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THE EFFECT OF PROBLEM-BASED LEARNING MODEL ASSISTED BY LEARNING ANIMATION VIDEO ON STUDENT LEARNING OUTCOMES

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ABSTRACT

Tujuan penelitian ini adalah mengetahui adanya pengaruh model pembelajaran berbasis masalah yang didukung oleh video animasi pembelajaran terhadap hasil belajar siswa. Pendekatan penelitian ini adalah kuantitatif dengan *quasi experimental design*. Populasi pada penelitian ini adalah kelas VII, kemudian untuk sampel dari penelitian ini yaitu kelas VII-C sebagai kelas kontrol dan kelas VII-D sebagai kelas eksperimen dengan masing-masing kelas berjumlah 31 siswa. Hasil penelitian diperoleh bahwa model pembelajaran berbasis masalah berbantuan video animasi pembelajaran memberikan hasil yang lebih unggul daripada pembelajaran langsung yang dibuktikan dari nilai reratanya 62,081 menjadi 84,613 di kelas eksperimen sedangkan 63,048 menjadi 79,452 di kelas kontrol. Hasil pengujian hipotesis menerapkan uji t-test juga membuktikannya yaitu diperoleh t_{tabel} = 2,00 dengan taraf signifikasinya 5% sedangkan nilai $t_{thitung}$ diperoleh 2,669 maka hasil dari t_{hitung} > t_{tabel} (2,669 > 2,00) artinya ada pengaruh model pembelajaran berbasis masalah berbantuan video animasi pembelajaran terhadap hasil belajar siswa.

The purpose of this study is to determine the effect of a problem-based learning model supported by educational animation videos on students' learning outcomes. The research approach used is quantitative with a quasi-experimental design. The population of this study consists of seventh-grade students, with class VII-C serving as the control group and class VII-D as the experimental group, each consisting of 31 students. The results of the study indicate that the problem-based learning model assisted by educational animation videos yields better results than direct learning, as evidenced by the average scores increasing from 62.081 to 84.613 in the experimental class, while the control class improved from 63.048 to 79.452. Hypothesis testing using the t-test also supports this finding, with a t-table value of 2.00 at a 5% significance level, while the calculated t-value is 2.669. Therefore, since the calculated t-value is greater than the t-table value (2.669 > 2.00), it can be concluded that there is an effect of the problem-based learning model assisted by educational animation videos on students' learning outcomes.

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INTRODUCTION

Education is an important thing from birth and lasts throughout life that must be owned by humans. Education starts from the family environment, where parents have the role of educators and children have the role of learners, which takes place naturally. This process includes the development of human potential and the formation of a personality in accordance with the principles that exist in society (Rachmawati & Erwin, 2022). However, this is not enough to anticipate the development of Science and Technology (IPTEK) so that the creation of a formal education structure can adjust to the times and can increase human resources (Akmal, 2024).

Education can make a medium that has a role in the formation of quality individuals and has high potential (Moto, 2019). Education includes the development of values within oneself, science, and character (Mayasari et al., 2019). In education there is an important role of the teacher. The role of this teacher has been explained in the Indonesian Law No. 14 of 2005 concerning teachers and lecturers, that teachers are professional educators with the main task of educating, teaching, guiding, directing, training, assessing and evaluating students in early childhood education from formal education, primary education and secondary education.

An example of the teacher's role in learning at school, one of which can be seen in learning mathematics, namely the teacher starts introducing mathematics early so that students get to know and understand mathematics early so that they can apply it in the real world. In addition to being introduced and taught early on, mathematics is also important to learn at all levels of education because learning mathematics can develop the ability to think logically, think critically, think rationally, and increase student confidence (Ristiani & Maryati. 2022). However, the perception that math is difficult makes some students less motivated, causing unsatisfactory learning outcomes. The Program for International Student Assessment (PISA) shows facts in the form of Indonesian data in 2022 showing a decrease in mathematics ability points by 13 points from the previous edition, namely from 379 to 366. In addition, there is a difference of 106 points between Indonesia's average score and the global average score. The level of mathematical competence of students only reaches 18.35%, which is below the average of 68.91% of members of the Organization for Economic Co-operation and Development (OECD) so that the conclusion is that the mathematical ability of the Indonesian state is low which has an impact on student learning outcomes is not satisfactory.

SMP Negeri 1 Kedungadem also experiences problems in mathematics subjects whose problems have been stated by the math teacher through interviews. The problem is that many students do not understand the material being studied, students often consider it a complicated lesson that causes laziness to learn and low learning motivation which results in student learning outcomes so that it is still considered unsatisfactory by the teacher. In reality, although the data proves that many students have obtained scores above the KKM with a score of 73, with 65% of 256 students or around 167 students having reached this score, and 35% or around 89 students still below the KKM, the teacher still considers that it is still unsatisfactory. These problems can be overcome by applying the right learning model in teaching mathematics. Other factors can be an additional solution in learning such as students' interest, motivation, and level of confidence which are internal factors, while for teaching strategies and the application of learning models applied by teachers are external factors (Khoirotunnisa' & Irhadtanto, 2019).

The application of learning models carried out by teachers in mathematics subjects, one of the appropriate models used is the problem-based learning model. This problem-based learning model encourages students to be more involved in learning where problems are directly taught in it to understand the material being taught (Ikhlas, 2018). The problem-based learning learning model emphasizes the problem-solving process so that students can develop thinking creativity for the problem-solving process (Hermansyah, 2020). Problem-based learning models can be applied with the help of learning animation videos so that they can provide assistance to students so that

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students can improve their problem-solving skills and make it easier for teachers to provide information to students to solve problems (Wahyuni, 2022). Learning animation videos are media that present learning materials with images and audio that are attractively designed to improve the learning process (Suherman et al., 2022). The impact of this application is to make it easier for students to understand the material, develop thinking creativity, be active, and it is hoped that there will be an increase in learning outcomes.

Based on previous research conducted by Ritonga & Hasibuan (2023) regarding the effect of problem-based learning models based on animated media on mathematics learning outcomes at SMPN 2 Rantau Selatan, it shows that the application of problem-based learning models based on animated media has succeeded in improving student learning outcomes for control classes and experimental classes in both classes, the highest scores are obtained by experimental classes where problem-based learning models based on animated media are applied and can also make students more active in solving problems with their groups and foster student confidence. In addition, research conducted by Hardiyanti et al., (2023) on the effect of the Problem Based Learning (PBL) learning model with the help of Powtoon animated videos on the learning outcomes of grade V thematic subjects at SDN 01 Klegen shows that there is an influence on student learning outcomes in grade V mathematics subjects at SDN 01 Klegen. This can be seen in the learning outcomes in the experimental class obtaining higher scores that apply the influence of the Problem Based Learning (PBL) learning model with the help of Powtoon animation videos compared to the control class that does not apply the model and makes it easier for students to understand the material being taught. However, the research to be carried out introduces new innovations by using more specific and interactive learning animation videos designed to visualize abstract concepts in mathematics subjects. In addition, this research is conducted in a broader scope and explores the impact of using animated learning videos on students' motivation and engagement in the learning process. Thus, this research provides a new contribution to the problem-based learning model with the help of learning technology such as animated learning videos that are more relevant and effective.

Based on the description above, it is important to conduct a study entitled “The Effect of Problem-Based Learning Models Assisted by Learning Animation Videos on Student Learning Outcomes”. This study aims to determine the effect of problem-based learning models supported by learning animation videos on student learning outcomes. In addition, this research is expected to provide benefits in adding and developing knowledge and serve as a reference in choosing the right learning model to use.

METHOD

The purpose of this study was to determine the effect of problem-based learning models supported by learning animation videos on student learning outcomes. Quantitative is the approach in this research with quasi experimental design. Quasi experimental design is a type of design that includes a control group, but is unable to control all external factors that may affect the experimental results in the study (Fitrilioni et al., 2024). This research was conducted in the even semester of the 2023/2024 academic year which took place at SMP Negeri 1 Kedungadem. The population is class VII students.

How to take samples applying cluster random sampling. Sampling comes from the population when the data is large then divide it into several clusters and randomly take from the cluster (Pasaribu et al., 2024). The sample is class VII-C using a direct learning model and class VII-D using a problem-based learning model assisted by a learning animation video. Data collection techniques apply tests and media expert validation while normality test, homogeneity test, balance test, and hypothesis test are used for data analysis techniques.

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RESULTS

Pre-test and post-test scores are the data used in this study. The data was taken from the scores of the two classes. The data related to the pre-test and post-test values of the control class and experimental class are presented in Table 1.

Table 1. Pre-test and Post-test Values

Class	Number of students	Average pre-test score	Average post-test score
Control class	31	63,048	79,452
Experimental class	31	62,081	84,613

The instrument trial was also conducted in another class, namely class VIII-C with 32 students. The pre-test and post-test questions consisted of 10 questions and were used as instrument trials with different assessments for each question. Validity test, reliability test, power difference test, and difficulty test are the next steps.

The validity test was tested by three expert validators stating that both questions met the criteria and were valid. The reliability test obtained the r_{11} value is 0.692 on the pre-test question and r_{11} is 0.749 on the post-test question while the rtabel is 0.349. The results of the two tests meet the requirements of $r_{11} \geq r_{table}$, so the question is reliable, with the value of r_{11} on the question of the two questions classified as high criteria so that these results indicate the instrument is reliable.

The results of the differentiator test on both questions show good and moderate criteria. In the pre-test question, there are 2 questions that have good criteria using a value range of 0.4 - 1, namely question numbers 3 and 5, while 8 other questions have moderate criteria with a value range of 0.2 - 0.4, in numbers 1, 2, 4, 6, 7, 8, 9, and 10. While the post-test questions, 2 questions were also found to have good criteria using a value range of 0.4 - 1, in numbers 3 and 6, while the other 8 questions had moderate criteria with a value range of 0.2 - 0.4, in question numbers 1, 2, 4, 5, 7, 8, 9, and 10. The results show that all the questions are suitable for use.

The results of the test of the level of difficulty of the questions on the two questions obtained moderate criteria. Moderate criteria questions are considered good questions because the questions are neither difficult nor difficult so they are suitable for use. Based on the test results, it can be concluded that these questions can be used as a test of mathematics learning outcomes with flat building material with a total of 10 questions each. The next step after carrying out the instrument trial is to carry out data analysis by applying the normality test, homogeneity test, and balance test then testing the hypothesis.

Normality Test

The chi-squared test was used in the normality test with a significance level of 5%. The following are the results of the pre-test score normality test presented in Table 2.

Table 2. Normality Test Results of Pre-test Values

Class	x^2_{count}	x^2_{table}	Distributed Data
Control class	4,668	9,488	Normal

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Experimental class	3,498	9,488	Normal

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The normality test results for the pre-test value get the x^2_{table} value is $x^2_{0,05;4}$= = 9.488 then DK = {x^2>9.488 }. The calculation results show the value of x^2_{count} = 4.668 for the control class and x^2_{count} = 3.498 for the experimental class is ∉ DK because in the results of both the value of x^2_{count} < x^2_{table} then the decision of the normality test is H_o accepted. The conclusion is that the data from the sample comes from a normally distributed population.

The normality test results on the post-test scores also showed that the data were normally distributed. Further details regarding this normality test are presented in Table 3.

Table 3. Normality Test Results of Post-test Values

Class	x^2_{count}	x^2_{table}	Distributed Data
Control class	4,586	11,070	Normal
Experimental class	7,120	11,070	Normal

The normality test for post-test scores shows the value of x^2_{table} which $x^2_{0,05;5}$ is = 11.070 then DK = {x^2> 11.070}. The calculation results show x^2_{count} = 4.586 for the control class and x^2_{count} = 7.120 for the experimental class is ∉ DK because in both results the value of x^2_{count} < x^2_{tabel} so the decision of the normality test is H_o accepted. The conclusion is that the data from the sample comes from a normally distributed population.

Homogeneity Test

F-test was used in the homogeneity test with a significance level of 5%. The following are the results of the homogeneity test of the pre-test scores presented in Table 4.

Table 4. Homogeneity Test Results of Pre-test Questions

Class	Variance	F_{count}	F_{table}	Conclusion
Control class	136,99	1,144	1,841	Homogeneous
Experimental class	119,78			

The results of the homogeneity test on the pre-test scores show that the F_{table} value is $F_{0,05;30;30}$ = 1.84 then DK = {F>1.841}. The calculation results show the F_{count} value of 1.144 ∉ DK because F_{count} < F_{table} so H_o is accepted. The conclusion is that the variance of the two samples comes from a homogeneous population.

The results of the homogeneity test of post-test scores also show that the variance between groups is homogeneous. Full details can be seen in Table 5.

Table 5. Homogeneity Test Results of Post-test Values

Class	Variance	F_{count}	F_{table}	Conclusion
Control class	51,989	1,231	1,841	Homogeneous
Experimental class	63,978			

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Meanwhile, the post-test value shows that the F_{table} value is $F_{0,05;30;30}$ = 1.841 then DK = {F>1.841}. The calculation results show the F_{count} value of 1.231 ∉ DK because $F_{count} < F_{table}$ so H_o is accepted. The conclusion is that the variance of the two samples comes from a homogeneous population.

Balance Test

The t-test was used in the balance test with a significance level of 5%. This balance test uses pre-test scores. The following balance test results are presented in Table 6.

Table 6. Balance Test Results

Class	T_{count}	t_{table}	Kesimpulan
Control class	0,336	2,00	Balanced or equal ability
Experimental class			

The results of the balance test on the pre-test value show that the t_{table} value used is $t_{0,05;60}$ = 2.00 then DK = {t<-2.00 or t> 2.00}. The calculation results show t_{count} of 0.336, then t_{count} ∉ DK because the results of $t_{count} < t_{table}$ so H_o is accepted so that the experimental and control classes have the same initial ability. The conclusion is that both classes have balanced or equal initial abilities.

Hypothesis Test

The t-test with polled variance was used in hypothesis testing with a significance level of 5%. The following hypothesis test results are presented in Table 7.

Table 7. Hypothesis Test Results

Class	t_{count}	t_{table}	Description
Control class	2,669	2,00	There is an effect
Experimental class			

There is an effect of problem-based learning model assisted by learning animation video on student learning outcomes is the hypothesis proposed in this study. The hypothesis test results show the t_{table} value which is $t_{0,05;60}$ = 2.00 then DK = {t<-2.00 or t>2.00}. The calculation results show the t_{count} of 2.669 then the t_{count} ∈ DK because the results of the $t_{count} > t_{table}$ (2.669> 2.00) then H_o is rejected and Ha is accepted so that it means that there is an effect of problem-based learning models assisted by learning animation videos on student learning outcomes.

Based on the results of the average value research in the two classes previously described, there was an increase. The control class obtained an average value of 63.048 to 79.452 and the experimental class obtained an average value of 62.081 to 84.613. The average value, the experimental class obtained a higher value. Supporting research for these results is research from Lello et al., (2022) which contains an increase in mathematics learning outcomes with the application of a problem-based learning model assisted by animated videos. In addition, it also has an impact on the process of involving students in the problem solving process where students become active in their groups and build students' self-confidence. Research by Riwayah & Hadi (2023) also supports these findings that the problem-based learning model assisted by Powtoon animation media has an influence. The impact is that the scores in the experimental class are better. The conclusion from these two studies is that students become more active in the problem-solving process with their groups and students' self-confidence can increase.

Based on the average value previously explained, the experimental class obtained a higher value. This is because the application of a problem-based learning model assisted by an animated video that not only hones students' skills to acquire new knowledge, but also stimulates students'

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enthusiasm for learning, encourages students to think critically when discussing with a group of friends, the learning process becomes more active. In addition, it can increase their learning motivation. Research conducted by Damayanti (2022) shows that psychological factors affect student interest and motivation to learn which results in student learning outcomes. Therefore, the use of this model not only improves students' overall learning outcomes, but can also overcome the challenges faced while in other classes that apply other learning models will create a lack of student involvement in learning, low student interest in learning and dependence on direction given by the teacher.

CONCLUSION

This study has concluded that the problem-based learning model assisted by learning animation videos provides superior results than direct learning as evidenced by the average value of 62.081 to 84.613 in the experimental class while 63.048 to 79.452 in the control class. The results of hypothesis testing applying the t-test also prove it, namely obtained t_{table} = 2.00 with a significance level of 5% while the tcount value is obtained 2.669, the results of $t_{count} > t_{table}$ (2.669> 2.00) means that there is an effect of problem-based learning models assisted by learning animation videos on student learning outcomes.

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The authors declare that generative AI or AI-assisted technologies were not used in any way to prepare, write, or complete this manuscript. The authors confirm that they are the sole authors of this article and take full responsibility for the content therein, as outlined in COPE recommendations.

INFORMED CONSENT

The authors have obtained informed consent from all participants.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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