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EFFECTIVENESS OF USING EDUCATIONAL GAME-BASED SCIENCE MEDIA PRODUCTS IN IMPROVING SCIENCE LITERACY IN ELEMENTARY SCHOOL

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Abstract

This study examines the effect of using educational game-based science media products on improving science literacy , especially in terms of critical thinking or problem-solving skills in elementary school students. Through an experimental research design, the results showed a significant increase in the aspects of science literacy studied in the group of students who used educational game media compared to the control group. The results showed a significant increase in the aspects of science literacy studied in the experimental group. These findings indicate that the use of educational games can be an effective method for improving high-level thinking skills in students, such as critical thinking and problem solving. This study emphasizes the importance of integrating educational games into the elementary education curriculum to support the development of science literacy in more depth. In addition, these results also open up further opportunities for research related to the effectiveness of educational games in various other aspects of education.

Keywords : scientific literacy, critical thinking, educational games, experiments, elementary school students.

INTRODUCTION

Current technology can be seen through the level of human resources in each country, which is influenced by the quality and quantity of education. The learning process is an activity carried out by teachers and students to achieve learning goals. Success in achieving these goals is highly dependent on the role of the teacher, who not only delivers learning materials but is also able to guide students (Shofia et al., 2024) . Teachers are people who can attract students to participate in the learning process by creating a fun learning atmosphere and helping students gain better scientific literacy. To improve students' scientific literacy, teachers must create effective content, facilities, media, strategies, and learning activities (Nafi'isah & Bahrodin, 2023) .

Basically , the movement to improve students' scientific literacy includes making lessons interesting for students and making the learning process fun . One of them is by using educational game- based science media products to improve scientific literacy . Scientific literacy is one of the important competencies that must be possessed by students , especially at the Elementary School (SD) level . As stated by Juliana et al. (2023) Scientific literacy is not only related to the ability to understand basic scientific concepts , but also includes the ability to think critically , solve problems , and make decisions based on scientific understanding . However , in reality , the level of scientific literacy of students in Indonesia is still relatively low . One of the contributing factors is the learning method that is less interesting and unable to motivate students to learn

science enthusiastically .

Along with the development of information and communication technology , digital -based learning media has begun to be widely used as an alternative to increase the effectiveness of the learning process (Putri et al., 2023) . One interesting innovation is the use of educational games as a science learning medium . This educational game is specifically designed to combine educational elements with entertainment , so that it can create a fun learning experience for students .

Scientific literacy is the ability to understand science and its application in everyday life which includes students' ability to solve problems using scientific skills so that they can represent hard skills and soft skills (Widyaningrum , nd) . Scientific literacy can be interpreted as an understanding of science and its processes , and its application to the needs of society . Therefore , scientific literacy skills can be explained as the ability to solve problems , make and make decisions based on the knowledge they have according to their level and be able to utilize the technology around them .

Based on this understanding , the emphasis in scientific literacy skills is not on mastering knowledge and understanding scientific concepts and processes , but rather directing how a person is able to make decisions and be involved in community life , based on their abilities , knowledge and understanding of science .

Games are a form of activity designed to provide entertainment, challenges, and enjoyment to players through a series of rules, goals, and interactions. In general, games involve the active participation of players who try to achieve certain goals, either by completing challenges, overcoming obstacles, or achieving the highest score (Zohri et al., 2022) . Educational games are a form of tool or means of playing that contain educational values in them . Playing is a series of activities or activities for children to have fun and be happy . Whatever the activity , as long as there is an element of pleasure or happiness for children , it can be called playing (Supriatin & Hayati, 2022)

This study aims to examine the effectiveness of using educational game -based science media products in improving elementary school students' science literacy. By combining interactive and interesting game elements , it is hoped that students will be more motivated to study science concepts in depth . In addition , educational games can also help students develop critical thinking and problem - solving skills through simulations and challenges presented in the game . Various studies have shown the effectiveness of science literacy using educational games in terms of improving learning outcomes in this digital age . Among them is research conducted by Sari et al (2023) through the Development of Edu-Games in Increasing Disaster Mitigation Awareness for Early Childhood. The results of this study indicate that disaster mitigation edu-games are very feasible

Based on several things that have been described above, the author conducted a study to examine the effect of using educational game-based science media products on increasing scientific literacy. How does the use of educational game-based science media products affect the understanding of basic science concepts among elementary school students? This objective aims to understand the extent to which educational games as learning media can help students understand science concepts more effectively compared to traditional learning methods.

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RESEARCH METHODS

The type of research used is a quantitative approach with an experimental design to measure the effectiveness of using educational game-based science media products in improving science literacy among elementary school students. The reason for using an experimental design was chosen in this study to provide objective and measurable measurements of the effectiveness of using educational game-based science media products in improving science literacy among elementary school students. This approach allows researchers to isolate certain variables and observe their impact directly on the experimental group receiving the intervention, namely the use of educational games, compared to the control group using conventional learning methods. With an experimental design, researchers can ensure that the observed differences in science literacy outcomes between the two groups are truly caused by the intervention provided, not by other factors. This approach also allows the use of statistical techniques to analyze data in depth, providing more valid and reliable results, and making it easier to formulate evidence-based recommendations for the development of learning media and teaching strategies in the future.

This research was conducted at SD Negeri 4 Bireuen. The subjects in this study were 4th and 5th grade students of SD Negeri 4 Bireuen. The subjects chosen in this study were Physics subjects such as basic physics concepts, such as force , motion , and energy . At the implementation stage , a pre-test was conducted on both groups to measure students' initial science literacy and learning motivation. A pre-test is a test conducted before a particular intervention or treatment is given in a study or learning process. The pre-test aims to measure participants' initial knowledge, skills, or understanding of the material to be studied or tested (Magdalena et al., 2021) . By conducting a pre-test, researchers or educators can find out the level of initial understanding of students or respondents before they receive the planned learning, training, or treatment. Furthermore, the researcher conducted an intervention where the experimental group would be given learning using educational games , while the control group would receive conventional learning for several learning sessions . The next stage is that both groups will be given the same post-test to measure changes in science literacy and learning motivation .

The next stage is the data processing stage, which is carried out by collecting data from the pre-test and post-test results, as well as observation and questionnaire data. And presenting the results of the analysis in the form of tables, graphs, and interpretation of the results. The next stage is the stage of analyzing the data obtained from the pre-test and post-test results which will be analyzed using statistical tests, such as the t-test for independent samples, to determine whether there is a significant difference between the experimental group and the control group. This analysis will help determine the effectiveness of the use of educational game-based science media products in improving the scientific literacy of elementary school students.

The data analysis technique used in this study refers to the data analysis model whose activities include three parts, namely data reduction, data presentation, and data verification (Rijali, 2019). The qualitative research data analysis process is described as follows.

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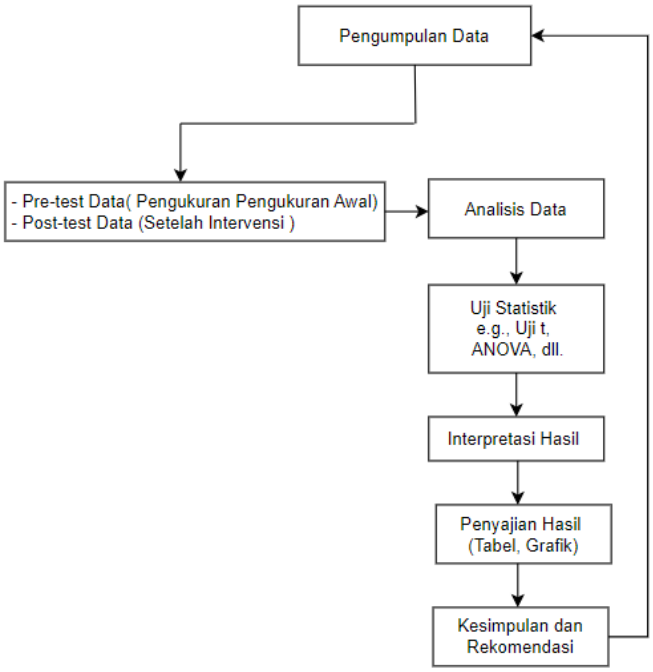

Figure 1. Data analysis techniques

The data management stage in this study began with the collection of data from the pre-test and post-test conducted on students before and after the use of educational game - based science media products . Pre-test data measured students' initial understanding of science concepts , while post-test data measured changes in understanding after the intervention . After the data was collected , the next stage was data validation and processing to ensure that the data obtained was complete , consistent , and free from errors . The data were then analyzed using statistical tests , such as the t- test or ANOVA, to identify significant differences between the pre-test and post-test results and between the experimental and control groups . The results of this analysis were interpreted to understand the impact of the use of educational games on students' scientific literacy . The final stage was the presentation of the results in the form of tables and graphs that facilitate visualization of the changes that occur , as well as drawing conclusions and compiling recommendations based on research findings . This systematic data management aims to provide evidence strong empirical evidence on the effectiveness of using educational games in science learning in elementary schools.

RESEARCH RESULTS AND DISCUSSION

The research results show a significant improvement in science literacy in the experimental group compared to the control group. In the experimental group, the average pretest score was 60, while the posttest score increased to 85, indicating a 25-point improvement. On the other hand, the control group showed only a 5-point increase, from an average pretest score of 62 to 67 in the posttest. The following is a graph showing the comparison of pretest and posttest results between the experimental and control groups.

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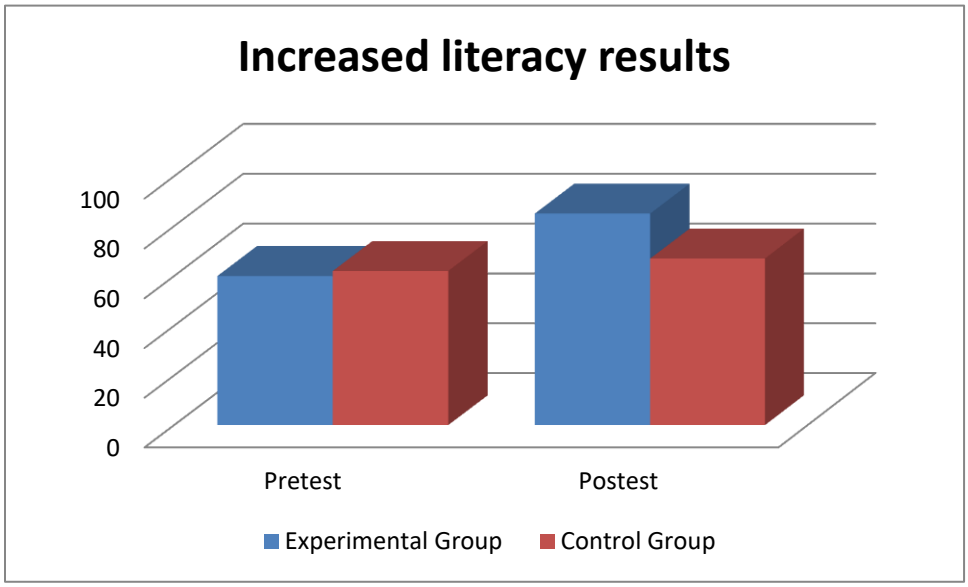

The graph above shows the comparison of pretest and posttest results between the experimental and control groups. This graph illustrates a significant improvement in the experimental group following the use of educational game-based science media, compared to the smaller increase observed in the control group.

The study also involved collecting data through questionnaires administered to the students of SD Negeri 4 Bireuen to evaluate the effectiveness of using educational game-based science media in enhancing science literacy. The questionnaire covered several aspects, including learning interest, material understanding, interactivity, and learning motivation. Each aspect was assessed using a Likert scale with the following response options: Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD).

Here are the questionnaire results from 30 students who participated in this study:

No	Assessed Aspect	SA (%)	A (%)	D (%)	SD (%)
1	Media increases learning interest	50%	40%	10%	0%
2	Media aids material understanding	60%	30%	10%	0%
3	Media is interactive and engaging	70%	25%	5%	0%
4	Media boosts learning motivation	65%	30%	5%	0%

From the table above, it can be seen that learning using educational game-based science media is effective. Many students felt interested in the learning process with this media, which led to an improvement in their science literacy.

DISCUSSION

The pretest and posttest results indicate that the use of educational game-based science media significantly enhances students' science literacy. Educational games facilitate more interactive and in-depth learning, and they motivate students through engaging and challenging learning approaches. Additionally, the immediate feedback provided by educational games helps students better understand scientific concepts.

The questionnaire results show that the majority of students believe that educational game-based science media is highly effective in improving various aspects of science learning. A total of 90% of students agreed or strongly agreed that the media increased their interest in learning. Furthermore, 90% of students also felt that the media helped them understand science material more effectively. The aspects of interactivity and media appeal also received positive responses, with 95% of students stating that the media is interactive and engaging. Learning motivation also significantly increased, with 95% of students stating that the media made them more motivated to study. Overall, these questionnaire results support the quantitative findings of previous research, which show that educational game-based science media has a significant positive impact on improving students' science literacy. This media is not only effective in enhancing material comprehension but also in increasing students' interest and motivation to learn, which are crucial factors for successful learning.

CONCLUSION

This study shows that the use of educational game-based science media has a significant positive impact on improving science literacy at SD Negeri 4 Bireuen. By implementing educational game-based media, students demonstrated a notable improvement in understanding scientific concepts, critical thinking skills, and interest in science subjects. The data obtained indicate that students who used this media had higher post-test scores compared to their pre-test scores, suggesting that this method is effective in enhancing their science knowledge. These results support the use of educational games as a valuable tool in science education, particularly in the context of elementary education.

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