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The Influence of the Application of Game Based Learning (GBL) Models Assisted by the Math Games Platform on the Mathematics Learning Outcomes of Fifth Grade Elementary School Students

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Abstract

  The purpose of this study The Influence of the Application of Game Based Learning (GBL) Models Assisted by the Math Games Platform on the Mathematics Learning Outcomes of Fifth Grade Elementary School Student this study uses an experimental quantitative approach to determine whether or not there is a result of a treatment. This study aims to determine the effect of implementing the Game Based Learning (GBL) model with the help of the Math Games platform on the mathematics learning outcomes of fifth grade elementary school students. This study used the One Group Pretest-Posttest Design method, with a subject of 29 students in an elementary school in Kediri Regency which was taken through purposive sampling technique. Data collection techniques using observation and objective tests. The instrument used was a multiple choice test with 10 questions that had been tested to determine the validity and reliability of the instrument. The results were analyzed using descriptive statistics and inferential statistics with the help of SPSS for Windows version 21. Based on the results, the mean pretest score was 60.35 and the posttest average score was 85.52 with an N-gain percentage of 66%. Analysis of research data was carried out through 2 stages, namely prerequisite tests and hypothesis testing. Based on the results of the prerequisite test, it was found that the research data were normal and homogeneous (having the same variance). The results of the hypothesis analysis using the paired sample t-test show that the data significance value is 0.000, where 0.000 <0.05, which means Ho is rejected and Ha is accepted. So it can be concluded that there is a significant difference between learning outcomes before and after the implementation of the game based learning model with an average increase in learning outcomes in the medium category.

Keywords: Game based learning; math games; learning outcomes; mathematics; primary school.

Abstract

  Penelitian ini menggunakan pendekatan kuantitatif eksperimen untuk mengetahui ada serta tidaknya akibat dari sebuah perlakuan. Penelitian ini bertujuan untuk mengetahui pengaruh penerapan model *Game Based Learning* (GBL) berbantuan platform *Math Games* terhadap hasil belajar matematika siswa kelas V sekolah dasar. Penelitian ini menggunakan metode *One Group Pretest – Posttest Design,* dengan subjek sebanyak 29 siswa di salah satu sekolah dasar di Kabupaten Kediri yang diambil melalui teknik *purposive sampling*. Teknik pengumpulan data menggunakan observasi dan tes objektif. Instrumen yang digunakan berupa tes pilihan ganda berjumlah 10 soal yang telah melalui uji coba untuk menentukan validitas dan reliabilitas instrumen. Hasil penelitian dianalisis menggunakan statistik deskriptif dan statistik inferensial dengan bantuan SPSS *for Windows* versi 21. Berdasarkan hasil penelitian, didapatkan rerata skor *pretest* 60,35 dan rerata skor *posttest* 85,52 dengan persentase N-*gain* sebesar 66%. Analisis data penelitian dilakukan melalui 2 tahapan, yaitu uji prasyarat dan uji hipotesis. Berdasarkan hasil uji prasyarat didapatkan hasil bahwa data penelitian normal dan homogen (memiliki varians sama). Hasil analisis hipotesis menggunakan uji *paired sample t-test* menunjukkan bahwa nilai signifikansi data sebesar 0,000 dimana 0,000 < 0,05 yang berarti Ho ditolak dan Ha diterima. Sehingga dapat disimpulkan bahwa terdapat perbedaan yang signifikan antara hasil belajar sebelum dan sesudah diterapkannya model *game based learning* dengan peningkatan rata-rata hasil belajar dalam kategori sedang.

Kata Kunci: *Game based learning; math games;* hasil belajar*;* matematika; sekolah dasar.

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INTRODUCTION

Learning can be said as a process of interaction between students and teachers, which is supported by the existence of learning elements such as, infrastructure, learning materials, teacher teaching methods, applied models, school environmental conditions, and evaluations given by teachers (Winatha & Setiawan, 2020). All of these elements are needed in supporting the learning process, especially in the use of media, models, and learning methods. If used properly, it will affect the success of the learning process. According to (Asyafah, 2020:19) an effective learning model is very helpful in the learning process so that learning objectives are easier to achieve. In addition, variations in learning models can give students a passion for learning, avoid boredom, and will have implications for the interests and motivation of students in participating in the learning process. Thus, providing a variety of models in learning is an urgent matter for teachers to implement.

Based on the results of observations at an elementary school in Kediri Regency, when delivering learning materials the teacher uses a conventional model with lecture, discussion, and question and answer methods. In practice, teachers only use blackboard media and sometimes use video media in delivering learning materials to students (Eliyantika,et al 2022). The use of various models and learning media to the maximum has not caused the learning process to seem monotonous because it is still *teacher oriented.* As a result of these conditions, most of the students in the class did not focus on following the lesson, one example of which was found some students who were sleepy and some students chatting with their friends while the learning process was in progress. The number of students who pay less attention when the teacher explains this material is caused by the lack of student interest in participating in learning. If this condition continues, it will have an impact on student learning outcomes which are decreasing.

In this digital era, students are the *digital native generation,* where they can easily use Information and Communication Technology (ICT) devices. In implementing a curriculum that uses a scientific approach, educators need to use a learning model that integrates ICT in the learning process. One model that can be used by educators is a game-based learning model (*Game Based Learning*).

In teaching the GBL model to students, educators should prefer a variety of approaches, strategies, methods according to the situation so that the planned learning objectives will be achieved. It should be noted that whether or not a learning model is selected will depend on the learning objectives, suitability with learning materials, the level of development of students (students), the ability of educators to manage learning and optimize existing learning resources. Games are also intended to build a dynamic, passionate, and enthusiastic learning atmosphere. Characteristics of the game is to create a learning atmosphere that is fun (*fun*) and serious but relaxed sergeant (Rame, 2022). The game should be used as part of the learning process, not just to fill empty time or just a game.

Game-based learning models can be applied in various subjects, especially for elementary school students who still like to play. The learning model utilizing educational games is used with the aim that class learning takes place dynamically and fun, students are more enthusiastic in carrying out learning activities (Sari, 2021),. By applying this model, it is hoped that learning is no longer centered on educators but student-centered. So that learning objectives can be achieved optimally, educators need to prepare learning media in the form of interactive games that are fun for students to play and learn the material. Another goal of the GBL learning model is to increase students' academic learning outcomes and students can accept diversity from their friends, as well as develop social skills.

While other studies focus on the effect of GBL on students' learning motivation (e.g. Ervan & Ratu, 20 17). Based on the results of the study, *Game Based Learning* can increase interest learning carried out on students in basic electronics courses. This is evidenced by an increase in interest in learning by 70%. In addition, the results of research conducted by

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(Astuti et al,. 2017), the results of this study indicate that the application of the *User Centered Design Method* in *Game Based Learning on* Student Learning Motivation. This is evidenced by an increase in students' learning motivation.

Based on the facts obtained from several previous studies, it can be concluded that by using the learning model, *Game Based Learning* can increase motivation as well as student learning outcomes. However, several studies that have been carried out still have shortcomings, one of which is that specific *game media have not been used* to support the application of the GBL model, so that readers do not know how researchers implement treated fish during research. Therefore, this study wants to use one of the *games* as an aid in implementing the GBL model.

In this study, the researcher wants to use the help of one of *the free online platforms* that has features like *games* in general. However, what makes the *platform different* from ordinary *games* is the content of *the game* which contains various games with the application of mathematical concepts. This *platform* is named **"Math Games "**.

Based on the description above, this study aims to determine the effect of implementing the *Game Based Learning* (GBL) model with the help of the *Math Games platform* on the mathematics learning outcomes of fifth grade elementary school students. With the implementation of the *Game Based Learning model assisted by the Math Games* platform in learning mathematics content, it is expected to improve learning outcomes optimally, so that

learning objectives can be achieved. This research is expected to provide benefits for readers, especially for educators at the elementary school level in order to provide innovation and variety in learning, such as the models and media used. In addition, for other readers, this research can be a reference and new knowledge in the world of education that can be developed into new, better research. The purpose of this study The Influence of the Application of Game Based Learning (GBL) Models Assisted by the Math Games Platform on the Mathematics Learning Outcomes of Fifth Grade Elementary School Student this study uses an experimental quantitative approach to determine whether or not there is a result of a treatment.

RESEARCH METHODS

This study uses a quantitative experimental approach to determine whether or not there is a result of a treatment. Explains that in the experimental method there must be a factor or condition that is tried to find out the results of an experiment. In this study as a factor or condition that was tested on the subject was the use of a *game based learning model* (GBL) to improve mathematics learning outcomes for fifth grade elementary school students.

The research method used is a quasi-experimental design with **"One Group Pretest-Posttest Design"** which is an experimental design that is applied to only one group without a comparison group (Sugiyono, 2012). The following is a research design that has been linked to the research problem. (See **Table 1**)

Table 1. Research Design Format *One Group Pretest-Posttest Design*

Pretest	Treatment	*Posttest*
O $_1$	X	O2

Information:

O $_1$ **:** The students' mathematics learning outcomes were given a *pretest* to determine the initial state of students' abilities.

O $_2$ **:** Students' mathematics learning outcomes after being given treatment

with the application of the *game based learning* (GBL) model.

X   **:** *Treatment* (Treatment). The treatment given is the application of a *game based learning* (GBL) model.

The population in this study is class V SDN for the Academic Year 2021/2022. The

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number of population subjects was 29 students consisting of 15 male students and 14 female students. The sample in this study were all students of class V SDN, totaling 29 students. Sampling in this study using **purposive sampling technique.** *Purposive sampling* is a sampling technique that is included in *Nonprobability Sampling. Purposive Sampling* is a sampling technique based on certain considerations (Sugiyono, 2010). The consideration used in selecting the sample in this study is that the two samples have initial abilities that are not much different (almost the same).

The data collection technique used by the researcher is the technique of giving an objective test. The instrument used is a test in the form of multiple choice questions (*multiple choice*) consisting of 10 items consisting of 4 answer options. The time allotted for the test is 45 minutes. The test is divided into two, namely the *pretest* which is given before the treatment and the *posttest* which is given after the treatment. The use of the test instrument aims to obtain data on students' initial abilities (*pretest*) and student learning outcomes after receiving different treatments (*posttest*). The test instrument used has met the eligibility test requirements, namely validity, reliability, discriminating power, and difficulty testing.

Data on the validity and reliability of test instruments obtained from test scores conducted on fifth grade students are presented. (See **Table 2 and Table 3**).

Table 2. Test Data Validity of Test Instruments

Item Number	Sig. (2-tailed)	Information
1	0.371	Invalid
2	0.008	Valid
3	0.285	Invalid
4	0.641	Invalid
5	0.007	Valid
6	0.315	Invalid
7	0.002	Valid
8	0.403	Invalid
9	0.833	Invalid
10	0.475	Invalid
11	0.053	Invalid
12	0.195	Invalid
13	0.034	Valid
14	0.008	Valid
15	0.001	Valid
16	0.885	Invalid
17	0.903	Invalid
18	0.001	Valid
19	0.025	Valid
20	0.612	Invalid
21	0.005	Valid
22	0.437	Invalid
23	0.541	Invalid
24	0.010	Valid
25	0.001	Valid

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Table 3. Test Instrument Reliability Test Data

Crombach's Alpha	Number of Items	Information
0.824	11	Reliable

Based on the data in the table, it is known that from the 25 questions tested, a total of 11 questions were declared valid and reliable. Of the 11 questions that passed the validity and reliability tests, 10 questions were taken to be used as question instruments. Instrument questions can be seen in the *appendix.*

Data analysis in this research uses quantitative data analysis. The collected data was then analyzed with the help of the *SPSS for Windows* version 21 program. Data analysis was carried out in two stages, namely prerequisite testing and hypothesis testing. Prerequisite tests include normality test and homogeneity test. Meanwhile, in testing the data hypothesis using the *independent sample t-test* testing method.

RESULTS AND DISCUSSION
RESULTS

The presentation of the data aims to reveal the effect of a treatment on students' mathematics learning outcomes, which can be observed in the following analysis which is grouped into two parts, namely the presentation of *pretest* data and *posttest data.*

Pretest Results of Class V Students Before Treatment

Based on the results of research that has been carried out by researcher i, before doing the *pretest,* the writer makes observations to see how the teacher teaches, namely the learning strategies applied, and student responses during learning. During the course of the study, the attitudes that occurred to each student during the learning process were recorded.

Based on the results of observations, during the learning process the teacher uses a conventional approach with a tendency to use the lecture method interspersed with questions and answers. Teachers also have not used the available interactive learning media. Student responses recorded during the learning process were students tended to be passive, so that many students seemed less enthusiastic about participating in learning. When the teacher asks questions, only a small number of students can answer. Thus, it can be concluded that the learning model used by the teacher did not get a good response during learning.

Based on the *pretest data analysis* conducted by the researcher on student learning outcomes, it is obtained that there are no students who are able to get a score of 100 as the maximum value. The highest score was 90 which was obtained by 2 students with a percentage of 6.89 %, while the lowest score was 3 0 which was obtained by 3 students with a percentage of 10.34%.

Posttest Results of Class V Students After The Treatment

Based on the results of the *posttest,* it was seen that the students' responses changed during the learning process. Prior to the treatment, students were passive parties. However, after the treatment, students become active parties in learning. Students look enthusiastic when the teacher applies the GBL

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model with *the math games platform,* as can be seen from the enthusiastic response of students to take turns playing *games.* The atmosphere in the classroom that was initially quiet became cheerful and full of two-way interactions between teachers and students, as well as students and students.

Based on the *posttest data analysis,* it was obtained that there were 7 students who were able to get a score of 100 as the maximum score with a percentage of 2 4.12 %, while the lowest score was 60 which was obtained by 1 student with a percentage of 3.45 %.

DISCUSSION
Data Analysis of Student Pretest and Posttest Results

Data on students' mathematics learning outcomes obtained from the *pretest* and *posttest scores* are presented (See **Table 4**).

Table 4. Student Mathematics Learning Outcomes Data

Test Type	N	Min.	Max.	Average
Pretest	29	30	90	60.35
Posttest	29	60	100	85.52
N-gain				0.66
% N-gain				66

Based on the data in Table 4, it is known that the average value of the *pretest* is 60.35. After being given treatment in the form of the application of a *game based learning model,* there was an increase in scientific literacy skills by 66% with an average *posttest score of* 85.52. The average increase in student learning outcomes after receiving treatment is in the **medium category.**

Pre-test and Post-test Prerequisite Test

Before testing the hypothesis, it is necessary to carry out a series of prerequisite tests in the form of a normality test and a homogeneity test on the *pretest* and *posttest results* that have been obtained. The recapitulation of prerequisite tests for students' mathematics learning outcomes is presented (See **Table 5**) .

Table 5. Summary of Pretest and Posttest Results of *Pretest* and *Posttest*

No	Tested	*Sig.*	Conclusion
1	*Pretest* normality	0.166	Normal data
	Posttest normality	0.054	

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2	Homogeneity	0.164	Homogeneous data

Based on the summary of the results of the analysis of the *pretest* and *posttest values* presented in Table 2. It is known that the normality of the data tested by the *Shapiro-Wilk test* showed a significance level for the *pretest value* of 0.166 and the *posttest value* of 0.054. Both values are greater than = 0.05 (sig. > 0.05) which means Ha is rejected and H_0 is accepted. So it can be concluded that the *pretest* and *posttest values* are normally distributed.

As for the homogeneity of the data, the results of the students' *pretest* and *posttest* were tested using *Levene's test.* The level of significance obtained is 0.164, greater than = 0.05 (sig. > 0.05) which means Ha is rejected

and H_0 is accepted. So it can be concluded that the *pretest* and *posttest values* come from a homogeneous population or the variance of each sample is the same.

Hypothesis Testing Pretest and Posttest Results

Pretest and *posttest* data which were known to be normally distributed and homogeneous, were then analyzed using paired sample t-test (*Paired Sample t-test*). Hypothesis test data of *pretest* and *posttest values* are presented (See **Table 6).**

Table 6. Hypothesis Testing Against *Pretest* and Posttest *Values*

Tested	Test Type	Sig. (2-tailed)	Conclusion
Hypothesis	*Paired sample t-test*	0.000	There is a difference

Based on the results of the SPSS *output presented in Table 4., it is known that the value of Sig. (2-tailed)* is 0.000 where 0.000 > 0.005 which means that H_0 is rejected and Ha is accepted. The results of this hypothesis test indicate that students' mathematics learning outcomes before and after the implementation of the *game based learning model* are not the same. Thus, it can be concluded that there is a significant difference between learning

outcomes before and after the implementation of the *game based learning model.* Looking at the *posttest mean value* which is greater than the *pretest value* in Table 2. It can be seen that learning using a *game based learning model* assisted by *a math games platform* can improve the mathematics learning outcomes of fifth grade students on the material properties and volumes of geometric figures.

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CONCLUSION

Based on the results of the comparison between previous research and this research, it will show the results of the discussion that the application of the *Game Based Learning model* has a positive influence in learning. Based on research by Ervan & Ratu (2017) the application of the GBL model can increase student learning motivation. Meanwhile, according to Sari & Supriyadi (2021) the GBL model can significantly increase student interest and learning outcomes. The two previous studies are in accordance with the results obtained in this study, namely **the GBL model can improve student learning outcomes in mathematics in the medium category.**

Based on the results of this study, it can be stated that the implication that the selection of the right learning model can affect the achievement of student learning outcomes. For learning mathematics content, there are differences in mathematics learning outcomes between learning using conventional learning models and *Game Based Learning models.* Next, the researcher proposes that other researchers can compare the effectiveness of the GBL model with other innovative learning models. In addition, other researchers can also add other variables so that they can be an element of novelty in the research conducted.

Viewed from the researcher's direct experience in this research process, there are some limitations experienced and can be a concern for future researchers. Some of the limitations in this study, among others, the number of respondents who were only 29 people, of course, is still not enough to describe the actual situation. In addition, the assistance of research objects is only focused on *the Math Games platform* which is only one of many other *game platforms* that can also support the implementation of *Game Based Learning models* in learning. Finally, in the data collection process, the student's learning outcomes, which are measured through multiple choice tests, sometimes do not show the actual ability of students. This happens because sometimes students just choose the answer without thinking about it.

Based on the limitations of this study, it is hoped that further research will be able to expand the number of respondents, so that they will be able to represent the real situation. In addition, in future research, it is expected to be able to use *platform assistance in other games* in implementing GBL, such as *quizizz, kahoot, profops brain,* and others. For data collection techniques, it is expected to use techniques that are more objective and more effective in measuring student learning abilities.

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