Identification of Students' Perceptions of Fraction Adventure Game in The Learning Process of Fraction Calculation Operation

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Abstract
The use of engaging learning media such as educational games is relevant to help students overcome difficulties in understanding the concept of fractions. However, the lack of in-depth research regarding students' perceptions of educational games creates a need for further exploration. The objectives of this study were 1) to identify the understanding of fraction calculation operations, 2) to analyze students' active involvement in learning, and 3) to assess the effectiveness of educational games in learning. The research method used is descriptive qualitative by analyzing the results of questionnaires, interviews, and observations. Then the data was validated with source triangulation. The research subjects were 4th and 5th grade elementary school students with a total of 45 students. The results showed that most students experienced an increase in understanding of the concept of fractions after playing educational games, feeling more confident in calculating and explaining fractions. In addition, students showed active engagement during learning, with 60% feeling happy and interested while playing, as well as participating interactively with friends. The majority of students found educational games more effective than traditional methods, perceiving improved learning outcomes and a more enjoyable learning experience. Educational games effectively improve students' understanding, engagement and learning outcomes in fraction operations, making it an interesting and useful learning method.
Keywords: *Student Perception, Fraction Adventure Game, Fractions*

Abstrak
Penggunaan media pembelajaran yang menarik seperti game edukatif relevan untuk membantu siswa mengatasi kesulitan dalam memahami konsep pecahan. Namun, kurangnya penelitian mendalam mengenai persepsi siswa terhadap game edukatif menciptakan kebutuhan untuk eksplorasi lebih lanjut. Tujuan penelitian ini adalah 1) mengidentifikasi pemahaman operasi hitung pecahan, 2) menganalisis keterlibatan aktif siswa dalam belajar, dan 3) menilai efektivitas game edukatif dalam pembelajaran. Metode penelitian yang digunakan diskriptif kualitatif dengan menganalisis hasil angket, wawancara, dan observasi. Kemudian data divalidasi dengan triangulasi sumber. Subjek penelitian adalah siswa kelas 4 dan 5 sekolah dasar dengan total 45 siswa. Hasil penelitian menujukkan sebagian besar siswa mengalami peningkatan pemahaman konsep pecahan setelah bermain game edukatif, merasa lebih percaya diri dalam menghitung dan menjelaskan pecahan. Selain itu, siswa menunjukkan keterlibatan aktif selama pembelajaran, dengan 60% merasa senang dan tertarik saat bermain, serta berpartisipasi secara interaktif dengan teman.Serta ayoritas siswa menganggap game edukatif lebih efektif daripada metode tradisional, merasakan peningkatan hasil belajar dan pengalaman belajar yang lebih menyenangkan. Game edukatif efektif meningkatkan pemahaman, keterlibatan, dan hasil belajar siswa dalam operasi hitung pecahan, menjadikannya metode pembelajaran yang menarik dan bermanfaat.
Kata kunci: Persepsi Siswa, Permaian Fraction Adventure, Pecahan

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INTRODUCTION

Teaching fraction calculation operations in elementary school is very important because it can develop students' cognitive abilities in understanding mathematical concepts and solving everyday problems (Rizqi et al. 2023). Effective learning using innovative models can improve students' understanding of mathematical concepts, which is important to support their mathematical abilities at the next level (Fauzi. 2022). However, many students have difficulty in understanding the concept of fractions, which often leads to confusion and lack of confidence in learning. Therefore, the use of interesting learning media, such as educational games, is becoming increasingly relevant to help students overcome this difficulty.

The use of interactive and innovative learning media can increase students' motivation to learn, so they are more enthusiastic in participating in the learning process (Apriani. 2024). Although there are many studies that show the effectiveness of using interactive and innovative media in education, there is still a gap in the understanding of how educational games in particular can influence students' perceptions in learning fraction operations. Most previous studies focus on academic outcomes, while the aspect of students' perceptions of games as learning tools is less explored. This creates a need to investigate how students perceive and feel about the learning experiences they have through educational games, and how this can affect their motivation and engagement in the learning process. Understanding students' perceptions of educational games is essential in order to improve their motivation and learning outcomes in learning mathematics in primary schools (Handican et al. 2023). If this gap is not addressed, it can lead to ineffective use of learning media, which ultimately has a negative impact on students' concept understanding and learning outcomes.

The results of Ariyanto et al's research (2023) show that the application of gamification in math learning not only makes students more involved but can also significantly improve their learning outcomes. In line with the research of Adipati et al (2021) educational game-based learning is recognized as an effective approach to increasing student motivation. Games in education can motivate students to learn, especially if the game is able to provide a fun and intrinsically satisfying experience (Cheung & Ng. 2021). Therefore, it is important to deeply understand how students respond to adventure games in the context of fraction operations.

Suciati's research (2021) showed that the use of snakes and ladders game media proved effective in improving students' math learning outcomes. The use of simple props, such as origami paper, in contextual learning, simulations, and trials has proven effective in increasing elementary school students' interest in learning mathematics, especially in fraction material (Fajri et al. 2022). However, the lack of research exploring students' perceptions of adventure games in fraction learning suggests the need for further exploration. Other studies have also shown that the use of game media in learning can not only be time-consuming in its preparation but also overwhelm the teacher in managing the class and cause difficulties in maintaining order and student focus (Nisa & Susanto, 2022).

This research offers novelty by focusing on identifying students' perceptions of fraction adventure games, an aspect that is still under-researched in the context of mathematics learning. By exploring how students perceive this educational game, this study aims to provide new insights into the design and implementation of games in fraction learning. It is expected that the results of this study can contribute to the development of more effective and interesting games, as well as provide guidance for educators in choosing and using appropriate learning media to increase student motivation and understanding. Based on the description above, the researcher

formulated a study with the title “Identification of Student Perceptions of Fraction Adventure Games in the Fraction Calculation Operation Learning Process”.

METHOD

This research used a descriptive qualitative approach (Turale. 2020). This approach aims to describe and understand in depth the participants' views on the use of the game in a learning context. Data were collected through several methods, namely interviews, observations, and questionnaires, in order to obtain comprehensive information and stronger data triangulation. This study involved 45 participants consisting of 4th and 5th grade students. Participants were selected by purposive sampling, where they were selected based on their direct involvement in the learning process of fraction materials using Fraction Adventure game.

The research instruments used were questionnaires and interview guidelines. The table below details the instruments used and the indicators measured:

Table 1. Aspects and Indicators of School Citizens' Perceptions

No	Indicator
1	Concept Understanding
2	Student Engagement
3	Learning Effectiveness

This research procedure is carried out starting from problem identification, preparing instruments, grouping inventory data, observations, documents, and transcripts of interview recordings. Furthermore, in-depth interviews and searches for supporting information were carried out so that primary and secondary data could be categorized (Siedlecki. 2020).

RESULTS AND DISCUSSION

Research Results

This study involved 45 learners from grades 4 and 5 who participated in an adventure game as a learning method to understand fraction operations. Data were collected through questionnaires, interviews, and observations to evaluate three main indicators: concept understanding, student engagement, and learning effectiveness. In general, students showed a positive attitude towards using the game as a learning medium. Respondents claimed to feel more confident in calculating fractions and enjoyed the more interactive learning process. However, there were some students who still experienced difficulties, indicating that although the game is effective, there is still room for improvement in its design and implementation.

Concept Understanding

The questionnaire results showed that most students felt an increase in understanding the concept of fractions after playing the game. A total of 44% of students strongly agreed and 40% agreed with the statement that they felt they understood the concept of fractions better after playing the game. Interviews conducted with some students revealed positive experiences, where one student stated, “This game helped me understand how to add fractions. For example, when completing level 3, I learned to combine fractions with different denominators.

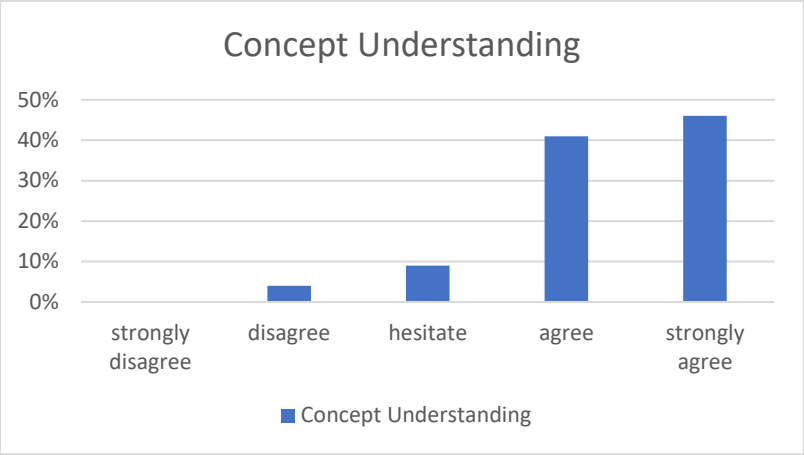

Figure 1: Concept Understanding Indicator

However, there were also students who reported difficulties, especially in the early levels of the game. From observation, 8 out of 10 students were able to explain the concept of fractions well, while two students still had difficulties. This suggests that while many students benefited from the game, some students needed additional support to achieve optimal understanding. This research shows that an individualized approach in providing guidance is essential to help students who are struggling to understand the concept.

Student Engagement

The student engagement indicator showed significant results. From the questionnaire, 60% of students reported feeling interested and happy while playing the game, while 51% of students felt more excited to learn fractions after engaging in the game. This reflects that the game not only serves to improve understanding but also motivates students to be more active in the learning process.

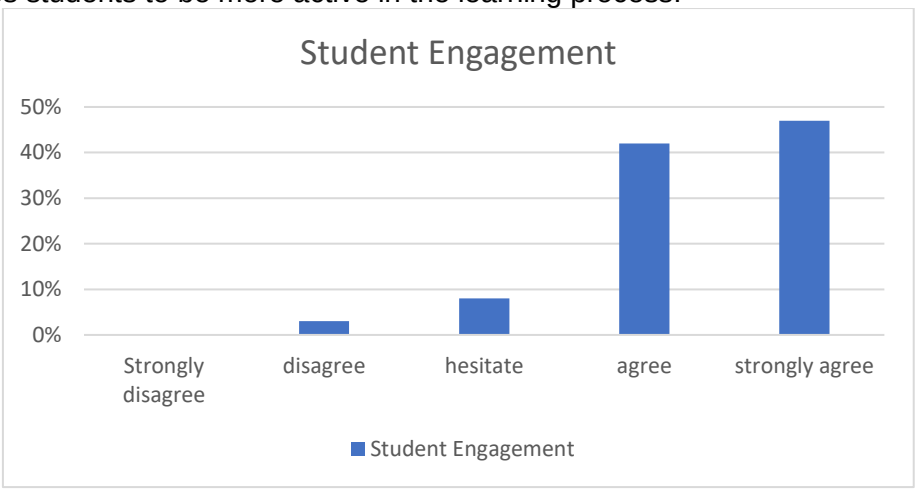

Figure 2: Percentage Results of Student Engagement Indicators

From the interviews, students revealed that certain elements of the game, such as the challenge, interaction with friends, and fun offered, contributed to their engagement. One student stated, “The game made me participate more actively in the learning process,” which suggests that the game succeeded in creating an interactive learning environment. Observations during the game session also noted that all students actively participated and showed great enthusiasm. However, two students seemed to prefer playing alone, indicating that although engagement was generally high, there were still students who needed to be encouraged to collaborate more within the group.

Learning Effectiveness

In terms of learning effectiveness, the questionnaire results show that 67% of students prefer learning using the game compared to traditional methods. They felt an improvement in learning outcomes after playing, with 62% of students feeling that the game was effective in helping them learn fractions. The majority of students found the game more effective than classroom learning. One student said, “I prefer learning this way because it's more fun and less boring,” emphasizing the aspect of better motivation and engagement.

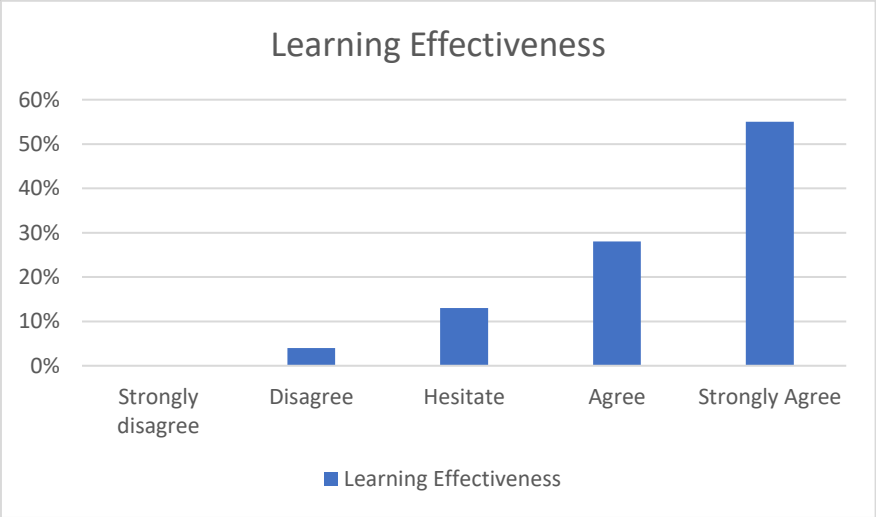

Figure 3: Percentage Results of Learning Effectiveness Indicators

From the observations, 7 out of 10 students showed better understanding after playing the game, however three students did not feel any change in their understanding. This suggests that while many students benefited from the game, there are still some students who may require additional support to achieve optimal results. It is important to consider this in future game development so that all students can benefit equally.

Research discussion

This study aims to identify students' perceptions of the use of adventure games in learning fraction calculation operations. The results showed that 84% of students felt an increase in understanding of fraction concepts after playing the game. In line with the research of Wijayanti & Yanto (2023), the application of games in mathematics learning improves students' concept understanding, interest, and motivation, as well as creating a fun and interactive learning environment. Students reported ease in understanding the material, as expressed by a student who felt more confident in calculating fractions after playing the game. The use of educational game tools in learning mathematics effectively improves students' cognitive abilities and conveys mathematical concepts in an interesting and interactive way (Hasna & Wathon. 2018).

The level of student engagement during the learning process also showed significant results, where 60% of students felt interested and happy while playing the game. The challenge element in the game motivates students to participate more actively. Constructivist learning theory states that students' active involvement in learning will increase their understanding of the material being taught (Masgumelar & Mustafa. 2021). Many students revealed that collaboration with friends while playing added to their enthusiasm, creating a positive learning environment. Vygotsky's theory emphasizes that social and environmental interactions are essential in learning, enhancing students' cognitive development and understanding (Fathoni. 2023).

In terms of learning effectiveness, 67% of students preferred using games over traditional methods. This is in line with research by Cheung & Ng (2021) which showed

that educational game media can improve student motivation and learning outcomes. Students reported a significant improvement in learning outcomes after playing, finding the learning experience enjoyable. However, observations showed that there were some students who did not feel any change in their understanding, signaling the need for continuous evaluation of the game design to be more inclusive.

From the observations, the majority of students actively participated and showed enthusiasm while playing. Although there were two students who preferred to play alone, which shows that although the general level of engagement was high, there is a need to encourage collaboration. According to research by Nisa & Susanto (2022), collaboration in learning can improve student understanding. Students who collaborate are better able to share strategies and help each other, creating a more supportive learning environment and reinforcing learning through group discussions.

Overall, the fraction adventure game was shown to contribute positively to students' concept understanding, engagement and learning effectiveness. This research shows that educational games can be an effective tool to improve motivation and learning outcomes in mathematics, especially in fractions. By integrating relevant learning theories, such as constructivism and social learning, the results of this study provide a basis for the development of better games in the future. Therefore, it is recommended that the development of this game should continue by considering the needs of diverse students as well as strengthening collaboration features and support for struggling students, so that all students can benefit optimally from learning through the game.

CONCLUSION

This study shows that the fraction adventure game is effective in improving students' understanding of fraction calculation operations. Student engagement increased, with 60% feeling interested and happy. A total of 67% of students preferred the game over traditional methods. Although many benefited, some students still needed additional support. Therefore, game development should consider the needs of diverse students for optimal effectiveness.

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