

Analysis of the Effectiveness of Using Digital Educational Game Media in Mathematics Learning to Improve Student Learning Outcomes in Elementary School

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Abstract. Education plays an important role in shaping the future of the younger generation. With the existence of education, it is able to improve the quality of knowledgeable human resources, as well as personal development and the ability of skills needed in achieving success in life. Educational Game is one of the creative and innovative learning media that can be used in learning Mathematics. This study aims to examine and explore the application of educational games in learning mathematics to improve learning outcomes in elementary school students. The method used in this research is a systematic literature study in accordance with the discussion, namely educational games, math learning, and learning outcomes. Based on the results of a systematic literature review, educational games for learning mathematics can be said to be effective and able to improve student learning outcomes quite well. In addition, the use of educational game media is also able to increase student learning motivation and students can learn more fun.

Keywords: Math Learning, Educational Game, Learning Outcomes, Elementary School

1. INTRODUCTION

Education plays an important role in shaping the future of the younger generation. With education, it is able to improve the quality of knowledgeable human resources, as well as personal development and the ability of skills needed in achieving success in life. Every individual must be able to adapt to every development of the times faced, such as in the era of technological development and rapid changes in the education paradigm, which certainly have a considerable impact in the world of education, thus making educators especially must be able to adapt to these changes. But in reality there

are still many educators who have not utilized technology in learning at school, this is due to the lack of understanding of educators in the use of technology in the learning process, so there are still many educators who still use conventional methods in the learning process, this will certainly affect student learning outcomes.

One of the conventional methods still used is the use of learning media which is still limited to teacher books and student books. The use of learning media that is less interactive will affect the level of student understanding, interest in learning and also student learning outcomes. Especially in elementary school students, the problem that often occurs is the lack of understanding of the material being taught and students often feel bored when learning takes place in the classroom. Therefore, it is important to make interactive and creative learning media innovations to be able to increase understanding, interest in learning to be able to improve student learning outcomes.

One of the creative and innovative uses of learning media that can be used is through educational games. Educational games are learning media that can combine entertainment aspects with learning, so as to increase student interest and motivation in learning. One of them can be applied to math subjects. Learning math at the elementary school level is an important foundation in shaping students' basic understanding of mathematical concepts that they will use throughout life. However, many students find it difficult to deal with math materials. Educational games come as a solution to help overcome these problems in an interesting and fun way.

The development of games in Indonesia itself is growing rapidly. Games hold a fairly important function as a means of entertainment or also education and learning for people old, young, men and women, let alone children. Games that are popular today are digital-based games. In addition to the entertainment function, games are also often created for education or learning, learning in the form of games usually includes early childhood learning such as learning to count, read and so on. It is proven that learning to count by using games is more interesting for students than using classic media using paper or stationery(1).

Terrel and Rendulic in their research stated that using games for learning in elementary schools can increase students' internal motivation and learning achievement (2). Educational games that are made must be able to stimulate student motivation and make the teaching and learning process more enjoyable. The main goal of educational games is to change the negative perception of math. Educational games offer a different way to present mathematical concepts in a more interesting and understandable way. In the context of games, abstract concepts can be illustrated through simulation, visualization, and direct interaction can help students understand mathematical material. Educational games also support problem-based learning. Students are invited to find mathematical solutions to overcome challenges in the game and involve students to be active in learning and help improve students' critical thinking.

The purpose of this study is to examine and explore the application of educational games in learning mathematics to improve learning outcomes in elementary school students. With this research, it is hoped that it can have a positive impact on readers, especially being able to improve the learning outcomes of elementary school students after applying educational games in learning mathematics.

2. METHOD

This method uses descriptive analysis and theoretical references that are relevant to the cases and problems studied. In this study, researchers used a journal review based on a number of empirical articles regarding educational games in mathematics learning to improve student learning outcomes studied with a qualitative approach. The research data used is secondary research data using literature studies, namely in the form of analysis of data sources from national and international journals. This research procedure includes: 1) determining the research theme which is the Application of Educational Games in Mathematics Learning to Improve Learning Outcomes in Elementary Schools; 2) searching and collecting various literatures using Google Scholar; 3) classifying various types of articles relevant to the research theme; 4) citing relevant articles; and 5) writing articles from the

citation results by studying content analysis techniques, namely studying the description of content, message characteristics, and development of a content (3).

3. RESULT AND DISCUSSION

3.1. Result

Advances in digital technology are interrelated with education and have a positive impact, especially in mathematics, one of which is the increased learning outcomes and effectiveness of mathematics teaching and the mathematical approach to the aspects to be taught and what should be learned can be aligned with technology. One concrete example of the integration of digital technology with education is the development of educational games as one of the interactive learning media. Math educational games are one of the instructional games that combine the concepts of learning and playing into one interactive learning media (4).

According to Dienes, a Hungarian, English and French mathematics teacher, Mathematics is a structured lesson, classification of structures, relations within structures and classifying relations within structures. He believes that every mathematical concept can be understood by students if it is presented in a concrete and diverse form, because according to observers, math lessons are only interested in the basics because they are easy. One of the stages carried out by Dienes is games, children begin to observe patterns and regularities contained in the concept. They will pay attention when there are certain rules to complete the game. Through games, students are invited to start recognizing and thinking about mathematical structures (5).

Educational games are specifically designed and developed to help students learn while playing, so that students are still learning even though they are playing. In addition, a game that is played can also help improve students' thinking, creativity, and ability to retain information. In addition, games have a positive effect on learning because they can provide direct experience from the users involved. This game is expected to make students more interested in learning math and invite students to play but also while learning. Game-based learning is an effective way to increase children's motivation to learn, because there are challenges that must be completed in a game so that it raises a greater sense of curiosity or curiosity to solve a challenge (6).

Fun learning can affect student learning outcomes. The success of learning is influenced by several factors, one of which is the learning media factor. According to Muhson (2010) in order to improve the effectiveness and efficiency of learning, it is necessary to develop various creative and innovative learning models. This needs to be done so that the learning process does not seem less interesting, monotonous and boring so that it will hinder the transfer of knowledge. Therefore, the role of media in the learning process is important because it will make the learning process more varied and not boring (7).

Educational games are proven to increase interest in learning for students so that educational games are one of the revolutionary steps in learning that is fun for students. Games as educational media can make students learn while playing. Educational games can also increase concentration and increase interest in learning. In addition, there are still several advantages of applying games as educational media, including: increasing student activeness, increasing understanding in students, and improving student learning outcomes. An educational game must take into account various things so that the game can really educate, increase knowledge and improve the skills of students so that it does not merely waste a lot of time that is not useful. Educational game applications are needed for elementary school students to more easily understand school material. In addition, educational games are also proven to be used as an alternative media in learning math. This proves that games as educational media can be applied to overcome problems with the difficulty of learning math for students (8).

The results of research from journal articles that have been collected regarding the application of educational games that can increase the effectiveness of elementary school students' math learning outcomes. In this study, researchers selected three journal articles which used the Research and Development method with different selected subject matter, namely fractions, math

numbers, addition and subtraction. In addition, the educational games used by each article are different, including math space adventure games, bilomatics games and whizzer games. However, from the results of the analysis obtained, the three of them are effectively used to improve student learning outcomes such as in the educational game math space adventure which shows a result of 32.79% and is said to be feasible to use to improve learning outcomes of fraction material in grade IV elementary school students. Then the bilomatika game shows a percentage of 80.5% and 85.2% on math number material that can be used for grade I elementary school students. And in the whizzer game, the results of 87% and 90% are very feasible to use in addition and subtraction subject matter for third grade elementary school students.

3.2. Discussion

The results of this study state that the use of digital educational game media is considered effective in learning mathematics in elementary schools. This is based on the results of the analysis of three research articles on the development of digital educational games and their application in elementary schools. Each research article discusses the development of different digital educational game media, but all three show that the use of educational game media can improve student learning outcomes in mathematics lessons in elementary schools. The results of the analysis of articles that have been carried out by researchers are as follows:

Tabel 1. Hasil Analisis Artikel

No.	Judul	Peneliti	Game edukasi digital yang di teliti	Hasil
1.	Development of Math Space Adventure Game as Learning Media on Fraction Materials in Elementary School (4)	Rofiqoh, I., Puspitasari, D., & Nursaidah, Z. (2020)	Math Space Adventure Educational Game	The trial results obtained an increase in student learning outcomes by 32.79%.
2.	Development of bilomatics educational games to improve student learning outcomes in grade 1 mathematics subjects (6)	Nur Arifah, R. E., Sukirman & Sujalwo (2018)	Bilomatics Educational Game	Assessing students through pre-test and post-test by obtaining an average pre-test result of 6.24 and post-test result of 89.6. So as to get an increase in the average N gain result of 0.72 which is included in the high criteria category with an average score of 27.2.
3.	Development of Educational Game Media in Improving Mathematics Learning Outcomes of Grade III Madrasah Ibtidaiyah Students (9)	Juhaeni., Cahyani,E. I., Mega Utami,F. A., & Safaruddin (2023)	Quiz Whizzer	Assessing students through pre-test and post-test by obtaining an average pre-test result of 54 and post-test result of 84.

Based on the results of the article analysis, it can be said that the use of educational game media in mathematics lessons can be said to be effective and able to improve student learning outcomes quite well. In addition, the use of educational game media is also able to increase student learning motivation and students can learn more enjoyably.

4. CONCLUSION

Based on the results and discussion presented above, it can be concluded that educational games have a good impact on improving student learning outcomes, especially in mathematics lessons for elementary school students. Educational games are also considered effective in helping to improve student learning outcomes quite well, and can help increase learning motivation in students so that it has a good impact on improving students' critical thinking. In addition, educational games also provide a fun experience in the learning process.

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