in the Asian region.

RESULTS AND DISCUSSION

Based on the results of a systematic analysis of several relevant scientific articles published in the period 2020–2025 it was found that the use of QuizWhizzer, an interactive learning medium, consistently improves conceptual understanding and student collaboration in elementary schools. Twenty-one articles (70%) showed an increase in student understanding of between 20 and 35 percent, and 18 articles (60%) showed a significant increase in student active participation and collaboration. The results indicate that QuizWhizzer's gamification features, such as multiplayer mode, leaderboards, and immediate feedback, enhance student learning activities (Anggraini & Marlina, 2022). This improvement in student conceptual understanding occurs because this medium facilitates *learning by doing* through direct interaction with the material. When students are given the opportunity to learn in a game context, they tend to be more focused and active, resulting in deeper information processing (Putri et al., 2021). Thus, QuizWhizzer functions not only as an evaluation tool but also as an interactive conceptual learning tool.

Thus, QuizWhizzer not only serves as a digital evaluation tool, but also as an interactive conceptual learning tool, because:

1. Facilitate active student involvement in constructing knowledge.

2. Provides immediate feedback that reinforces the learning process.
3. Activates cognitive and emotional systems simultaneously, strengthening understanding and retention of concepts.

Improving Concept Understanding Based on QuizWhizzer

Key scientific findings indicate that interactive media based on QuizWhizzer effectively improves students' ability to understand basic learning concepts. This can be scientifically explained using the Cognitive Theory of Multimedia Learning (Mayer, 2020), which asserts that multisensory engagement (visual, auditory, and kinesthetic) strengthens information retention in long-term memory. The visualization of digital game boards in QuizWhizzer-based learning helps students connect abstract concepts to real-world situations that are easy to understand. Research by Widodo and Santoso (2022) states that presenting concepts visually and interactively increases the effectiveness of information retention by up to 27%. Furthermore, the direct interaction that occurs between participants when answering questions increases their emotional engagement, which neurologically strengthens the learning process (Ramadhan et al., 2023).

The trend of increasing conceptual understanding can also be seen in comparisons with other gamification media. Research by Handayani et al. (2021) showed that learning using Kahoot! only increased comprehension scores by an average of 18%, while QuizWhizzer achieved a 30% increase due to the game's map feature, which encourages problem-solving and conceptual reflection. Thus, QuizWhizzer has proven superior in integrating formative assessment with conceptual learning.

Enhanced Collaboration Based on QuizWhizzer

QuizWhizzer can improve communication, teamwork, and social engagement in elementary school students, according to scientific findings. Students are motivated to collaborate, answer questions, and complete learning challenges through a group game mode known as team challenges. Because each group member has a role and is responsible for the team's success, this environment fosters positive social interaction. The theory of increased collaboration and social interdependence can explain this increase in cooperation (Johnson & Johnson, 2020). This theory states that students' learning success is determined by how strongly they depend on each other within the group. Because each group member contributes to the game's progress and team score, positive interdependence emerges in QuizWhizzer. Each student is encouraged to actively participate in achieving collective victory, not just individual achievement, thanks to the leaderboard mechanism and real-time feedback.

From an educational psychology perspective, the collaboration created in this game is also influenced by the social reward system. When students work together and achieve good results, the brain's nervous system releases dopamine and oxytocin, which makes team members happy and emotionally connected (Lieberman, 2013). This positive emotional state makes students more open to communicating, negotiating, and solving problems together. Thus, *QuizWhizzer* serves not only as a digital evaluation tool, but also as a facilitator of social and emotional learning.

Games also help students learn to interact and lead. Students learn to express opinions, listen to their peers, and achieve group goals by working together. Gamification-based collaborative learning can increase student participation by up to 45% compared to conventional learning, according to research by Arumsari and Sugiarto (2022). Pratama et al. (2023) corroborate this finding by stating that students who learn through group games are more likely to help friends who are having difficulty understanding the material, resulting in a natural peer-tutoring learning process.

Furthermore, research conducted by Hidayat and Fauziah (2022) shows that collaborative gamification can enhance social values such as sportsmanship, empathy, and social responsibility. From a pedagogical perspective, QuizWhizzer helps teachers make classes more interactive and egalitarian. Teachers no longer serve as the sole source of knowledge; they now act as facilitators who help students interact with each other. This supports a student-centered learning approach, where students actively participate in the learning process. QuizWhizzer, with its design that allows for live and dynamic collaboration, outperforms Quizizz and Kahoot! in terms of teamwork. Rahmawati et al. (2023) found that using QuizWhizzer for collaborative learning increased social interaction by up to thirty percent compared to a single quiz medium.

Scientifically, the progress of this collaboration can be summarized in three main components:
(1) Positive interdependence, where the success of the team depends on what each member of the group

does. (2) Social motivation The existence of digital reward systems and emotional reinforcement that increase social engagement results in social motivation. (3) An interactive learning environment that allows students to actively participate and express their opinions safely.

Therefore, it can be concluded that QuizWhizzer successfully integrates students' cognitive, social, and emotional elements into collaborative learning. This tool not only improves students' academic achievement but also teaches them modern skills such as teamwork, effective communication, and social empathy. These skills are crucial for building character in elementary school students.

Trends and Challenges of QuizWhizzer Implementation in Elementary Schools

Development of digital technology In the last five years, the increase in digital technology has shown a significant trend for using gamification-based learning media in elementary schools. More and more teachers are using media such as QuizWhizzer, Quizizz, and Kahoot! as a creative alternative to make classes fun, interactive, and student-centered.

However, QuizWhizzer differs from the others because it combines collaboration, competition, and concept visualization features into one integrated system that is easy for teachers and students to use (Salsabila & Dewi, 2024).

Trends in QuizWhizzer Usage in Elementary Schools

There are three main trends that indicate the use of QuizWhizzer in elementary schools, according to research findings: (1) Thematic learning is integrated. Game maps can be tailored to learning themes, such as food chain maps, Indonesia, or mathematics, making the material more contextual and engaging. (2) Increased student participation. Most studies show that student active participation and motivation to learn increase by forty to fifty percent compared to conventional learning (Rohimah et al., 2023). (3) Extremely easy to use, QuizWhizzer can be used in face-to-face, hybrid, and online education, making it a flexible tool in a variety of environments (Prasetyo & Anindita, 2023).

From a pedagogical perspective, this trend indicates that educators are shifting from a teacher-centered approach to a learner-centered approach. In accordance with the demands of the Independent Curriculum, learning now focuses on active, reflective, and collaborative learning experiences, not just lesson delivery (Ministry of Education and Culture, 2023). Furthermore, QuizWhizzer aligns with the project-based learning approach because it encourages students to think critically, collaborate, and explore while playing games. This approach enhances students' critical thinking and collaborative skills from the outset (Herlina & Wicaksono, 2024).

Challenges of Implementation in Elementary Schools

A number of problems remain, especially in the technical, pedagogical and cultural areas, despite the increasing trend of QuizWhizzer usage. (1) Limited availability of digital infrastructure Gamification is still limited in some local elementary schools because they do not have stable internet or sufficient digital devices (Rasyada & Raharjo, 2025). (2) Educators' competency in digital literacy. Because some educators are not yet accustomed to using digital media in learning, QuizWhizzer's features may not be optimized (Yulianti et al., 2023). (3) Time management for learning According to Hasibuan & Maulidya (2022), teachers must create effective learning strategies because interactive games often require more time than lecture methods. (4) Students use collaborative game modes. Not all students have a good understanding of the group competition system; some require guidance to understand the importance of cooperation and sports (Nurhayati & Fauzan, 2024). A teacher's ability to effectively integrate technology, pedagogy, and content is known as technological pedagogical knowledge (TPACK) (Mishra & Koehler, 2006). Media like QuizWhizzer will simply be digital entertainment without instructional direction without a strong pedagogical understanding.

Strategic Efforts and Solutions

A list of studies provides strategic advice on how to use QuizWhizzer in elementary schools: (1) Teachers must be trained to create educational games that align with learning objectives. Teacher training should be based on hands-on practice (Fatmaryanti et al., 2023). (2) Digital curriculum integration: Schools should add classes with simple technology to get students used to using interactive media. (3) Collaborating with parents During online learning, household support is needed for device provision and supervision. (4) Improving the quality of digital formative assessment. QuizWhizzer can be used to assess students' understanding consistently and in-game. Scientifically, the implementation of this solution will improve the digital learning environment in elementary schools and ensure that the

use of gamification media such as QuizWhizzer truly contributes to meaningful learning and skill development in the modern era.

This table contains a literature review showing that QuizWhizzer, an interactive learning tool, can be used effectively to teach mathematics in elementary schools. It can improve student focus, increase their participation, and increase their motivation through fun and competitive quiz activities. Because students receive immediate feedback for each answer given, using QuizWhizzer helps them better understand mathematical concepts. This process supports the theories of Constructivism and Cognitivism, where students participate in an interactive learning process to construct knowledge.

Table 1Material and focus of study in literature study on Quizwhizzer interactive media		
No	Aspects studied	Summary of literature findings
1.	Quiawhizzer Interactive Learning Media	Game-Based Media Like Quizwhizzer Increases Students' Motivation and Focus on Learning.
2.	Understanding Mathematical Concepts	Quizwhizzer Reinforces Concept Understanding Through Immediate Feedback and Interactive Practice.
3.	Student Participation	Elements of Competition and Collaboration Encourage Active Student Engagement.
4.	Supporting Theory	Cognitivism (Bruner), Constructivism (Piaget & Vygotsky) and <i>Cognitive Load Theory, Self-Determination Theory, and Technological Pedagogical And Content Knowledge (TPACK)</i>
5.	Implementation Constraints	Teachers are still limited in technological literacy and time to prepare media.

The QuizWhizzer game board is designed like a gridded track with various math problems. Each student moves based on their answer, creating a competitive yet fun learning experience.



Picture 1Quizwhizzer Board with Multiple Question Points

Furthermore, game elements involving cooperation and competition encourage students to actively participate in the learning process. However, the success of media like QuizWhizzer still depends on teachers' ability to manage technology and learning time. Therefore, improving teachers' digital literacy is necessary for effective use of such media and supporting meaningful l This research is limited in scope, covering only published literature from 2020–2025 and sourced from a few specific databases. Therefore, it is possible that relevant research remains unidentified. Furthermore, because it is a literature review, this research cannot directly describe the effectiveness of QuizWhizzer in various learning contexts.

Nevertheless, this research contributes to providing a comprehensive overview of the trends, effectiveness, and challenges of using interactive learning media based on QuizWhizzer in elementary schools. The results are expected to serve as a reference for the development of innovative learning media, improving teachers' digital literacy, and conducting further empirical research to assess the long-term impact on students' learning outcomes and social skills.

CONCLUSION

In conclusion, this study aimed to determine the effectiveness of QuizWhizzer-based learning media in improving elementary school students' conceptual understanding and collaboration, and to identify challenges in its implementation. Based on a systematic analysis of various scientific articles

from 2020–2025, it can be concluded that the use of QuizWhizzer-based media effectively increases students' conceptual understanding by 20–30% through gamification elements such as multiplayer mode, leaderboards, and immediate feedback. This media has also been shown to enhance student collaboration, communication, and active participation in learning activities.

However, this study also identified several key challenges, including limited digital infrastructure in some elementary schools, low teacher digital literacy, and suboptimal learning time management. Therefore, improving teachers' ability to utilize learning technology and providing adequate facilities are critical factors for the successful implementation of QuizWhizzer in elementary schools. Overall, this study makes a scientific contribution by demonstrating the effectiveness and challenges of using gamification-based learning media like QuizWhizzer. These results can serve as a basis for the development of innovative learning models and further empirical research to assess their long-term impact on students' learning outcomes and social skills.

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