Android-Based Social Science Educational Game Media in Elementary Schools: The Effect of Media on Student Learning Outcomes

Elvani Hertati[1], Asrowi[2], Deny Tri Ardianto[3]

[1,2,3]Postgraduate Program, Sebelas Maret University, Surakarta 57126, Indonesia

ABSTRACT: This study aims to examine the differences in student learning outcomes between classes that use educational games and those that do not use games in social studies lessons. The subjects in this study were 103 fifth grade elementary school students in Magelang Regency. The data in this study is quantitative data. The instrument used to collect quantitative data is a learning outcome test consisting of 45 questions in the form of a multiple choice test. The results of the study, based on the results of statistical tests with the help of the SPSS 22 program, obtained a significance level of 0.000 less than 0.05 ($0.000 < 0.05$) or tcount > ttable for the acquisition of learning outcomes, namely $6.025 > 1.678$. This shows that the value of Ho is rejected and Ha is accepted or that there is a significant difference between the learning outcomes of the experimental class and the control class. As well as, The post-test average score of experimental class students' learning outcomes was higher with a score of 83.96 compared to the control class with a score of 76.48. Thus, learning with the help of Android-based educational game media is more effective than classes that do not use Android-based educational game media.

KEYWORDS: Android Based Educational Games, Social Sciences, Influence, Learning Media, Student Learning Outcomes

I. INTRODUCTION

The development of technology today shows very significant changes in all aspects of the lives of the world community, one of which is in the aspect of education. The presence of technology has improved the quality and efficacy of education, as the four pillars of education initiated by UNESCO, namely learning to know, learning to do, earning to be, and learning together. The implementation of technology in education in Indonesia means technology can be used as a learning medium, administrative tool, and learning resource (Jo et al., 2017; Mewengkang et al., 2018). Learning media is a very useful tool to convey information/messages during the learning process, so that the information received is easier to understand and interesting (Cahyana et al., 2017), especially for learning in elementary schools.

The characteristics of elementary school-aged children are that they are happy to play, love to move, love to work in groups, and enjoy feeling and doing things directly. The existence of educational innovation, especially in the development of learning media, is an opportunity to improve the quality of learning in schools. Improving the quality of learning in schools is an example that supports efforts to improve education management. This can be seen from the quality of teacher learning behavior, student learning behavior, learning climate, learning materials, learning media, and learning systems in schools.

In this study, the authors review the learning media factor, namely the influence of the application of android-based educational game media on social science learning (IPS) in elementary schools to improve student learning outcomes. Social Studies is one of the compulsory subjects in elementary school (SD). With social studies lessons in elementary school, students are expected to have knowledge of the basic concepts of social science, sensitivity to problems in their environment, and the role of humans as social beings. Teaching social studies subjects in elementary school requires a special strategy due to the characteristics of elementary school students who are still happy with playing activities. In addition, social studies material that is dense with theories requires students to do a lot of reading activities so that they can understand the lesson well. (Sapria, 2009) UNESCO stated that Indonesia is second from the bottom in terms of world literacy, where people's reading interests are very low.

Students with an individual interest in learning are generally seen to seek new information and have a more positive attitude towards school. Likewise, students who are interested in social studies subjects will be seen from their activities looking for new information and developing positive attitudes towards social studies subjects. As associated with the low social studies learning outcomes of elementary school students in Magelang Regency, so far it is known that the learning strategy applied during classroom learning is the lecture method and the learning media used are textbooks. Therefore, by using educational games as social studies learning media, it is hoped that it can contribute to student learning with visual and audio media in Android-based game applications.

Android-Based Social Science Educational Game Media in Elementary Schools: The Effect of Media on Student Learning Outcomes

Android-based applications are still an option because, currently, many Android smartphones are owned by parents and students themselves. Newzoo's survey results show that smartphone users in Indonesia occupy the fourth position with 170.4 million users. Smartphone penetration in the country has reached 61.7% of the total population. Android is the most popular type of smartphone in Indonesia. Based on a report by analytical company StatCounter, Android version 10 is installed on 34.37% of Android phones in Indonesia. Android is the most popular type of smartphone in Indonesia. Based on a report by analytical company StatCounter, Android version 10 is installed on 34.37% of Android phones in Indonesia. Android is the most popular type of smartphone in Indonesia. Based on a report by analytical company StatCounter, Android version 10 is installed on 34.37% of Android phones in Indonesia.

Educational games are games that combine play and learning (Aslan & Balci, 2015; Bado, 2019; Nadolny et al., 2017). Through educational games specifically designed for learning, students can develop and train their ability to understand the subject matter (Hooshyar et al., 2020). The form of educational game developed is an Android-based digital game. The game is designed not only to present fun activities but also contains subject matter to achieve certain learning goals. The advantage of the educational game itself is that it can stimulate students' curiosity, so they are motivated to learn. Thus, through game-based learning, teachers can improve the quality of learning (Dimitriadou et al., 2020). As (Naimah et al., 2019) stated, some students thought that they felt positive feelings such as joy and enthusiasm when playing games. This is in line with Adi Joko Purnomo, stating that if students feel happy and motivated to take part in learning, then students will easily understand the subject matter taught by the teacher (Purnomo, 2017). Based on these problems, researchers are interested in researching the influence of Android-based educational game media on student learning outcomes in social studies learning in elementary school.

II. METHODS

This study uses a quasi-experimental method with a non-equivalent control group design. The study was divided into two pre-determined groups, namely the experimental class and the control class. The study was conducted on 103 elementary school students in Magelang Regency who have used learning media. The subjects used were fifth grade students at SD Negeri Muntilan and SD Negeri Banyubiru 2. The instruments used were as follows: 1) RPP for Learning Implementation In this research, two different lesson plans will be made for two classes, namely the experimental class and the control class. 2) Android-based educational games used in adventure or adventure-type research. The goal of the game is to complete the quiz to collect scores and also collect keys. Each level consists of 3 keys that must be obtained to be able to continue the game. At the end of the game, it will be known how much value has been collected. 3) The exam questions meet the purpose of this study, namely to see whether there is a difference in the level of understanding between the class that applies the game and the class that does not apply the game, the researcher uses a multiple-choice test. Two tests will be made, namely for the pretest and posttest, with 45 items each. Data analysis in this study consisted of two types, namely prerequisite tests for data analysis and hypothesis testing with the help of SPSS 22. Data analysis was carried out on student understanding of learning outcomes. There are 2 stages of data analysis prerequisite tests, namely the normality test and the homogeneity test. Then proceed with testing the research hypothesis. Two tests will be made, namely for the pretest and posttest, with 45 items each. Data analysis in this study consisted of two types, namely prerequisite tests for data analysis and hypothesis testing with the help of SPSS 22. Data analysis was carried out on student understanding of learning outcomes. There are 2 stages of data analysis prerequisite tests, namely the normality test and the homogeneity test. Then proceed with testing the research hypothesis.

III. DISCUSSION

The results showed that there were differences in the mean (mean) of the control and experimental classes.

Table 1. Descriptive Data

	Data	Control Class	Experiment Class
Posttest	**N**	52	50
	mean	76.48	83.96

Normality test

The normality test, in this study used the Shapiro normality test assisted by SPSS 22 with = 0.05, to determine whether the data were in normal condition or not. The results of the normality test can be seen in the following table.

Android-Based Social Science Educational Game Media in Elementary Schools: The Effect of Media on Student Learning Outcomes

Table 2. Normality Test

	SD Negeri Banyubiru 2			SD Negeri Muntilan			Information
	Statistics	df	Sig.	Statistics	df	Sig.	
Experiment	,914	22	0.058	,939	28	,103	**Normal distribution**
Control	,950	22	,319	,940	30	,093	

Homogeneity Test

The homogeneity test used the One Way Anova test with the help of the SPSS 22 program at a significance level of = 0.05.

Table 3. Homogeneity Test

SD Negeri Banyubiru 2				Muntilan State Elementary School				Information
Levene Statistics	df1	df2	Sig.	Levene Statistics	df1	df2	Sig.	**Homogeneous**
,630	1	42	,432	,252	1	56	,618	

Hypothesis testing

Test the hypothesis using the t-test Independent Sample Test with the help of the SPSS 22 program. The test is based on the following hypothesis:

Ha: (there is an average difference between the experimental class and the control class)

Decision criteria: If t counts with a significance level (2-tailed) < 0.05 then the mean of the two classes is not the same (Ho is rejected, Ha is accepted).

Table 4. Test Results of Independent Samples Test

	Levene's Test for Equality of Variances		t-test for Equality of Means	
	F	Sig.	t	Sig (2-tailed)
Student learning outcomes	0.441	0.525	6,025	0.000

Based on the table of statistical test results with the SPSS 22 program, the learning outcomes of the two students obtained a significance level of 0.000, which is smaller than 0.05 (0.000 < 0.05), or tcount > ttable for learning outcomes that is 6.025 > 1.678, then Ho is rejected and Ha is accepted, if there is an average difference between the experimental class and the control class on student learning outcomes. One factor that can be done to improve students' abilities is the use of games in learning activities. The results of this study support research conducted by (Okada & Matsuda, 2019) who also found that there was a significant difference in learning outcomes between the experimental and control groups in the learning process using game media. Learning games can attract students' attention so as to make students more motivated to learn. Students will also be more engaged in teaching and learning activities.

A game is an example of a form of digital media. Digital media can be created, viewed, distributed, modified, and can survive on digital electronic devices. Digital technology offers many opportunities to create engaging content (Chen et al., 2019). The approach of using digital media technology as a learning medium has a better and more effective impact than other approaches. In terms of social interaction and collaboration, the use of digital media (iPad & games) carried out in learning centers can increase the frequency of interaction between children, either with friends or with teachers (Chou et al., 2021). This is because when they get new experiences (either in the form of difficulties or solutions), they tend to communicate with their teachers and friends. This game is a broad concept that refers to all game structures consisting of rules, objectives, and challenges created for diversion or entertainment (Chen et al., 2019). To date, the game has evolved in various ways. Today, most people are encouraged to use games as a means of play and entertainment. There are now a lot of people who play games as entertainment. This can be applied to teaching and learning activities in the classroom. In this case, the game can generate motivation, train skills, increase perception and stimulation, and develop the user's ability to solve problems. In addition, games can also develop an assessment of the ability of a strategy, organize media and tools to get smart answers or solutions. (Mertala, 2019) also stated that games can have a positive effect on the learning process, although there is a broad consensus that games only motivate users to master their gaming skills.

The genre of this game is adventure games. This game is able to provide motivation for students to learn. The use of game backgrounds using real-world conditions can also have an impact on increasing motivation for players (Tang, 2020). This game consists of several levels. Each level has its own level of difficulty. The difficulty of each of these levels can trigger students to complete the challenge. (Wu & Sung, 2021) state that gamers basically have the passion and desire to complete each level of the

game and advance to the next level. This study shows the effective use of learning games in the classroom. The results of the study illustrate that there are differences in student learning outcomes among those who apply learning games and those who do not apply learning games to Class V students at SD Magelang Regency. Data was collected by dividing the class into 2 groups, namely the control class and the experimental class. Both classes were given a posttest. The experimental class uses learning games while the control class uses the lecture method. Obtained a significant level of 0.000, which is smaller than 0.05 (0.000 < 0.05) or tcount > ttable for learning outcomes, namely 6.025 > 1.678. Thus, if the value of Ho is rejected, then Ha is accepted, or there is a difference in mean between the experimental class and the control class. In addition, the posttest average value of the experimental class students' learning outcomes was higher with a score of 83.96 when compared to the control class, which only had a score of 76.48. These findings suggest that learning in classes that use Android-based educational gaming media is more effective than learning in classes that do not.

This situation shows that the learning outcomes of the experimental class's understanding exceed the value of the control class's understanding. This difference is caused by the influence of using Android-based educational games in the learning process given to the experimental class, so that these students have better learning outcomes after using educational games compared to the control class. From the analysis results, learning using educational games shows the experimental class learning outcomes exceed the control class learning outcomes. So there is an influence of learning games on student learning outcomes in class V social studies learning at SD Magelang Regency. It can be concluded that there is a significant effect on student learning outcomes by using educational games. Learning games can have a positive impact on students. Besides that, they also increase student activity in class and concentration in learning. In accordance with the research conducted by Syarif, entitled The Effect of Learning Games on Improving Learning Outcomes of Natural Science Understanding in Class VIII MTS Raudlatul Ulum Karangploso, showed that there was an increase in student understanding of learning outcomes.
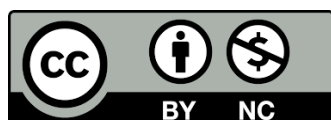
CONCLUSIONS

Based on the description of the results and discussion above, the value of the independent t-test at the time of the post-test obtained a t count value of 6.025 > 1.678, which means that the test decision rejected Ho, which means that at the post-test there was a difference between the experimental and control classes. Meanwhile, based on the results of the comparison of the average post-test scores, it is known that the difference in scores between the experimental class and the control class is 7.48. Therefore, it can be concluded that there are differences in learning outcomes between classes that apply learning games and classes that do not apply learning games. The learning outcomes of students who apply learning games are higher than those of the group that does not apply learning games. In addition, learning games can increase student activity, interest, and motivation in participating in learning.

REFERENCES

1) Aslan, Serdar, And Osman Balci. 2015. Gamed : Digital Educational Game Development Methodology. Vol. 91.
2) Bado, Niamboe. 2019. "Game-Based Learning Pedagogy: A Review Of The Literature." Interactive Learning Environments 0(0):1–13. Doi: 10.1080/10494820.2019.1683587.
3) Cahyana, Ucu, Mario Paristiowati, Muhammad Fajar Nurhadi, And Siti Nuryana Hasyrin. 2017. The Study of Students' Learning Motivation on the Use of Mobile Game Media in Base Learning. Vol. 19.
4) Chen, Szu Wei, Chih Hui Yang, Keng Shiang Huang, And Shen Li Fu. 2019. "Digital Games For Learning Energy Conservation: A Study Of Impacts On Motivation, Attention, And Learning Outcomes." Innovations In Education And Teaching International 56(1):66–76. Doi: 10.1080/14703297.2017.1348960.
5) Chou, Yi-Shiuan, Huei-Tse Hou, Kuo-En Chang, And Chien-Lun Su. 2021. "Designing Cognitive-Based Game Mechanisms For Mobile Educational Games To Promote Cognitive Thinking: An Analysis Of Flow State And Game-Based Learning Behavioral Patterns." Interactive Learning Environments 0(0):1–18. Doi: 10.1080/10494820.2021.1926287.
6) Dimitriadou, Anastasia, Naza Djafarova, And Margaret Verkuyl. 2020. Challenges In Serious Game Design And Development : Educators' Experiences.
7) Hooshyar, Danial, Margus Pedaste, Yeongwook Yang, Liina Malva, Gwo-Jen Hwang, Minhong Wang, Heuiseok Lim, And Dejan Delev. 2020. "From Gaming To Computational Thinking: An Adaptive Educational Computer Game-Based Learning Approach." Doi: 10.1177/0735633120965919.
8) Jo, Jaechoon, Wonhui Yu, Kyu Han Koh, And Heuiseok Lim. 2017. Development Of A Game-Based Learning Judgment System For Online Education Environments Based On Video Lecture : Minimum Learning Judgment System.
9) Mertala, Pekka. 2019. "The Best Game In The World : Exploring Young Children' S Digital Game – Related Meaning-Making Via Design Activity." Doi: 10.1177/2043610619867701.

10) Mewengkang, Alfrina, Manado State University, Irene RH Tangkawarow, Manado State University, Hendrik Kasehung, Manado State University, And Obtaining Content Material. 2018. Development of Mobile-Based Ecosystem Introduction Educational Game. Vol. 1.

11) Nadolny, Larysa, Zina Alaswad, Dennis Culver, And Wei Wang. 2017. "Designing With Game-Based Learning: Game Mechanics From Middle School To Higher Education." Doi: 10.1177/1046878117736893.

12) Naimah, J., DS Winarni, And Y. Widiyawati. 2019. Development of Science Adventure Educational Games to Improve Students' Problem-Solving Skills. Vol. 7.

13) Okada, Yoshiko, And Toshiki Matsuda. 2019. Development Of A Social Skills Education Game For Elementary School Students.

14) Prasetya, Didik Dwi. 2018. Multiplatform Mobile Game Application For.

15) Purnomo, Adi Joko. 2017. Educational Game Applications For Elementary School Children Educational Game App For Children Of Primary School By:

16) Sapphire. 2009. Social Studies Education. Bandung: Pt Teen Rosdakarya.

17) Tang, Joni Tzuchen. 2020. "A Study Of Taiwanese Children' S Learning And Preferences In Game-Based Learning Scenarios." Doi: 10.1177/2042753020980124.

18) Wu, Ting-Ting, And Tien-Wen Sung. 2021. "Analysis Of The Effects Of A Game-Based Review System Integrated With The Hierarchy Of Learning On Learning Outcomes In An Elementary Social Science Course." Interactive Learning Environments 0(0):1–21. Doi: 10.1080/10494820.2021.1948870.