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Problem Based Learning Model Assisted by Renderforest Video Animation on Mathematics Learning Outcomes

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ABSTRAK

Guru kurang dapat mengemas model dan media pembelajaran pada pelajaran matematika sehingga menyebabkan peserta didik merasa kesulitan dan bosan dalam belajar. Penelitian ini bertujuan untuk menganalisis pengaruh penggunaan model pembelajaran problem based learning berbantu media animasi video renderforest terhadap hasil belajar matematika siswa pada materi bangun ruang kelas IV SD. Penelitian ini menggunakan pendekatan eksperimen kuantitatif. Jenis penelitian ini yaitu menggunakan quasi eksperimental design, menggunakan sampel total 28 siswa. Teknik pengumpulan data yang digunakan melalui tes prestasi belajar dan dokumentasi. Teknik yang digunakan untuk menganalisis data yaitu uji-T. Hasil analisis menunjukkan bahwa rata-rata nilai post-test kelas kontrol adalah 77 dalam kategori cukup, nilai minimum 55 serta maksimum 81 dan rata-rata hasil belajar post-test kelas eksperimen adalah 86 dalam kategori baik, nilai minimum 80 serta maksimum 92. Hasil analisis data menunjukan terdapat pengaruh penggunaan model problem based learning berbantu media animasi video renderforest dalam meningkatkan hasil belajar matematika materi bangun ruang pada siswa kelas IV S. Disimpulkan bahwa model problem based learning berbantu media animasi video renderforest dapat meningkatkan hasil belajar matematika pada siswa sekolah dasar.

ABSTRACT

Teachers need to be more able to package learning models and media in mathematics lessons, causing students to feel more confident and energized in learning. This study aims to analyze the effect of using the problem-based learning model assisted by renderforest video animation media on students' mathematics learning outcomes in fourth-grade elementary school building materials. This study uses a quantitative experimental approach. This type of research uses a quasi-experimental design, using a total sample of 28 students. Data collection techniques are used through learning achievement tests and documentation. The technique used to analyze the data is the T-test. The analysis results show that the average post-test score for the control class is 77 in the adequate category, the minimum score is 55, and the maximum is 81. The average post-test learning outcomes for the experimental class are 86 in the good category, the minimum score is 80, and the maximum is 92. Results Data analysis showed an effect of using the problem-based learning model assisted by renderforest video animation media in improving the mathematics learning outcomes of geometric materials in grade IV S students. It was concluded that the problem based learning model assisted by renderforest video animation media could improve mathematics learning outcomes in elementary school students.

1. INTRODUCTION

Education is a need that has an important role as humans. With education, individuals can achieve goals in various fields to improve their self-worth of life and be in a better position (Aloo et al., 2017; A. Putri et al., 2020; Widyastuti et al., 2019). Education is also said to be a means that can develop a potential person and the skills of students through a learning process to equip them for living life in society, their nation, and their country (Buchori Muslim, 2020; Kurniawan, 2019). Law No. 20 of 2003 concerning the National Education System contained in Article 1 Paragraph 1 firmly defines that education is defined as a real and structured effort to create conditions and learning activities intended for students to be able to actively channel their talents and receive knowledge in terms of religion, social, personal, ability, character, and the skills they need, the people, the nation, and also the country. The learning process is an important component of education. In this learning process, social interaction activities can be formed that occur between teachers and students and between students and their friends (Beswick & Fraser, 2019; Fahri & Qusyairi, 2019; Kuantum et al., 2018). The quality of education can increase if implemented effectively. The effectiveness of the learning process is, of course, inseparable

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from the roles of the teacher and the students themselves. Teachers have an important role in education (Anugrah et al., 2020; Erwinsyah, 2017; Kusmawati, 2016). If in a learning process, the teacher can actively participate in creating an interesting learning atmosphere and students have high enthusiasm for the learning, then these effective learning activities can be created (Fauzan & Rahdiyanta, 2017; Setiawan et al., 2020).

In learning activities, students are faced with various subjects that must be followed. However, there are subjects that students are not even interested in, namely mathematics (Agustina, 2015; Fitrianawati et al., 2020). This problem was also found at SD Negeri Sambirejo 1. Through observation and interviews conducted, it was found that students had difficulty understanding the concept of mathematics because they saw it as a subject that was scary, difficult, too abstract, and also complicated. Mathematics education has an important role in forming and preparing modern human resources (Kusmawati, 2016; Yudha, 2019). The results of the interviews stated that students had difficulty learning mathematics independently due to a lack of media. Important media are used in learning (Saifudin et al., 2020; Wardani & Setyadi, 2020). Meanwhile, mathematics is not a foreign subject for all students, and students will always encounter mathematics at the school level. However, the student's perception of mathematics as a scary subject has never changed. Mathematics is a broad science that has a relationship with or examines abstract forms or structures and the relationships that occur, to understand it, one needs an understanding of the concepts in mathematics (Arifin & Retnawati, 2017; Tilaar, 2015). Mathematics is also a broad science that has a great influence on the scientific field of science and the development of human intelligence (Fauzy & Nurfauziah, 2021; Rangkuti et al., 2019; Rustan & Bahru, 2018). Today's rapid developments in technology, information, and communication cannot be separated from the role of mathematics development. Thus, high mastery and understanding are needed starting at an early age. Mathematics lessons must be facilitated for all students in educational institutions as a way to have the ability to think, be careful, structured, and also creative, and be able to find solutions to problems that come in everyday life (Mashuri, 2019; Suryadi et al., 2020; Yuniawatika et al., 2018).

One of the various mathematical materials that are so closely related to everyday life is geometry. Building space is one of the materials reached in elementary school. Even though this material appears to be simple at first glance, students frequently struggle to understand and solve questions about spatial shapes in the form of story problems (Putri & Pujiastuti, 2019). In essence, if realized, geometric material is material that is often encountered in everyday life, but many students are less aware of this. Therefore, efforts to update creative learning models so that mathematics learning activities have value, are always awaited, liked, and can improve student learning outcomes. Innovative learning activities are learning to develop knowledge in the process of changing behavior (Rizal et al., 2020; Suryawati & Osman, 2018; Yuliandri, 2017). Learning is no longer centered on the teacher but on the students. The teacher has the role of being a guide, facilitator, and motivator who can encourage so that learning activities can run in a conducive manner (Laksana, 2017; McInerney & Green-Thompson, 2019; Rashid et al., 2021). One of the various learning models that can be used in innovative learning, for example, is the discussion (group) model. The discussion model is a model whose delivery involves students actively discussing and finding alternative solutions to a problematic topic of discussion. Learning methods using the application of discussion can add to the ability in sensitivity of students because, in these discussions, students will have increased activity in learning (Fauzan et al., 2022).

The problem-based learning (PBL) learning model is one of several discussion models (groups). Problem-based learning requires students to be active in learning (Hasanah et al., 2019; Suwono et al., 2021). A problem is used as discussion material in problem-based learning. These problems will later be solved by students (Chairudin & Dewi, 2021; Silva et al., 2018). With the presence of this type of learning, it is hoped that students can get used to dealing with problems and be able to solve them. In this learning model, students are formed in thinking critically when finding a solution to a problem that exists in the real world or around them. Furthermore, this model will teach students to collaborate when working in groups, which will foster lively learning and, later, students will be able to remember because they will understand and try to solve problems that arise on their own (Amin et al., 2020; Aryanti et al., 2017).

In addition to the learning use models, learning media also have a major influence on learning activities, especially in mathematics. The use of aids in learning activities is one of the efforts to create more meaningful and high-quality learning. The use of learning media is very important (Rahayuningsih, 2020; Ridha et al., 2020; Tafonao, 2018). Study sessions are part of the interaction that runs in a system, so learning aids occupy a position that is considered quite important as one of the systems in learning. Without using tools, that learning activity refers to communication cannot be carried out properly because of the lack of interaction that exists (M. A. Fauzan & Rahdiyanta, 2017; Febriani, 2017). Various kinds of learning media can be used, one of which is the "Renderforest animated video" medium. Renderforest Media is an application for making animated videos in the form of cartoons that can be filled with learning

materials and can also be used as learning media for learning activities because they have interesting, fun, and interactive animations. Renderforest learning media is an audio-visual-based learning medium that is by technological developments, where teachers can create and edit learning videos. Renderforest is a software application that is used for a specific purpose, such as processing documents, managing windows, playing games, and so on. Furthermore, renderforest is a free application that can create professional-quality presentations, intros, slide shows, and much more (Harahap & Lubis, 2022). The results of previous studies stated that problem-based learning models could help students learn (Aiman et al., 2020; Silva et al., 2018; Suwono et al., 2021). Other research findings also state that problem-based learning models can improve students' mathematics learning outcomes (Anwar & Jurotun, 2019; Ratnawati et al., 2020; Wicaksana et al., 2016). Other research findings also state that media use will facilitate students in learning mathematics (Muna et al., 2017; Ridha et al., 2020; Sanusi et al., 2015). Based on this, using PBL models assisted by learning media will make it easier for students to learn PBL. However, there has yet to be research the effect of problem-based learning models assisted by renderforest animated video media on mathematics learning outcomes in geometry material. This study aimed to analyze the effect of a problem-based learning model assisted by renderforest animated video media on the mathematics learning outcomes of fourth-grade students at SD Negeri Sambirejo 1.

2. METHOD

In this study, we used a quantitative experimental approach. The researcher chose this method because an experiment would be carried out in a class by providing certain treatments shaped by applying or using a problem-based learning model assisted by renderforest video animation media in learning mathematics on geometric material, as well as analyzing the success of learning outcomes. Then the learning outcomes of these students will be analyzed to determine whether there is an effect of using the problem-based learning model assisted by renderforest video animation media on the mathematics learning outcomes of fourth-grade students at SD Negeri Sambirejo 1. The researcher raised the type of research used was a quasi-experimental design, which has a group that is not given treatment but cannot fully play a role in controlling other variables that can participate in running the experiment. The quasi-experiment in this study used a pretest-posttest nonequivalent control group design. The reason for using the nonequivalent control group design was that in this study, the experimental and control group designs were not randomly selected.

In this study, a total sample was used, where the entire population was used as a sample. The samples taken were all from fourth-grade students, with a total of 28 students. If there are fewer than 100 research subjects, then the research subjects are combined to become a population study (Arikunto, 2009).. In this case, fourth grade A will be used as the control group and fourth grade B will be used as the experimental group, with each class consisting of 14 students. Data collection techniques are used through learning achievement tests and documentation. To find out whether there is an impact of using a problem-based learning model with assistive devices renderforest video animation media on mathematics learning outcomes, a t-test analysis is used (data analysis using SPSS 23.0 for Windows software). When sig. (2-tailed) 0.05 is obtained, and Ho is declared rejected or not accepted because there are differences between the control and experimental classes. Before carrying out the hypothesis analysis, a normality test experiment using the Kolmogorov-Smirnov test technique and a homogeneity test to see that the data had been normally distributed and homogeneous.

3. RESULT AND DISCUSSION

Result

Based on the data analysis of Control Class Student Learning Outcomes Scores (Pre-test), the minimum student score was 55, and the maximum student score was 81. The average student score was 67.36, and the standard deviation obtained was 8.177, with a variance of 66.863. Student learning acquisition data are then included in the categorization of learning acquisition shown in Table 1.

Table 1. Categorization of Control Class (Pre-test)

No.	Value Range	Frequency	Percentage (%)	Category
1	0 – 50	0	0	Very less
2	51 – 74	12	86	Not enough
3	75 – 80	1	7	Enough
4	81 – 89	1	7	Well
5	90 – 100	0	0	Very good

No.	Value Range	Frequency	Percentage (%)	Category
Total		14	100	

After knowing the pre-test scores of students' learning outcomes in the control class, they are then given a post-test to find out the student's understanding after being treated with conventional learning methods. The results of data analysis on the score of Control Class Student Learning Outcomes (Post-test), namely the minimum score obtained by students is 67 and the maximum score obtained by students is 89. The average value obtained by students is 77, the standard deviation of the data is 6.226 and the variance is 38.769. Student learning acquisition data are then included in the categorization of learning acquisition shown in table 2.

Table 2. Categorization of Control Class Learning Outcomes (Post-test)

No.	Value Range	Frequency	Percentage (%)	Category
1	0 – 50	0	0	Very less
2	51 – 74	5	36	Not enough
3	75 – 80	5	36	Enough
4	81 – 89	4	28	Well
5	90 – 100	0	0	Very good
Total		14	100	

The following is the post-test acquisition of the experimental class students learning outcomes. The results of data analysis in the experimental group are as follows. The minimum score that students get is 56 and the maximum score that students get is 76. The average score of students is 67.21. The standard deviation of the data is 6.129 and the variance is 37.566. Student learning acquisition data are then included in the categorization of learning acquisition shown in table 3.

Table 3. Categorization of Experiment Class Learning Outcomes (Pre-test)

No.	Value Range	Frequency	Percentage (%)	Category
1	0 – 50	0	0	Very less
2	51 – 74	12	86	Not enough
3	75 – 80	2	14	Enough
4	81 – 89	0	0	Well
5	90 – 100	0	0	Very good
Total		**14**	**100**	

After knowing the data above, the experimental class, they were then given a post-test with the result scores. Based on the results of data analysis, the lowest experimental class score (Post-test) was 80 and the highest score was 92. The average student score was 86. The standard deviation was 3.70 and the variance was 13.692. Student learning acquisition data are then included in the categorization of learning acquisition shown in table 4.

Table 4. Categorization of Experiment Class Learning Outcomes (Post-test)

No.	Value Range	Frequency	Percentage (%)	Category
1	0 – 50	0	0	Very less
2	51 – 74	0	0	Not enough
3	75 – 80	2	14	Enough
4	81 – 89	9	64	Well
5	90 – 100	3	22	Very good
Total		**14**	**100**	

Before testing the hypothesis, the researcher will test the learning outcomes of students using a normality experiment to obtain whether the data is normally distributed or not as shown in table 5.

Table 5. Normality Test

KELAS		Kolmogorov-Smirnov[a]		
		Statistic	**df**	**Sig.**
RESULT	PRE_EKS	.200	14	.133

KELAS	Kolmogorov-Smirnov[a]		
	Statistic	df	Sig.
POS_EKS	.143	14	.200*
PRE_KON	.197	14	.147
POS_KON	.126	14	.200*

The obtained results show a significance > 0.05, then Ho is accepted so that it is said that the data is normally distributed, then proceed with identifying the homogeneity test as shown in table 6.

Table 6. Homogeneity Test Results

		Levene Statistic	df1	df2	Sig.
Learning Outcomes	Based on Mean	3.066	1	26	.092
	Based on Median	2.856	1	26	.103
	Based on the Median and with adjusted df	2.856	1	21.252	.106
	Based on trimmed mean	3.141	1	26	.088

The acquisition of the homogeneity test gives facts a significance greater than 0.05 which means that the data is varied or homogeneous. Next, a t-test is carried out see taking calculations on whether there is an effect of applying the learning model shown in table 7.

Table 7. Independent Sample Test Results

		Sig. (2-tailed)
Learning Outcomes	Equal variances assumed	.000
	Equal variances not assumed	.000

According to the results, sig. (2-tailed) 0.000 < 0.05 leads to the conclusion that Ho is rejected. This shows that there is an influence on the mathematics learning outcomes of students in geometric material using problem-based learning models assisted by renderforest video animation media.

Discussion

Based on the results of student learning acquisition, it shows the effect of the problem-based learning model assisted by renderforest video animation media. The application of problem-based learning models combined with renderforest video animation media to students' mathematics learning outcomes is efficient. This is influenced by the renderforest video animation tool that can increase student enthusiasm and influence them to focus on the knowledge conveyed by the teacher. Video media can attract the interest and attention of students so that they become active in expressing opinions and responding to the subject matter (Muna et al., 2017; A. Putri et al., 2020; Yunita & Wijayanti, 2017). The application of problem-based learning methods is felt to be able to add to students' mathematics learning gain (Fauzia, 2018; Fitra Surya, 2017; Primayanti et al., 2019).

Previous research findings state that applying problem-based learning methods assisted by the use of video media can improve student learning outcomes (Janah et al., 2019; Pertiwi & Dibia, 2018). Problem-Based Learning (PBL) refers to a learning approach that enters into real-world situations as contexts in which students study important to study and tenacity to solve problems and derive important information and concepts from classroom content (Anwar & Jurotun, 2019; Chao et al., 2017). The problem-based learning model is also series of studies that leads to students personal activities to learn basic material based on circumstances and gaps given at the beginning of learning has directions to prepare students to solve problems through a problem-solving approach (Hussin et al., 2018; Ismail et al., 2018). Furthermore, Problem Based Learning (PBL) is part of the learning model that studies the theoretical charts of constructivism, where students not only learn concepts but also scientific methods to solve these problems.

The selection of learning models is considered important because it can affect student learning outcomes. The application of learning methods with problems can increase the acquisition of students' mathematics learning (Asriningtyas et al., 2018; Ratnawati et al., 2020; Widayanti & Nur'aini, 2020). Not only choosing a learning model, but the teacher also has a role in arousing enthusiasm, encouraging the active role of students, and creating conducive conditions for learning activities. A teacher must be can hold his students more active in learning and love the learning process (Istiandaru et al., 2015; Safithri et al., 2021; Sihaloho et al., 2020). Using video media in the learning process can foster students' attention

and increase the ease of learning material (Ridha et al., 2021; Risky, 2019; Widiyasanti & Ayriza, 2018). Learning video-based media is also one of the media that can be used in the digitalization era as it is now, where students can learn material that they feel they don't understand anytime and anywhere (Masykuroh & Khairunnisa, 2022; Muhibbin et al., 2021). How to learn with problems assisted by animation aids can well increase the acquisition of learning mathematics for school students, referring to the data that has been obtained. The advantage of using renderforest video animation media in the problem-based learning model is that it can provide facilities for students are expected to act critically in their thinking by presenting problems that can be encountered in everyday life. In addition, also affects increasing student learning gains in mathematics, especially geometric material. This study suggests that students can learn mathematics by watching a rendering forest animation video that is oriented to problem-based learning geometric materials to obtain a meaningful learning process that makes the influence of student learning gain.

4. CONCLUSION

The data analysis results show an effect of using the problem-based learning model assisted by renderforest video animation media in improving mathematics learning outcomes. It was concluded that the problem-based learning model assisted by renderforest video animation media could improve mathematics learning outcomes. Suggestions for teachers to further develop learning models and media in the digital era to attract interest and enthusiasm and maximize student learning outcomes for future researchers to expand the scope of research to different classes and different schools.

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