




An Analysis of Students' Needs for Educational Games in Mathematics Learning

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Article Info	Abstract
Received November 30, 2025	The persistent gap between conventional mathematics instruction and students' digital-era learning needs demands a fundamental reimagining of instructional media in junior high schools. This study used students' perceptions as data, including the effectiveness of current mathematics learning, the level of technology use, and the obstacles they experienced while learning mathematics at junior high schools in Palangka Raya City. Data were collected through a needs questionnaire that focused on learning motivation, the availability of learning media, and students' views on the use of games as learning aids. The analysis showed that most students needed learning media that were more engaging, interactive, and able to help them visualize mathematical concepts more clearly. Further findings indicated that students' difficulties in understanding mathematical concepts were related to the teaching methods used by teachers and the limited use of digital learning media in the classroom. Integrating educational games could provide visual, contextual, and interactive experiences to support deeper understanding. These results strengthen the evidence that game-based learning can increase student engagement and encourage a more meaningful learning process. Addressing students' learning needs through digital instructional media, particularly educational games, is fundamental to advancing meaningful mathematics learning in secondary education.
Revised February 16, 2026	
Accepted March 12, 2026	
Keywords	
Digital Media; Educational Games; Mathematics; Motivation; Students' Needs.	

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How to Cite:

Septiyana, D., Katrin, G. L., Thofan, A. A & Sasalia S., P. (2026). An Analysis of Students' Needs for Educational Games in Mathematics Learning. *Journal of Instructional Mathematics*, 7(1), 16-25.

INTRODUCTION

Mathematics is a compulsory subject in education, from elementary school to university. Mathematics studies structured patterns and measurements that help students navigate various problems and challenges in everyday life (Jannah & Hayati, 2024). The process of learning mathematics is not without challenges. One such obstacle is learning difficulty, which is influenced by students' concentration levels (Raharjo et al., 2021). Most students also find mathematics difficult and boring, thus decreasing their motivation to learn (Ayu et al., 2021). One effort to overcome these obstacles in the current educational process is the implementation of Deep Learning, which emphasizes innovation.

Deep learning aims to develop students' abilities to create and apply knowledge meaningfully (Rahayu et al., 2025). Current learning challenges demand a transformation of teaching and learning methods to produce a creative, critical, collaborative, and communicative generation (Magay et al., 2025). Mathematics, as a basic science, plays a crucial role in equipping students with these skills (Irawan et al., 2025). International surveys such as the Programme for International Student Assessment (PISA) and the Trends in International Mathematics and Science Study (TIMSS) show that Indonesian students' mathematics abilities are still relatively low compared to other countries (Pusmendik Kemendikbud, 2022). Innovation in learning is supported by increasingly widespread technological advances.

Technological developments facilitate teachers provision of technology-based learning media. One innovation that can be developed is educational games. Educational math games make students more active in learning, help them understand the material more quickly, and increase their interest in learning mathematics (Muhtarom et al., 2022; Nasrullah et al., 2024). Educational games are also able to adapt to technological developments, making them increasingly relevant to students' daily lives (Apriyantini et al., 2024). Therefore, various learning media innovations, such as educational games, are being developed as potential solutions to increase student learning motivation.

Schools need media that can address the problem of students lack of motivation in learning mathematics. Evidence from a comprehensive meta-analysis indicates that educational technology in K–12 mathematics classrooms worldwide significantly improves students' achievement, highlighting the meaningful contribution of well-designed digital tools, including educational games, to academic performance (Cheung & Slavin, 2013). Educational games can be a relevant alternative because they offer more engaging learning. The implementation of educational games can increase student motivation because they are presented in an interactive format (Mubharokh et al., 2021; Nisa & Mawardah, 2023). Therefore, a needs analysis of the use of educational games in junior high school mathematics learning in Palangka Raya is necessary to determine the need for educational games in mathematics learning.

RESEARCH METHODS

This study used a mixed-methods approach with an explanatory sequential design (Creswell, 2014), as shown in Figure 1. This approach involved two research stages. The first stage was the collection and analysis of quantitative data, which was then used to design the qualitative stage (Rachmad et al., 2024). The qualitative data helped explain in more detail the quantitative data obtained from the first stage of the study. This approach was chosen because it allowed researchers to understand students' needs for educational games more comprehensively.

Three junior high schools in Palangka Raya City were selected as participants in this study: SMP Negeri 6 Palangka Raya, SMP Negeri 8 Palangka Raya, and SMP Negeri 12 Palangka Raya. These three schools were selected based on their learning characteristics and school accreditation. Twenty-five students from each school participated in the questionnaire, resulting in a total of 75 respondents for the quantitative phase. For the qualitative phase, participants were randomly

selected students who provided supporting information through interviews and classroom observations.

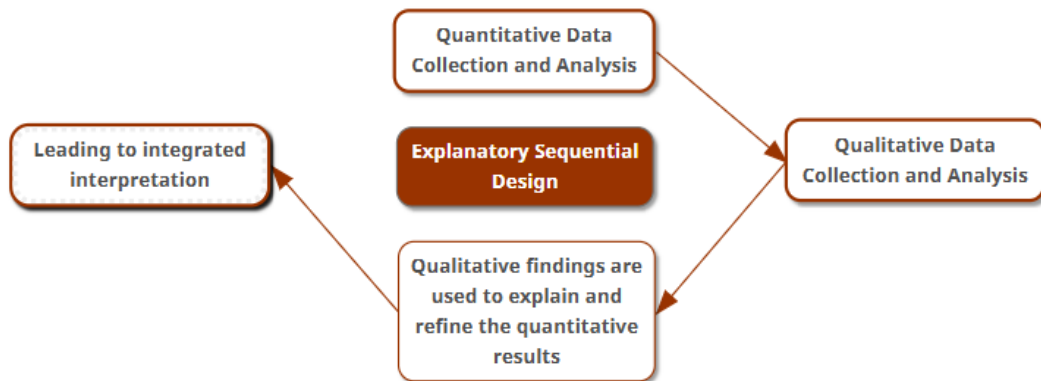


Figure 1. Explanatory Sequential Design

The quantitative phase used a student needs questionnaire, as presented in Table 2. The questionnaire was developed based on the interview guidelines listed in Table 1, cited from Sahid et al. (2024), ensuring that each question aligned with the aspect being measured. For the qualitative phase, open-ended interviews and observation data were recorded. All instruments were designed to capture accurate and relevant information to support the achievement of the research objectives.

Table 1. Student Interview Grid

Aspect	Indicator
a. Student Interest in Mathematics Learning	<ul style="list-style-type: none"> – Students like mathematics – Students' opinions about the mathematics learning that is being implemented
b. Availability of Learning Media	<ul style="list-style-type: none"> – Students using smartphones – Use of learning media in the classroom – Need for learning media
c. Is Interactive Learning Media Interesting or Not	<ul style="list-style-type: none"> – Students' opinions regarding the expected learning media
d. Student Interest in Educational Game-Based Media	<ul style="list-style-type: none"> – Student interest in learning media with game elements – The need for learning media based on educational games

Data were analyzed separately using an explanatory sequential design (Creswell, 2014). Quantitative data were analyzed in percentages to identify trends in student responses across all aspects. The results of the quantitative analysis were used to determine the types of qualitative open-ended questions to be asked to participants (Daruhadi & Sopiati, 2024). In the next stage, qualitative data were analyzed through data reduction, data presentation, and conclusion drawing. The final stage was data integration, which involved comparing and combining the results of the quantitative and qualitative analyses to compare the results from both stages and analyze new findings obtained (Rachmad et al., 2024).

Table 2. Student Needs Analysis Questionnaire

No	Question	Aspect	Answer Choices	
			Yes	No
1	Do you like math?	1		
2	Are you excited when learning mathematics?			
3	Is mathematics a difficult subject?			
4	Is the teacher's way of teaching mathematics easy to understand?			
5	Does your math learning feel boring?			
6	Do you have a smartphone?	2		
7	Do you use your smartphone every day?			
8	Have you ever used a smartphone to learn math?			
9	Do you often use learning media in class?			
10	Have you ever used technology learning media in class?			
11	Are you interested in technology learning media?			
12	Do you wish there were more interactive learning media for mathematics?	3		
13	Do you prefer learning media in the form of images or animation rather than text?			
14	Do you like playing games?	4		
15	Have you ever used educational games in learning mathematics?			
16	Are you interested in educational game media?			
17	Do you need educational game media?			
18	Would you be more enthusiastic about learning if mathematics was presented through educational games?			

RESULTS AND DISCUSSION

Questionnaire results from junior high school students in Palangka Raya City revealed differing perceptions of mathematics learning and technology-based learning media. To present the results in a structured and comparative manner, the data are presented in a Table 3 covering aspects of mathematics learning. This presentation also aims to identify the extent of student enthusiasm for using educational math games in mathematics learning.

Based on the results of student responses to mathematics learning, the availability of learning media, and interest in educational game media, it was found that students showed diverse responses in each aspect studied. The aspect of student interest in mathematics learning showed that an overall average of 59.2% of students assessed that learning had gone well, with a distribution of SMP 6 (60.8%), SMP 8 (52%), and SMP 12 (64.8%), so it can be seen that the learning model applied by teachers greatly influences the quality of students' mathematics learning experiences. Teachers use a combination of lecture and inquiry methods that make learning more varied, easier to understand, and enjoyable for students. Learning with a combination of lecture and inquiry methods has been proven effective in

improving conceptual understanding and student engagement in the learning process (Warpaatun, 2023; Antonio & Prudente, 2024). However, there are still 40.8% of students who consider learning less than optimal because learning tends to be teacher-centered and less contextual, so that a contextual approach plays an important role in improving understanding of mathematical concepts (Monica et al., 2022; Nurhana & Abdullah, 2021).

Table 3. Students' Responses to Mathematics Learning and Educational Media

Aspect	Grade						Overall	
	6 th		8 th		12 th		Average	
	Yes (%)	No (%)	Yes (%)	No (%)	Yes (%)	No (%)	Yes (%)	No (%)
a. Interest in mathematics learning	60.8	39.2	52	48	64.8	35.2	59.2	40.8
b. Availability of learning media in school	71.3	28.7	93.3	6.7	92.7	7.3	85.8	14.2
c. Interactive learning media is interesting	78	22	94	6	88	12	86.7	13.3
d. Interest in educational game-based media	70.4	29.6	78.4	21.6	88	12	78.9	21.1

The availability of learning media indicates that SMP 6 (71.3%), SMP 8 (93.3%), and SMP 12 (92.7%) reported having technology-based learning media. An average of 85.8% of students stated that media access was available, although 14.2% still lacked optimal support. This data indicates that despite adequate technology infrastructure, its utilization is not optimal in all schools due to limited teacher strategies for using digital media. The level of technology adoption in schools is greatly influenced by the support and readiness of teaching staff (Cindarbumi et al., 2025; Judijanto, 2024). Teacher training is needed to ensure the effective use of available technology, as evidenced by schools that have optimized digital media through policy support and ongoing training. This technology integration can improve learning effectiveness and student motivation siswa (Mawaddah et al., 2024; Pratidina et al., 2024; Suwanti, 2025). Strengthening teachers' pedagogical readiness and digital competence needs to be a focus of school development, because teachers who are adaptive to technology are a key factor in the success of digital learning (Arifin & Mu'id, 2024; Rais et al., 2024).

Regarding interactive learning media, student expectations were very high in all schools: SMP 6 (78%), SMP 8 (94.6%), and SMP 12 (88%), with an average of 86.7% stating that media such as animation and dynamic visuals were highly desirable in mathematics learning because they were considered to help understand abstract concepts. High student interest in this interactive media indicates that the use of technology in learning has become an important need to create a more engaging and meaningful learning experience. These results support research (Hui & Mahmud, 2023; Pan et al., 2022) which states that interactive media can increase student cognitive and affective engagement. Furthermore, the use of animation and interactive visual media is considered effective because it can visualize complex mathematical concepts more concretely, making it easier for students to understand the material, retain information in long-term memory, and increase their motivation

and conceptual understanding (Çeken & Taşkın, 2022; Chang et al., 2022). High student interest in interactive learning media was also seen in SMP 12, which received B accreditation, indicating that the need for learning innovation remains strong despite differences in the quality of school accreditation. Interactive digital media can increase student concentration and interest in learning abstract concepts in mathematics (Ahmad et al., 2025; Sanz-Ramos et al., 2024).

Interest in educational game-based learning media also shows that an average of 78.9% of students showed positive interest in educational games, with nearly 80% enjoying playing games and feeling enthusiastic about learning mathematics using them. Technology-based interactive media, including educational games, can improve learning motivation and academic outcomes (Hui & Mahmud, 2023; Pan et al., 2022). The high level of student enthusiasm when learning through this approach indicates that interactive game-based learning is more engaging for students. The implementation of educational games can increase student collaboration and participation. Furthermore, most students feel motivated to learn through games (Öztop, 2022; Videnovik et al., 2023). Educational games can significantly increase students' social interaction and learning engagement (Debrenti, 2023).

In addition to these quantitative findings, researchers also conducted interviews with several students as supporting data to strengthen the interpretation of the survey results. The interviews revealed that most students had a positive perception of mathematics learning when teachers used varied approaches and utilized technology-based media. Students stated that learning that focused solely on lectures tended to bore them easily and made it difficult to grasp mathematical concepts. In contrast, the use of animation and educational games was perceived as more engaging, enjoyable, and helped them understand the material more concretely.

These students' opinions reinforce quantitative findings that student motivation and engagement increase when learning is presented interactively. Furthermore, students believe that teachers' creativity in selecting media and learning strategies plays a crucial role in creating meaningful learning experiences and enhancing their understanding (Sa'adah et al., 2024; Sitorus et al., 2023). Students also believe that the use of interactive media, including animations and educational games, helps them understand abstract mathematical concepts in a more concrete and engaging way. They feel more enthusiastic, confident, and able to retain their understanding longer when directly involved in learning activities using technology.

Furthermore, research findings indicate that technological facilities are widely available in schools, and students are generally accustomed to using digital devices such as smartphones and laptops. This indicates that schools in Palangka Raya are technically ready to integrate game-based learning media into the mathematics learning process. However, the implementation of digital learning media remains hampered because not all teachers utilize them optimally in teaching and learning activities. Even though digital devices and internet connections are available, some teachers still prefer conventional approaches. Therefore, teacher creativity and school support play a crucial role in ensuring the sustainability of educational game implementation, not just occasional activities.

The results of this study provide a new perspective, demonstrating that the need for educational games is not simply a preference, but rather a response to the need

for learning that is more tailored to students' needs. Supporting facilities, student readiness, and increased teacher technology utilization are necessary for the use of educational games. The use of learning media such as educational games has great potential to be an effective, engaging, and relevant learning tool for mathematics instruction in Palangka Raya Public Junior High Schools.

CONCLUSION

The high demand for educational math games in all three schools indicates that students need more interactive learning media. These findings also indicate that school accreditation does not significantly impact students' level of need for educational games. Differences are clearly visible in the level of readiness of each school to implement these media, both in terms of facilities and learning practices. Therefore, teacher creativity and school support need to be continuously improved to ensure optimal implementation of learning media, including educational games, and meet student needs.

The findings of this study have significant implications for the implementation of educational technology in Palangka Raya City. The survey results indicate that students not only have a high need for educational math games but also demonstrate a strong readiness and interest in using them as part of the learning process. This suggests that the use of educational games has significant potential for integration into mathematics instruction in public schools in Palangka Raya. Given students' high interest in digital games, this approach could be an effective solution to address low learning motivation, boredom with conventional methods, and the gap between student learning culture and the learning model implemented in schools. Therefore, the implementation of educational games is not only feasible but also strategic as a learning medium relevant to student characteristics in the digital age.

However, this study has several limitations. The number of participants was limited to three schools in Palangka Raya City, so the findings cannot be broadly generalized to other school contexts outside this region. Furthermore, the research instrumentation focused only on student perceptions and needs and did not comprehensively assess teacher readiness regarding technology competency and digital literacy in implementing educational games. These limitations provide an opportunity for further research to expand the scope of respondents and evaluate the readiness of the overall learning ecosystem, including students, teachers, school facilities, and policy support.

Based on these findings and limitations, this study offers hope that the use of educational games in mathematics learning can be implemented more systematically and sustainably. Schools are expected to not only provide technological facilities but also foster a technology-based learning culture through teacher training, adaptive curriculum development, and ongoing evaluation of the effectiveness of educational game use. This support is needed to foster a more enjoyable and meaningful mathematics learning experience.

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