

Madani: Jurnal Ilmiah Multidisiplin

Volume 3, Nomor 6, July 2025, P. 687-695

E-ISSN: 2986-6340

Licenced by CC BY-SA 4.0

DOI: <https://doi.org/10.5281/zenodo.16485185>

Obstacles and Challenges of Elementary School Students in Learning Mathematics with Quizzes Media

Mutia Madani Khanaya¹, Nasya Putri Sashena², Wahyunengsih³

¹²³Pendidikan Matematika, UIN Syarif Hidayatullah Jakarta, Tangerang Selatan, Indonesia;

email: *mutia.madani24@mhs.uin.jkt.ac.id, nasya.putri24@mhs.uinjkt.ac.id, wahyu.nengsih@uinjkt.ac.id

Abstrak

Penelitian ini dilatarbelakangi oleh kesulitan siswa sekolah dasar pada pembelajaran matematika dalam menggunakan kuis di sekolah. Penelitian ini bertujuan untuk mengidentifikasi dan menganalisis faktor-faktor hambatan yang mempengaruhi siswa sekolah dasar dalam pembelajaran matematika menggunakan media kuis. Metode penelitian ini menggabungkan antara pendekatan kuantitatif dan kualitatif dengan mengumpulkan data dari hasil kuesioner dan hasil wawancara dari beberapa peserta didik. Hasil penelitian menyatakan bahwa terdapat beberapa peserta didik yang merasakan kendala dan hambatan pada pembelajaran, seperti keterlambatan pemahaman terhadap konsep matematika dasar, kesulitan dalam mengoperasikan perangkat teknologi yang digunakan, tekanan waktu yang membatasi peserta didik untuk menjawab soal dengan tepat serta perbedaan kemampuan antar siswa. Kesimpulannya, tantangan dan hambatan penggunaan kuis pada siswa sekolah dasar muncul dari berbagai aspek yaitu pemahaman pedagogi, psikologis, teknis dan konseptual. Dari keempat aspek tersebut, kendala pedagogi adalah yang paling dominan.

Kata Kunci: (Pendidikan, Matematika, Kuis, Tantangan dan hambatan)

Abstract

This study was motivated by the difficulties experienced by elementary school students in learning mathematics in using quizzes at school. This study aims to identify and analyze the inhibiting factors that affect elementary school students in learning mathematics using quiz media. This research method combines quantitative and qualitative approaches by collecting data from questionnaires and interviews with several students. The results of the study stated that there were several students who felt obstacles and barriers to learning, such as delays in understanding basic mathematical concepts, difficulties in operating the technological devices used, time pressure that limited students to answer questions correctly and differences in abilities between students. In conclusion, the challenges and obstacles to the use of quizzes in elementary school students arise from various aspects, namely pedagogical, psychological, technical and conceptual understanding. Of the four aspects, pedagogical obstacles are the most dominant.

Keywords: (Education, Mathematics, Quiz, Obstacles and challenges).

Article info:

Received date: 25 June 2025

Revised date: 27 June 2025

Accepted date: 13 July 2025

Introduction

Using quizzes as digital media is very important in supporting effective learning processes in the modern era. Quizzes can improve students' understanding by encouraging their curiosity about the material, which ultimately increases their self-confidence (Kartini et al., 2024). Quizzes help increase students' motivation to study harder, make students more interactive, and store and remember information in long-term memory (Case & Kennedy, 2024). The use of quizzes by involving active student participation and helping to develop communication skills with active learning methods can produce learning outcomes (Yuliana et al., 2024). This is also in accordance with the character of quizzes that resemble games so as to encourage active student involvement which is very important in the digital era (Mulyati & Iskandar, 2023).

The use of digital quizzes in mathematics learning can improve students' conceptual understanding in depth. Digital quizzes play an important role in improving mathematics learning through interactive and visual methods that are easier for students to understand (Ardyan, 2024). Digital quizzes can improve students' knowledge of mathematical concepts and encourage learning motivation (Kaban et al., 2023). In addition, it helps the process of evaluating mathematics learning which can have a positive impact on students' conceptual understanding (Hasibuan, 2023). Quizizz as a game-based learning media not only

improves students' numeracy skills but also strengthens their understanding of mathematical concepts through direct feedback and interesting interactive features (Morata, 2024). This shows that digital quizzes can be an effective learning tool compared to methods that do not use these tools (Mathematics et al., 2023).

Obstacles and challenges in using quizzes can interfere with their effectiveness in improving student understanding. There are several factors that influence this, including the large number of students who experience anxiety and have a negative impression of mathematics, which is further complicated by the quiz format that prioritizes speed and results (Erbay, 2024). Difficulty understanding the material and time pressure can also hinder the understanding and abilities of some students when given quizzes (Winarsih et al., 2024). Quizzes that do not match students' abilities can cause frustration and reduce their learning motivation (Atashpendar & Rothkugel, 2023). In addition, the level of difficulty of quiz questions that does not match students' abilities causes students to feel burdened, especially in independent learning (Wong & Nasir, 2024).

Barriers experienced by teachers in using quizzes at school can reduce the effectiveness of the learning process. Limited time in designing and implementing quizzes is one of the main reasons and this has an impact on the low use of quizzes as a tool in the learning process (Gan, 2022). Limited teacher training in designing and implementing quizzes effectively results in assessments that are inaccurate and less appropriate to learning objectives (Kristiani et al., 2024). In addition, limited institutional policies can hinder the implementation of innovative assessment methods, thereby limiting teachers' room to utilize quizzes optimally (Jalilzadeh & Coombe, 2023).

Several researchers have explored how quizzes affect student learning and engagement. Research conducted by (Narawati et al., 2024) explains that the use of digital quiz media such as Quizizz can strengthen the learning process at the elementary school level by increasing student participation, enthusiasm for learning, and understanding of the material. (Heriyanto et al., 2024) also said that the use of Quizizz can increase student motivation and involvement in learning activities, with this method having a positive impact by encouraging activeness and increasing student learning experiences. Meanwhile, research conducted by (Iskrenovic-Momcilovic, 2020) explains that the use of Kahoot quizzes shows a significant increase in results on the final exam compared to students who study using traditional methods; this proves that the use of technology in quizzes improves student understanding. In addition, the characteristics of quiz games can foster student learning motivation while encouraging more active involvement in the material being studied (Nikola et al., 2024). Previous research has highlighted the positive side and various benefits of using quizzes in learning. Although quizzes are often highlighted in research for their role in improving student performance, little research has addressed the challenges and barriers to quiz use, especially in elementary school mathematics learning.

In contrast to previous studies that discussed the benefits of using quizzes in improving learning outcomes, this article discusses other aspects, namely the challenges and obstacles to using digital quizzes at the elementary school level, especially in mathematics learning. This article provides new information in designing more effective mathematics learning at the elementary school level. With in-depth discussions and topics that are relevant to the context of 21st century learning, this article makes a real contribution to the development of more adaptive learning methods.

This study aims to identify and analyze factors that influence the barriers and challenges of using quizzes in elementary school mathematics learning. This study focuses on students' understanding of the material and their experiences in using digital quizzes, including their perceptions of the effectiveness of quizzes, technical constraints and their readiness to use quizzes. By understanding these aspects, it is hoped that this study can provide recommendations for the implementation of more optimal digital quizzes in elementary school mathematics learning.

METHOD

This research process uses quantitative and qualitative methods that tend towards quantitative. Using a questionnaire, interview. Investigations into preparation that utilize a combination of quantitative and subjective strategies, particularly through surveys and interviews, Could be identified as a typical aspect of mixed methods approaches. Integrated methods research combines quantitative and qualitative methodologies to improve the robustness and comprehensiveness of experimental investigations (Nair & Prem, 2020). While mixed methods offer a comprehensive approach, some

researchers argue that integrating clear ideal models can lead to epistemological conflicts, which may complicate the inquiry process (Bell et al., 2022).

The study participants are 5 out of 15 grade VI students of SDN Grogol 11, asking for recommendations from teachers. Participants to help facilitate this research have been selected by 5 out of 15 grade VI students of SDN Grogol 11; they are students of various characters. Selecting 5 students in grade VI by asking for recommendations from teachers regarding the characteristics of each student suitable to respond to Mathematics Learning with Quiz Media.

This study employs a combination of data collection instruments, including questionnaires, interviews, tests, and data analysis techniques. This research approach uses a mixed quantitative method biased towards the quantitative using presently available media through a questionnaire that will be filled by representatives of the student population on questions they would like answered in interviews with Elementary School students as a whole and with qualitative using interviews of several existing students. The study gathered data using a questionnaire as the method of data collection with 35 questions, and 3 student interviews to enrich the study and identify the problems for grade VI students of SDN Grogol 11. In the field of research, a variety of methods such as questionnaires, interviews, tests, and examinations are commonly used to gather and analyze data in a systematic manner. Each of these methods has its own strengths and specific characteristics that researchers must carefully consider from the planning stage. When researchers are familiar with how each method works and what it offers, they're more likely to design research that's solid and reliable. Take questionnaires, for instance they're often preferred because their format makes it possible to ask the same questions to a large group of people. This setup helps researchers look at patterns and compare answers in a fair and consistent way (Questionnaires, 2019). Therefore, surveys are essential for acquiring broad insights with minimal time investment. Interviews, on the other hand, offer a flexible method of data collection that can be structured, semi-structured, or unstructured, depending on the depth and nature of the responses sought (Tusting, 2022).

The selection data observed by the researchers included two main processes. First, they made the most of the results from questionnaires and student interviews regarding obstacles to learning mathematics through quizzes. Second, they selected relevant teacher interview responses corresponding to students' experiences and conditions.

In this research, triangulation was done through two key steps. First, the researchers examined insights from teacher interviews alongside student perspectives. Then, they cross checked those findings by looking at students' quiz outcomes, responses gathered from the questionnaires and insights drawn based on the interviews, the students mentioned a few things some parts of the learning made sense to them, others were confusing or didn't go well, depending on how the quiz worked.

RESULT AND DISCUSSION

This research used a well organized list of questions to look into what makes learning math with quizzes challenging for elementary school students. There were 35 questions, grouped under three main themes each designed to uncover specific difficulties experienced by students. These indicators examine a range of factors that may affect the effectiveness of quizzes as a learning medium, including pedagogical constraints such as instructional methods and student-teacher interaction, mental blocks such as nervousness or low self-confidence, along with technical troubles tied to digital tool usage. The questions also touch on issues students often face when trying to make sense of quiz instructions, as well as their struggles with grasping basic math ideas. From this, it's hoped that teachers and curriculum planners can get useful input to improve how quizzes are created and used in math classes. The table below presents a detailed breakdown of the data based on each indicator.

The first indicator in the questionnaire is designed to examine the pedagogical challenges that elementary school students face when completing mathematics quizzes.

Table 1. Results of Data on Pedagogical Obstacles

Pedagogis Challenges				
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

0.7 %	18.5%	43.8%	30.0%	7.0%
-------	-------	-------	-------	------

The data reveals that most students do not perceive significant pedagogical obstacles when learning mathematics through quizzes. Specifically, 0.7% of students strongly disagreed, and 18.5% disagreed with the method used by teachers in implementing quizzes. Meanwhile, 30.0% of students agreed, and 7.0% strongly agreed with the statement regarding pedagogical challenges in conducting math quizzes. Additionally, 43.8% of students responded neutrally, indicating they neither agree nor disagreed with the statement. The numbers indicate that the majority of students don't see the quiz-based teaching approach as something that seriously gets in their way. Many seem to view quizzes as a normal and acceptable part of how they learn. Based on this, we can assume that using quizzes in math classes isn't seen as a major challenge by most of them.

Even though quizzes aren't usually seen as a big problem, some students still face pedagogical challenges in learning mathematics. Recent studies provide explanations for this phenomenon. Some teachers may not be adequately prepared to use creative quiz methods that support active learning approaches like Inquiry based or Collaborative Learning (Lee & Paul, 2023). Relying too much on traditional quiz formats can limit students' chances to interact with real life and engaging math content, something that's important for building a deeper understanding (Morales & Díaz, 2016). Ngu and Phan (2024) point out that instructional design needs to take cognitive load into account so that students can grasp the material more effectively. They point out that it's important to make sure quiz questions aren't too hard or too easy, but instead fit what students can actually handle otherwise, it might overwhelm them and make it harder to learn. In addition, Lespiau and Tricot (2024) emphasize that teachers should try different ways of teaching that align with how each student learns best, so that the learning process becomes more effective and doesn't overwhelm them mentally. Because of that, some of the teaching-related problems students face may come from things like quizzes being too hard, the lack of diverse approaches in teaching, or the quiz format not matching the way certain students learn best. To truly make quizzes useful in elementary math classes, they need to be planned and applied thoughtfully by paying attention to how hard the questions are, using a mix of teaching techniques, and taking into account what students need both mentally and motivationally.

The second indicator addresses the psychological barriers students experience when working on mathematics quizzes. The following are the student's responses to the questionnaire regarding psychological obstacles.

Table 2. Results of data on Psikologia Obstacles

Psikologis Challenges				
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
35.0%	03.9%	34.3%	14.2%	12.5%

The results indicate that 35.0% of students completely disagreed with the way quizzes were delivered by the teacher, while 3.9% also expressed disagreement. On the other hand, 14.2% agreed and 12.5% strongly agreed that there were teaching-related issues in how the quizzes were handled. Around 34.3% chose a neutral stance, meaning they didn't lean one way or the other. From this data, it appears that the majority of students didn't feel the teacher's quiz approach caused major difficulties.

Although most students do not feel burdened by the quiz method, there were students who said that quizzes sometimes made them feel a bit uneasy or just not comfortable. Mathematics related fear and anxiety can impede students' willingness to engage with quizzes (Sidik et al., 2021). Supporting this view, Dowker et al. (2024) observed that students who experience higher anxiety levels often perform worse in math, and this issue appears more commonly among female learners. In addition, Putwain et al. (2023) looked into various studies and pointed out that helping students manage test anxiety early can make it easier for them to concentrate and do better in school. This is supported by the findings of Romandhon et al. (2021), who state that quizzes that are not adequately managed may trigger anxiety, which can impact students' concentration and academic performance. These findings highlight the importance of addressing students' psychological well-being in implementing math quizzes to ensure

that the learning process remains inclusive, healthy, and conducive to optimal academic achievement.

The third indicator highlights the technical difficulties students experience during mathematics quizzes. The percentage table follows.

Table 3. Results of Data on Teknisi Obstacles

Teknisi Challenges				
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
14.2%	35.7%	35.7%	9.6%	4.8%

The third indicator focuses on students' technical problems while implementing mathematics quizzes. The collected data shows that 14.2% of students strongly disagreed, and 35.7% disagreed, with the idea that technical issues had any real effect on the quiz process. On the other hand, only 0.95% agreed, and 9.6% strongly agreed that they faced tech-related problems during the quiz. Interestingly, 35.7% stayed neutral, the same figure as those who disagreed. This suggests that while the majority weren't heavily impacted by technical issues, a small group of students still ran into some difficulties.

Nova, Putri, and Santoso (2023) observed that learners often deal with tech related difficulties while using applications such as Quizizz. The problems they face usually relate to unstable internet, hectic schedules, faulty electronic devices, or a limited understanding of how to operate digital platforms. According to UNESCO (2023), digital learning tools continue to present considerable obstacles, particularly regarding accessibility and disparities in digital competence. Inadequate technological infrastructure often prevents the smooth execution of tech-driven educational methods, such as online quizzes. Many students face difficulties due to insufficient access to computers or reliable internet, which restricts their participation in digital assessments and e-learning platforms (먹튀검증, 2023). User friendliness of Software: When educational tools have complex interfaces, they can cause confusion and reduce motivation, especially among students who are not familiar with using digital technologies (Amanda et al., 2024). Although most students do not report significant technical issues, the challenges faced by a minority highlight the need to improve digital access, software usability, and technical support for effective quiz implementation.

The final indicator discusses the difficulties some students experienced in understanding mathematical concepts while completing the quiz. The following table presents the results of the collected data.

Table 4. Results of Data on Conceptual Understanding

Conceptual Understanding				
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
22.0%	33.3%	35.7%	8.3%	0.7%

From the results, 22.0% of students strongly disagreed with how the teacher implemented the quiz, and another 33.3% also expressed disagreement. In contrast, only 8.3% showed support for the method. Interestingly, just 0.07% of students mentioned had difficulty felt unclear about the quiz's content, with 35.7% choosing not to take a definite side.

While one or two students appeared a little uncertain about some of the questions, the majority of students had no trouble with the quiz. This is supported by recent research showing that digital quizzes

can potentially hinder students' conceptual understanding and critical thinking skills, particularly if they are not carefully designed. Many students often struggle to fully understand abstract mathematical concepts, and this difficulty can become even more evident when they are required to quickly recall and apply those ideas in quiz settings (Erbay, 2024; Mili, 2016). In addition, Lestari et al. (2023) pointed out that individual learning preferences such as auditory, visual, kinesthetic, and reading-writing styles also significantly influence how well students grasp mathematical material, especially in online learning environments.

This final section looks at what the students shared in the interviews. Talking with three elementary students showed that the use of quizzes in math class brought different reactions. Some students felt that quizzes supported their learning, while others found them challenging mostly due to the complexity of the questions and the time constraints they faced.

When asked about how the quizzes affected their thinking, two of the students mentioned that the quizzes actually helped them grasp math concepts more easily. Regularly taking exams improved their ability to think faster and understand the questions, according to one student. Meanwhile, another student reported that they were still confused by more challenging challenges and that they often had trouble understanding the quiz questions when they got too tough. This demonstrates that when the quiz's complexity matches the student's current level, the advantages of thinking skills tend to manifest. Students' emotional reactions to using quizzes in the classroom varied. One student commented that the quizzes prevented things from seeming dull and made learning more fun. On the flip side, another student mentioned feeling nervous, especially when there was a time limit. "I get nervous because I'm afraid I won't finish in time." Such emotional stress, if not properly addressed, can negatively influence learning outcomes. When asked about the impact on critical thinking, most students agreed that quizzes helped them think more carefully before answering. One student said, "I've learned to think more carefully before choosing an answer, not just guess." However, one student admitted that challenging questions sometimes confused them: "When the questions are hard, I get stuck and understand even less."

Based on the fully explained data, each category shows the highest response rate from the majority of students. The following table presents the results.

Table 5. The data from the results of each category

Category	Persentase
Pedagogis	43.8%
Challenges	
Psikologis	34.3%
Challenges	
Teknis	35.7%
Challenges	
Conceptual	35.7%
Understanding	
g	

The data indicates that the highest percentage comes from pedagogical barriers, showing that students most frequently experience difficulties in this category.

From a teaching perspective, the challenges that students have when taking quizzes to learn mathematics are often linked to the manner in which teachers design and deliver these assessments. One of the main concerns is the disparity between the quiz's level of difficulty and the pupils' current cognitive readiness. When quizzes are too challenging without appropriate scaffolding or preparatory instruction, students may experience cognitive overload, which hinders their ability to absorb and process mathematical concepts effectively. Furthermore, the frequent and repetitive use of quizzes especially when presented in a rigid, unvaried format can reduce enthusiasm and interest in learning. This is especially true for young students, who frequently respond better to varied, interactive, and engaging teaching approaches that acknowledge and take into account the various ways in which they

learn. Because these formats don't suit their preferred learning styles, students who prefer tactile or visual contact, for instance, may find it challenging to keep up with time-limited, text-heavy digital tests.

The fact that pupils do not receive feedback after finishing the quiz is another significant educational problem. Usually, there isn't much significant follow-up to clear up misconceptions or inaccurate answers and these tests are usually solely used as grading tools. Without prompt clarifications or assistance, students may lose the chance to own up to their errors or expand their knowledge, which lowers the learning process' overall efficacy. Furthermore, the gap between students who are already performing well and those who are failing may grow if differentiated instruction or tailored assistance are not provided. Quizzes frequently have the unintended consequence of making people feel more stressed and less motivated rather than encouraging learning.

In conclusion, quiz-based mathematics learning has great potential to enhance students' understanding and critical thinking skills. Effectiveness of this approach greatly relies on matching the quiz difficulty to the students' skill levels, offering emotional encouragement and consistent teacher guidance. When used thoughtfully, quizzes can be a fun and useful way to support learning in elementary classrooms. Still, the issues teachers often run into during math lessons usually aren't caused by the quizzes themselves, but by the way they're used in class. If teachers don't take into account how ready their students are, how they learn best, or whether feedback is given at the right time, quizzes might not work as well as intended, meaningful feedback, the value of quizzes as a learning aid can be significantly reduced. Therefore, educators need to adopt more adaptive, student-centered approaches to fully maximize the benefits of quiz-based learning.

CONCLUSION

The conclusion of this research shows that the challenges and obstacles to using quizzes among elementary school students arise from various aspects, namely pedagogical, psychological, technical and conceptual understanding. Of these four aspects, pedagogical constraints are the most dominant. This can be seen from students' difficulties in understanding the contents of the quiz due to inappropriate instructional design, questions that are too difficult, and lack of direction during the quiz. This was also reinforced by the results of interviews, where some students admitted that they felt helped by the quiz in understanding concepts, but others felt confused and stressed because the questions were felt to be too complex.

Teachers need to design quizzes appropriate to the level of cognitive development of elementary school students. Questions should be prepared in simple, clear language and adapted to the material being taught, so that students can more easily understand and answer them.

REFERENSI

- Amanda, F., Nisa, S., & Suriani, A. (2024). An Analysis of Assistance in Learning Mathematics for Elementary School Students Viewed from Various Factors. *Dewantara*, 3 (2), 282–293. <https://doi.org/10.30640/dewantara.v3i2.2652>
- Ardyan, N. R. (2024). The Role of Digital Technology in Mathematics Learning and its Impact on Learning Concepts. *Aksioma Education Journal*., 1(4), 22–30. <https://doi.org/10.62872/94nb5c80>
- Atashpendar, A., & Rothkugel, S. (2023). *Difficulty-Adjusted Quizzes: An Effectiveness Analysis*. 1–6. <https://doi.org/10.1109/tale56641.2023.10398305>
- Bell, E., Bryman, A., & Harley, B. (2022). *Penelitian Metode Campuran: Menggabungkan Penelitian Kuantitatif dan Kualitatif*. Oxford University Press. <https://doi.org/10.1093/hebz/9780198869443.003.0040>
- Case, J., & Kennedy, D. (2024). Using Quizzes Effectively: Understanding the Effects of Quiz Timing on Student Motivation and Knowledge Retention. <https://doi.org/10.18260/1-2--37996>
- Dowker, A., Smith, L., & Jones, R. (2024). Math anxiety and student performance: Gender differences in mathematics achievement. *Journal of Educational Psychology*. Retrieved from <https://link.springer.com/article/10.1007/s44217-024-00343-z>
- Erbay, G. (2024). Navigating mathematical obstacles: eighth grade students' journey in overcoming learning challenges in mathematics. *Deleted Journal*, 03(03), 01–07. <https://doi.org/10.55640/gjhss-social-326>

- Gan, C.-Y. (2022). Mobile learning-technology barriers in school education: teachers' views. *Technology, Pedagogy and Education*, 32(1), 29–44. <https://doi.org/10.1080/1475939x.2022.2121314>
- Hasibuan, S. M. (2023). Analysis of the Effectiveness of Using Technology in Evaluation of Mathematics Learning in the Digital Era. *EduMatika: Jurnal MIPA*, 3(2), 44–47. <https://doi.org/10.56495/emju.v3i2.413>
- Heriyanto, H., Cahyadi, A., & Suroso, J. S. (2024). The Effectiveness of Using Quizizz in Improving Learners' Motivation and Engagement in Learning. *Sebatik*, 28(2). <https://doi.org/10.46984/sebatik.v28i2.2526>
- Iskrenovic-Momcilovic, O. (2020). Quiz-Enhanced Learning in Elementary School. *Croatian Journal of Education-Hrvatski Casopis Za Odgoj i Obrazovanje*, 22(3), 913–933. <https://scispace.com/papers/quiz-enhanced-learning-in-elementary-school-50mutl5zq2>
- Jalilzadeh, K., & Coombe, C. (2023). Constraints in employing learning-oriented assessment in EFL classrooms: teachers' perceptions. *Language Testing in Asia*, 13(1), 1–16. <https://doi.org/10.1186/s40468-023-00222-8>
- Journal of Computer Science. (2023). Challenges and Difficulties in Learning Mathematics: Students' Perspective (pp. 311–323). Springer Proceedings in Mathematics & Statistics. https://doi.org/10.1007/978-981-99-0447-1_27
- Kaban, L. br, Sari, M., Yoki, M., Sihombing, M. P. Prof. Dr. L., & Pratiwi, W. (2023). Interactive Learning Through Digital Media: Enhancing Elementary Math Instruction. *Jurnal Arjuna*, 1(6), 250–257. <https://doi.org/10.61132/arjuna.v1i6.331>
- Kartini, S., Putra, H. K., & Mukti, W. P. (2024). Pengaruh Penggunaan Media Pembelajaran Quizizz Terhadap Motivasi Belajar Siswa. *Edudikara : Jurnal Pendidikan Dan Pembelajaran*, 8(4), 146–151. <https://doi.org/10.32585/edudikara.v8i4.350>
- Kristiani, T., Sudiyanto, S., & Usodo, B. (2022). Exploration of the Use of Quizizz Gamification Application: Teacher Perspective. *International Journal of Elementary Education*. <https://doi.org/10.23887/ijee.v6i2.43481>
- Lee, J., & Paul, N. (2023). A Review of Pedagogical Approaches for Improving Engagement and Learning Outcomes in Mathematics. *Student Research Journal*. <https://doi.org/10.47611/jsrjs.v12i3.5021>
- Lespiau, F., & Tricot, A. (2024). Reasoning more efficiently with primary knowledge despite extraneous cognitive load. *Thinking & Reasoning*. Advance online publication. <https://doi.org/10.1177/14747049241252694>
- Matematika, J., Wulandari, S., Bharata, H., & Rosidin, U. (2023). Development of a Quizizz-Based Mathematics Learning Assessment Tools to Improve Students' Concepts Understanding. *Numerical*. <https://doi.org/10.25217/numerical.v7i1.3103>
- Morales, JJ, & Diaz, WJ (2016). Unidades Lesson: For a Mathematics Lesson . 18 , 107–115. <https://doi.org/10.5377/FAREM.V0I18.2766>
- Morata, J. A. (2024). *Enhancing the Numeracy Skills of Grade 8 Students through Quizizz: An Interactive Learning Approach for Improved Mathematical Proficiency*. 2(12). <https://doi.org/10.69569/jip.2024.0581>
- Mulyati, S., & Iskandar, I. (2023). The Use of Quiz-Based Digital Media on Student Motivation and Learning Outcomes. *Edumaspul : Jurnal Pendidikan*, 7(1), 1903–1910. <https://doi.org/10.33487/edumaspul.v7i1.6626>
- Narawati, A. Y., Supriadi, D., & Mulyanto, R. (2024). Using Quizizz as an Interactive Learning Media to Improve Cognitive Values in Elementary School Students. *International Journal of Engineering, Science and Information Technology*. <https://doi.org/10.52088/ijesty.v5i1.637>
- Nikola, D. A., Harini, E., & Taufiq, I. (2024). The effect of using the educational game Quizizz on student motivation and math learning in grade 8. *Union*, 12(3), 612–625. <https://doi.org/10.30738/union.v12i3.17763>
- Putra, A. W., & Sari, R. N. (2023). Analisis Pengaruh Model Pembelajaran Problem Based Learning terhadap Kemampuan Pemecahan Masalah Matematis Siswa SMP. *Buana Matematika*, 13(2), 123–135. https://jurnal.unipasby.ac.id/buana_matematika/article/view/8906/5977

- Putwain, D. W., Woods, K. A., & Symes, W. (2023). Early interventions for test anxiety: A systematic review of effects on concentration and academic outcomes. *Educational Psychology Review*. Retrieved from <https://www.sciencedirect.com/science/article/pii/S0022440523000158>
- Sidik, G., Suryadi, D., & Turmudi, T. (2021). Learning Obstacles in Addition and Subtraction Among Elementary School Students: An Analysis of Algebraic Thinking. *Education Research International*, 2021, 1–10. <https://doi.org/10.1155/2021/5935179>
- Yuliana, D., Baijuri, A., Suparto, A. A., Seituni, S., & Selvianda, N. P. (2024). Pengaruh penggunaan media pembelajaran quizizz terhadap hasil belajar mahasiswa mata kuliah analisa dan desain sistem informasi. *Cyberspace*, 8(1), 66. <https://doi.org/10.22373/cj.v8i1.23630>
- Winarsih, S., Komalasari, N., Maharani, A., & Noto, M. S. (2024). Students' Perception in Learning Mathematics Using Quizizz. *International Journal of Educational Research Excellence*, 3(2), 958–965. <https://doi.org/10.55299/ijere.v3i2.1191>
- Wong, K., & Nasir, M. K. M. (2024). Exploring the Challenges and Academic Performance of Online Learning Students in Flipped Classrooms: A Case Study. *International Journal of Academic Research in Progressive Education and Development*, 13(3). <https://doi.org/10.6007/ijarped/v13-i3/21873>