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The Influence of the Discovery Learning Approach with Quizizz Paper Mode Media on Improving Mathematics Scores

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ABSTRAK

This study aims to determine the effect of the discovery learning model with the help of quizizz paper mode media on increasing the average mathematics scores of grade 3 students of Segorotambak State Elementary School, Sedati District, Sidoarjo as an experimental group. The background of this study is the large number of students who have mathematics scores below the KKM (Minimum Completion Criteria). In this study, there are 2 population groups, namely Segorotambak State Elementary School as an experimental group using the discovery learning model with the help of quizizz paper mode and Pepe State Elementary School as a control group. This study uses a quantitative experimental research type with a pre-Experimental Design One-Group (Pretest-Posttest Design) research design. The population used was grade 3 of Pepe State Elementary School totaling 28 students and Segorotambak State Elementary School totaling 17 students. Data collection techniques in the form of giving an initial test (pre-test) before being given treatment and a final test (post-test). The data analysis technique used in this study was the results obtained from the pre-test and post-test scores of students using Shapiro Wilk. The results of this study showed a significant increase in the average value from 49.41, after using the Discovery Learning approach with the help of quizizz paper mode media to 70.58 or an increase of 21.17 so that research with the discovery learning approach through quizizz paper mode media at Segorotambak State Elementary School has been proven to be able to improve the mathematics scores of students in the experimental group.

INTRODUCTION

Education is a very important aspect in national development because it is from this aspect of education that the character of a nation is formed and developed. The greatness of a nation can be seen from the quality of its education. For that, improving the quality of education must continue to be developed. One of them is by improving the quality of learning in schools.

Mathematics is an important discipline. It is taught from Elementary School to High School.Mathematics is a concrete science that is needed and applied in solving

problems in life and helps improve human thinking power.(Ayunis & Belia, 2021). However, mathematics is often considered a difficult and confusing subject for students. The same thing was also expressed by Ruseffendi in his journal(Dzahabiyyah et al., 2023)that there are many students who, after studying mathematics, are unable to understand even the simplest parts, many concepts are misunderstood so that mathematics is considered a difficult, complicated and hard science.

Many students still have difficulty understanding math problems, especially in terms of reasoning. In fact, according to Koneta 2019 in his journal(Yusril & Rachmani, 2025)Students are expected to have mathematical reasoning skills and be able to use them to solve mathematical problems, because in the process of solving these problems, logical and analytical thinking skills are often needed. One of the reasons why students find it difficult to understand mathematics is the use of media and teacher learning models that tend to be monotonous, so that students become bored in learning and understanding the subject.

According to Piaget quoted by M Jhon L Etol in his book Mathematics learning methods for Elementary Schools Sumantri there are 3 basic principles about how children learn mathematics, namely (1) stimulating children to try and test all their senses (2) stimulating active learning, and (3) completing various kinds of social interactions. For that, as a teacher we need to innovate by using various learning models, so that learning is not boring, because the success of mathematics learning is very dependent on the quality of the learning process. Teachers are required to be able to develop and plan an effective learning process, including regulating the planning of the learning process which requires education in educational units to develop a learning implementation plan (RPP) ((Primantiko et al., 2021)or teaching modules in the independent curriculum.

According to(Nuranafi & Rusnilawati, 2022)The selection of learning models greatly influences the learning outcomes of students. One of the learning models that we know is discovery learning. The discovery learning model is a learning model that directs students to find various information so that students are active and find their own knowledge ((Cintia et al., 2018)). Bruner emphasized that learning must be done or learning by doing. With this model, students actively participate, not just passively receive knowledge. The discovery learning approach encourages students to be actively involved in the learning process by exploring, investigating, and concluding themselves. The same thing was also expressed by Thalib es, al 2020 where in the application of the discovery learning model emphasizes the activeness of students. Students become the center of the learning process, so that students are more active.

According to(Khasinah & Elviana, 2022)Discovery Learning method creates an active learning process where the material or content is not given by the teacher at the beginning of the learning directly. Thus learning is more meaningful so that it is expected to increase learning value. Teachers, in this learning model only function as facilitators who guide students in the discovery process.

In applying the Discovery Learning model, there are procedures that must be carried out in teaching and learning activities, including: (1) Stimulation/Providing Stimulation, (2) Problem Identification, (3) Information Collection, (4) Information Processing, (5) Proof, (6) Drawing Conclusions (Syah, 2010.)

In addition to the learning model according to Maya Afriani, 2022 students in order for mathematics learning to attract students' attention, appropriate media are needed to be able to improve the ability to understand concepts. The same thing was also

expressed (Melisa & Darlan Sidik, 2019)Media is a tool that makes it easier for teachers to carry out teaching and learning activities, resulting in students understanding and comprehending the expected goals well without reducing the meaning of the material presented. Currently, there are so many learning media, both digital and non-digital. One of the digital-based learning media is the quizizz media. Media *Quizizz*is a web tool for creating interactive quiz games that can be used as an alternative digital learning media. In addition, according to(Al Mawaddah et al. 2021)

Quizizz is an online application-based learning tool or media which consists of quiz survey, game, and discussion features. This Quizizz application contains learning materials which is packaged in interactive questions on various themes at various levels, subjects lessons, and others with a selection of content materials created by the educators themselves.According to(Desi Nursyifa Ramdhani et al., 2023)stated that Quizizz is a tool that is believed to be able to arouse students' interest in absorbing knowledge with all its interesting features so that it can improve learning outcomes.

One of the features of quiziz is quizizz paper mode. This feature contains interactive quizzes that can be done offline, namely students can answer quizzes given by the teacher by lifting the Q Cards that have been distributed and the teacher will scan the student's answers with the Quizizz account on the Smartphone. This Quizizz paper mode is suitable for Elementary School students, in lower grades (grades 1, 2 and 3) because students do not need Gadgets and networks. In addition, this feature is also practical because the barcode sheet or Q-Cards (Quizizz Cards) answers for students can be used repeatedly with different quiz materials. In addition, the Q-Cards sheets between students are different so that students cannot imitate or copy friends' answers. However, there are also shortcomings in this feature where teachers must use two devices, namely a laptop and a cellphone. In addition, teachers must also move the student's answer barcode to the cellphone.

This method provides a solution for limited access to technology in early education environments while maintaining the interactive aspect of digital learning. By using printed Q-Cards, students are still engaged in a game-based and visually stimulating activity without the distraction or requirement of personal electronic devices. This helps accommodate students who have yet to master digital literacy skills, ensuring inclusivity in the learning process. Furthermore, teachers can utilize the data gathered from scanned responses to analyze student performance and identify areas where additional support may be needed.

In practice, the implementation of Quizizz paper mode encourages active participation and fosters collaborative learning dynamics. During the quiz sessions, students are motivated to respond quickly and accurately, promoting a sense of excitement and challenge. Moreover, the use of varied Q-Cards not only prevents academic dishonesty but also encourages individual thinking. Teachers, in turn, can diversify their instructional strategies by integrating the Quizizz paper mode into different lesson plans, thereby making assessments feel less intimidating and more like educational games.

Despite its advantages, the effectiveness of Quizizz paper mode still depends on the teacher's readiness and technical skills. Managing two devices simultaneously laptop for creating quizzes and smartphone for scanning responses can be time-consuming and may pose challenges for educators unfamiliar with digital platforms. Therefore, adequate training and preparation are essential to maximize the potential of this tool. With proper

support, Quizizz paper mode can serve as a bridge between conventional learning methods and modern digital education, especially at the elementary level.

Based on the results of observations of mathematics learning with the material Use of Mathematical Sentences for Whole Number Operations for grade 3 at SDN Pepe and SD Segorotambak Sedati Sidoarjo, it shows that most students get scores below the KKM. With the KKM, the grade 3 mathematics score at SD Pepe is 70 and SD Segorotambak Sedati Sidoarjo is 68. This can be seen in table 1.

Table 1 Initial Mathematics Learning Outcome Data

School	Number of Students	Mark Average	Value ≥ KKM	Value ≤ KKM
Pepe Elementary School	28	62.5	57.1%	43.9%
Segorotambak Elementary School	17	49.4	29.4%	70.6%

Source ; data management

Based on table.1, it can be seen that out of 28 students in class 3B of Pepe State Elementary School, 43.9% of students have scores below the KKM. Meanwhile, out of 17 students in class 3 of Segorotambak Sedati Elementary School, Sidoarjo, only 29.4% of students have scores above the KKM, while 70.6% of students have scores below the KKM. One of the causes of low mathematics scores, especially in Segorotambak State Elementary School, is the lack of development of learning models and media by teachers. The explanation of the material only focuses on one direction, namely only from the teacher so that students have difficulty solving the existing problems.

In addition, the geographical conditions of Segorotambak State Elementary School are coastal areas where many parents do not support their children's education. Similar things were expressed by Sari and Harnudu 2018 who stated that several things that cause low coastal communities to get education are economic conditions, lack of motivation, long-standing community culture and lack of government attention.

For that reason, in this study, the author tried to improve the average mathematics score of students through the Discovery Learning approach with the quizizz paper mode media at SD Negeri Segorotambak by making it an experimental group, there was an increase in the average score of learning outcomes using the Discovery Learning learning model. Likewise, research that has been conducted by(Riyadi & Wibawa, 2024)The use of Quizizz can increase student engagement, deepen understanding and create an engaging learning experience.

METHODOLOGY

This research is a quantitative research with the aim of the research to determine the effect of using the discovery learning model using the quizziz paper mode media on increasing the average mathematics score of the Whole Number Operation material of grade 3 students of SDN Pepe and grade 3 students of SDN Segorotambak Sedati Sidoarjo.

The population and sample in this study were 28 students of grade 3 of SDN Pepe, and 17 students of grade 3 of SDN Segorotambak. So the total population and sample in this study were 45. This study used two groups where students of grade 3 of SDN Segorotambak Sedati Sidoarjo were the experiment and students of grade 3 of SDN Pepe were the control.

There are two variables in this study, namely independent and dependent variables. Where the independent variable is the use of the discovery learning model with quizizz paper mode media. While the dependent variable is the average mathematics score of students.

Data collection techniques in this study include tests, interviews and documentation. Tests were conducted before the study (pre-test) and during the study (post-test). Where students answered questions about the material on integer number operations, mathematical sentences, multiplication. Learning outcomes and indicators in this study are shown in the following table.

Table 2. Learning Achievements and Indicators

Learning Outcomes	Indicator
understand multiplication as repeated addition and apply it in solving problems up to 100.	• Participant Students can solve story problems involving multiplication up to 100

Before the survey questions were used, validity and reliability tests were conducted to ensure that the test questions were valid and reliable. Validity and reliability tests were conducted at SD Segoro Tambak on 17 students. Then a survey was conducted at both

The researcher conducted a validity test and reliability test before conducting a hypothesis test. The validity and reliability tests were conducted at Segorotambak State Elementary School. The results of the validity test showed that out of 20 pretest and posttest questions, 10 multiple-choice questions were valid. Then the researcher selected 10 pretest and posttest questions for multiple choice and 5 questions in the form of essay answers. The results of each student's scores obtained were then processed using SPSS. First, a prerequisite test was carried out, a normality test using the Shapiro Wilk test and a homogeneity test using Levene statistics with the aim of determining whether the data was normally distributed and homogeneous. Then, to answer the research objectives, several hypothesis tests were carried out, namely the independent t-test, paired t-test, and simple correlation test.

Then in the reliability test, the Cronbach's alpha value was used to assess the internal consistency of the questions. The Cronbach's alpha value was obtained at 0.703, which means it meets the standard reliability assumption of >0.7. From the results of the average pretest value of the study, it is known that the learning outcomes of students in mathematics, namely the experimental group obtained a result of 49.41 and the average value of the control group was 62.45.

Based on the pretest results between the experimental and control groups. It can be seen that the average value in the experimental group is lower than the control group. This is because the experimental group in this study were students at Segorotambak Elementary School which is geographically a coastal area, where parental support for education is generally still low. This is emphasized by the opinion(Anan et al.,

2023)which states that the low awareness of coastal communities regarding the importance of education means that education is not a priority for children from coastal communities.

Before the posttest was conducted, the experimental group carried out learning using the Discovery Learning model with the help of Quizizz paper mode, while for..., the control group used exceptionary leaning. The average posttest score of students' learning outcomes in mathematics for the experimental class was 71.76, while for the control class the average score was 80.42.

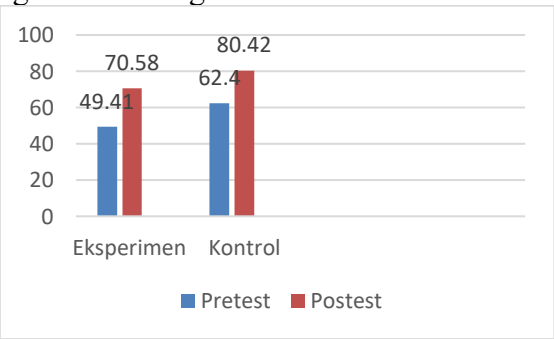
Table 3. Average pretest and posttest scores

Group	Pretest average value	Posttest mean score
Experiment	49.41	70.58
Control	62.45	80.42

Source: Data processing

FromThe results of the average post-test scores can be concluded that there was an increase in the average scores of students from both the experimental and control groups. The following

Figure 1: Average Pretest and Posttest Scores



Source ; Data management

Fromdiagram 1 shows that the increase in the average value in both groups, both the experimental and control groups. For the experimental group using the discovery learning model with the help of quizizz paper mode, there was an increase in the average value of 21.17. While in the control group there was an increase in the average value of 17.97. This shows that the average value of students increased more with the discovery learning model

Meanwhile, the number of students who had scores above the KKM in the experimental group was 12 out of 17 students or 70.5%, while in the control group it was 25 out of 29 students or 89%.

Table 4. Number of students who have scores above the KKM in the posttest

Group	Number of students with pretest scores above KKM	(%)	Number of students with pretest scores above KKM	%
Experiment	5	29.4%	12	70.5%
Control	16	57.1%	25	89.3%

Source ; Data management

Based on table 4, there is an increase in the number of students whose scores are above the KKM, both from the experimental group and the control group. In this case, the KKM for mathematics for the experimental group is 68 while the control group is 70. The KKM is different because of the different conditions and characteristics of the two schools, where the experimental group is geographically located on the coast, where parents generally do not support education.

While the control group is in the middle of Sedati sub-district, Sidoarjo, which generally has high parental attention to children's education. Before conducting a hypothesis test using the t-test, a prerequisite test is needed, namely a normality test and a homogeneity test. The following are the results of the normality test of the post-test scores of learning outcomes and critical thinking skills of students using the Shapiro-Wilk test presented in Table 5.

Table 5. Normality Test

Group	Significance level
Pretest experimental group	0.202
Posttest of experimental group	0.203
Pretest control group	0.139
Posttest control group	0.080

(Source: Data Processing Results)

Based on the normality test using the Shapiro-Wilk test presented in Table 3, it shows that both Sig. values > 0.05. Thus it can be concluded that the posttest value of learning outcomes and critical thinking skills of students in each application of the learning model is normally distributed.

Furthermore, a homogeneity test is carried out to determine whether the data obtained has the same variance or is homogeneous. The homogeneity test criteria in this study are if the sig. value > 0.05 then the data obtained from the research results are homogeneous.

Table 6. Homogeneity Test

Levene statistics	Df	df 2	sig
2.45	3	86	0.069

(Source: Data Processing Results)

From table 6 above, it can be seen that the sig. value of the homogeneity test using Levene's test at a real level of 5% shows a value of 0.069. With a sig. value > 0.05, it can be concluded that the data obtained are homogeneous. using the t-test and simple correlation test. The t-test is used to determine the effectiveness. Discovery learning model with quizizz paper mode media on student learning outcomes, while the simple correlation test is used to determine the correlation of the Discovery Learning Model with quizizz paper mode media on learning outcomes. There are three hypotheses that will be tested in this study, including:

1. Hypothesis, first Ho: There is no difference between the use of the Discovery Learning model and the Quizizz Paper Mode Media in improving students' Mathematics learning outcomes.

Ha: There is a difference in the use of the Discovery Learning Model with the Quizizz Paper Mode Media in improving students' Mathematics learning outcomes.

Table 7. Independent t-test

t_{hitung}	t_{tabel}	df	sig
2,067	2,016	43	0.045

(Source: Data Processing Results)

Based on table 7 above, it shows that> namely 2.067> 2.016 and with a significance level of <0.05 which is 0.045. So Ho is rejected or Ha is accepted. Thus, it can be concluded that there is a difference in the average value of Mathematics learning outcomes, namely an increase with the use of the Discovery Learning Model with Quizizz Paper Mode Media t_{hitung} t_{tabel}

2. Second hypothesis

Ho: The application of the Discovery Learning Model with Quizizz Paper Mode media is not effective in improving student learning outcomes.

Ha: The application of the Discovery Learning model with Quizizz Paper Mode media is effective in improving student learning outcomes.

Table 8. Paired t-test

t_{hitung}	t_{tabel}	df	sig
12,812	2,034	33	0.00

(Source: Data Processing Results)

Based on table 8 above, it shows that with a significance level of 0.00, which is <0.05, Ho is rejected or Ha is accepted. Thus, it can be concluded that the application of the Discovery Learning Model with Quiziz Paper Mode media is effective in improving student learning outcomes.

3. The third hypothesis

Ho: There is no significant relationship between learning outcomes and critical thinking skills with the use of the discovery learning model using the Quiziz Paper Mode media.

Ha: There is a significant relationship between learning outcomes and critical thinking skills with the use of the discovery learning model using the Quzizz Paper Mode media.

In the third hypothesis using a simple correlation test (Bivariate Pearson), the following results of the simple correlation test are presented in table 9.

Table 9; Simple Correlation Test

		Learning outcomes	Critical thinking	Learning methods
Learning outcomes	Pearson Correlation	1	0.679	0.301
	Sig.		0.003	0.045
Method Learning	Pearson Correlation	0.301	0.561	1
	Sig.	0.045	0.018	

(Source: Data Processing Results)

Based on table 9, it can be seen that the significance value between learning outcomes and critical thinking with the Discovery Learning Model approach with the help of Quizizz Paper Mode media <0.05. Namely 0.045 and 0.018 <0.05. So it can be concluded that Ho is rejected or Ha is accepted. Thus, there is a significant relationship between learning outcomes and critical thinking skills with the use of the discovery learning model using Quizizz Paper Mode media.

RESULTS AND DISCUSSION

Result

This study obtained the results that the application of the discovery learning model with the help of quizizz paper mode media is effective in increasing the average value of student learning outcomes in solving Mathematics problems. The average value of student learning outcomes increased both from the experimental group and the control group. For the experimental group, the average value of 49.41 at the time of the pretest increased to 70.58 at the time of the posttest. For the control group, from 62.45 at the time of the pretest increased to an average of 80.42 at the time of the posttest. However, for the experimental group, the increase was more significant.

This is in line with the research of Dwi Anggita Nuranafi (2022) which found that there was an increase in student learning outcomes using the discovery learning method. The discovery learning model improves learning outcomes and critical thinking skills for PPKN in grade IV elementary school.

In the application of the discovery learning model, students are directed to find information so that they become more active in learning. However, the discovery learning model is less effective if given to classes with a large number of students. The steps of discovery learning include; 1). Stimulation or providing stimulation; 2). Problem statement or problem identification; 3). Data collection or collection of data and information; 4). Data processing or data processing; 5). Verification or analysis and interpretation of data or also called proof; 6). Generalization or drawing conclusions.

In addition to encouraging student activity, the discovery learning model also helps develop students' independence and sense of responsibility in constructing their own understanding. Through each of its steps, students are trained to explore problems, seek relevant data, and analyze findings before reaching a conclusion. This process not only strengthens academic comprehension but also fosters soft skills such as curiosity, collaboration, and communication. When applied effectively, discovery learning can transform the classroom into an interactive learning environment where students are no longer passive recipients, but active seekers of knowledge.

However, for optimal implementation, teachers must act as facilitators who guide students without directly providing answers. This requires careful classroom management and adaptive teaching strategies, especially when faced with diverse student abilities and backgrounds. In large classes, it becomes crucial to divide students into smaller discussion groups so that each student has the opportunity to engage in the discovery process. Teachers must also ensure that the problems presented are relevant and challenging, yet still accessible according to the students' cognitive levels. In this way, the discovery learning model can be more inclusive and effective in enhancing the quality of learning across different learning contexts.

Discussion

This study employed a quantitative approach to examine the effect of the Discovery Learning model integrated with Quizizz Paper Mode media on improving the mathematics scores of third-grade students at two elementary schools in Sidoarjo. Involving a total of 45 students, the research divided them into two groups: the experimental group (SDN Segorotambak) and the control group (SDN Pepe). The independent variable was the use of the Discovery Learning model with Quizizz Paper Mode media, while the dependent variable was the students' average mathematics score.

Data were collected through tests (pretest and posttest), interviews, and documentation. The test instruments were first validated on a small group and then tested for reliability, with a Cronbach's alpha value of 0.703, indicating good internal consistency. Data analysis involved prerequisite tests (normality and homogeneity tests), t-tests (independent and paired), and a simple correlation test.

The pretest results showed that the average score of the experimental group was lower than that of the control group, which can be attributed to differing socio-economic backgrounds and parental support for education. After the treatment, the experimental group experienced an average score increase of 21.17 points, while the control group increased by 17.97 points. Although the control group still had a higher absolute score, the significant improvement in the experimental group demonstrated the effectiveness of the method and media used.

Furthermore, statistical analysis showed that the use of the Discovery Learning model with Quizizz Paper Mode media had a significant effect on students' learning outcomes. This was confirmed by the results of the independent and paired t-tests, where the t-values exceeded the critical values and the significance levels were below 0.05. In addition, the correlation test showed a significant relationship between the use of the method and both student learning outcomes and critical thinking skills.

Overall, the implementation of Discovery Learning supported by Quizizz Paper Mode media proved effective in enhancing students' mathematics achievement and had a positive correlation with their critical thinking development. This approach is therefore considered relevant and beneficial for primary education contexts, as it promotes a more active, interactive, and meaningful learning experience.

CONCLUSION

Based on the results of the study, it was concluded that there was a significant increase in the average mathematics score from 49.41 to 70.58 for the experimental group, namely SD Negeri Segorotambak. While for the control group 62.45 to 80.42. This shows that the use of the discovery learning model approach using the help of quizizz paper mode for the experimental group can improve the value of student

learning outcomes. Geographically, Segorotambak State Elementary School is a coastal area where public awareness of education is generally low, so that the average learning value is not optimal. For this reason, further innovation and assistance are needed for students to study harder

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