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Analysis of the Influence of Problem Based Learning Models Assisted by Wordwall Media on Science Learning Outcomes of Primary School Students

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Abstract: This study aims to analyze the effect of the Problem Based Learning model assisted by Wordwall media in thematic learning of science content on force and motion material on the learning outcomes of fourth-grade students at SDN Pasir Putih 03. This quantitative research design, True Experiment, used a *posttest-only* control group final test. *Cluster random* was the sampling used. Biserial Point Correlation was used to test the validity and produces 25 valid questions and five drop questions from a total of 30 multiple-choice questions. The KR-20 was used to test reliability and get $r_{count} = 0,75 > r_{table} = 0,34$ so the instrument is reliable. Liliefors test in order to test normality obtained values for the control class and experimental class, namely $L_{count} = 0,1467 < L_{table} = 0,152$ and $L_{count} = 0,0972 < L_{table} = 0,152$ which means that both data were normally distributed. Fisher's test is used to test the homogeneity and get homogeneous results, namely $F_{count} = 1,67 < F_{table} = 1,79$. T-test to test the hypothesis of $t_{count} = 8,97 > t_{table} = 1,668$ at 0.05 with dk = 66. Then H_0 was rejected, and H_1 was accepted, namely the influence of problem-based learning models assisted by Wordwall media in thematic learning of science content on force and motion material on the learning outcomes of fourth-grade students at SDN Pasir Putih 03. The results of this study showed that the use of the PBL model could make students more active, think critically, and independent. Where with this model, students are required to find their solutions to problems by conducting an experimental, and with the help of website-based Wordwall media, students become more enthusiastic and not bored because, with the help of this media, students can learn while playing.

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Introduction

In essence, education is a way to provide various knowledge, understanding, expertise, and specific skills for every human being. Therefore, teachers must create quality education supported by active and varied learning models compiled by teachers to increase students' enthusiasm for learning to produce increased student achievement, quality, and quantity. Learning was the occurrence of changes that could be seen better than before in a person by understanding, skills, behavior, habits, and attitudes (Sariani et al., 2021). Learning, namely the occurrence of changes for the better from the child's self, attitudes, actions, and behaviors previously owned (Isti'adah, 2020). Learning was emphasized changing attitudes, and through experience, changes in attitudes will be relatively permanent (Taliak, 2020). While the learning model was a series of plans to serve as guidelines for classroom learning activities that could be used to realize a learning activity's expectations and goals (Nurlaelah & Sakkir, 2020). The learning model was defined as an arrangement of

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plans prepared in various ways for the preparation of learning curricula, arranged teaching materials to be delivered, and directions for teachers in teaching in the classroom so that competencies and learning objectives can be realized more effectively and efficiently as expected (Kaban, Anzelina, Sinaga, & Silaban, 2021).

The 21st century emphasizes students' critical thinking skills that can correlate and integrate the knowledge obtained with its application in everyday life (Maslakhatunni'mah, Safitri, & Agnafia, 2019). Therefore, professional teachers are needed at this time to prioritize the quality of education and produce quality graduates so that the managers of educational institutions can make their institutions competitive in the current era of fierce competition and avoid low results and student interest in learning.

Learning outcomes were changes that occured after the learning process in the form of experiences or exercises (Nugraha, Sudiatmi, & Suswandari, 2020; Suarni et al., 2021). If someone had learned, then the evidence and results that occured were a change in the behavior of that person, such as initially not understanding something, then becoming understanding, initially unable to do something, being able to do something and from not knowing something then becoming aware (Hamalik, 2016). These changes are divided into affective, cognitive, and psychomotor. Cognitive change has to do with memory, intellectual or thinking ability. Students' lack of learning outcomes can be caused by several triggers, including teachers who do not make and develop appropriate, effective, efficient, and student-oriented learning implementation plans and the lack of student capabilities in problem-solving aspects. Science is learning material that requires integration between model applications and relevant learning media.

Natural Science was a systematic and logical science (Harefa & Sarumaha, 2020). Natural Science was the skill of examining various natural phenomena in a certain way to gain knowledge and develop further knowledge (Isrok'atun, Hanifah, Maulana, & Suhaebar, 2020). Science discusses a collection of data concepts about natural phenomena based on the results of experiments, tests, observations, and the arrangement of theories. PISA 2018 conducted a review published in March 2019 on educational issues in Indonesia; namely, Indonesia's scientific ability had a low score because Indonesia was ranked 71 out of 79 countries with an average score of 396 (Hewi & Shaleh, 2020).

So far, learning Natural Sciences (IPA) is considered a boring, complicated, less fun, and less interesting lesson with enthusiasm for students to learn, both for elementary school students and up to college. This is evident in the acquisition of scores for the mid-semester exam at SDN Pasir Putih 03. Based on the data, there are still many students whose learning outcomes are not maximal and do not reach the Minimum Completeness Criteria, which is 61%.

Thematic learning activities on Natural Sciences (IPA) class IV content at SDN Pasir Putih 03 is still not as expected. Referring to the findings in interviews with teachers who are in charge of class IV, the factors that trigger discrepancies between learning activities and expectations include: (1) only my smart students are actively involved in teaching and learning, (2) the majority of students are still classified as passive in participating in the teaching and learning process, (3) teachers who still apply conventional learning models (*teacher-centered learning*).

The solution needed for these problems, namely the application of an active, fun, and relevant learning model to the learning material and making students think more critically about the questions or problems that have been taught by the teacher so that the creation of a

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teaching and learning activity that is meaningful for students and learning outcomes also increases. Therefore, the Problem Based Learning model is considered a model that needs to be applied.

The Problem Based Learning (PBL) model was a model that made reality a context to push and motivate students' capabilities to think critically, especially to solve existing problems according to the subject matter (Rusman, 2015). The PBL model was a model that provided students with a problem related to everyday life, and in groups, the students look for solutions to solve the problem (Astiti, Subekti, & Kuswandari, 2021). This model is suitable for 21st-century learning, where students must constantly hone their critical thinking capabilities and want to be actively involved during the learning process. PBL also requires students to deal with problems that are correlated with their daily lives so that they can help students in their understanding of learning materials. Students look for solutions with groups to problems that the teacher provides so that student skills will be created in solving existing problems and creating communication and collaboration when looking for solutions to problems with their groups. The media studied in this study is Wordwall. Wordwall is a medium in the form of a very interesting website. Wordwall could be used as a learning media, resource, and interactive and fun assessment tool for students (Fikriansyah, 2021). Wordwall was a web-based gamification application in which various quizzes and games were available that teachers could use as learning tools (Putra, Aryani, & Ariessanti, 2021). On the Wordwall sheet, there are various examples of the teachers' creativity, making it easier for new users to use and create teaching materials provided on the website application. This research ais to analyze the effect of the Problem Based Learning model assisted by Wordwall media in thematic learning of science content on force and motion material on the learning outcomes of fourth-grade students at SDN Pasir Putih 03.

Research Method

This study used a quantitative approach that utilizes a True Experimental design. The test was carried out with a final control group test (Posttest-only control group) (Taniredja & Mustafidah, 2015). This design determines the effect in the treatment only by comparing the average after conducting between the two groups, namely the experimental and the control, as shown below:

Table 1. ***Posttest-Only Control Design***

Sample	Treatment	Posttest
E	X	Y
K		Y

Description**:**

K : Control Group
Y : Learning Outcomes in Both Groups
E : Experimental Group
X : Treatment in the Experimental Group

The population was a subject or object in the generalization area with special qualities and characteristics that the researcher decided to learn and concludes with (Sugiyono, 2018). This study involved a population of all fourth-grade students at SDN Pasir Putih 03, totaling 103 students divided into three classes during the even semester of the 2021/2022 academic year. Sugiyono (2016) stated that the sample was part of the population as a whole. The sample was selected through Cluster Random Sampling, a technique to determine if the research

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object is wide and randomly selected in the form of groups, not individuals. So the number of samples selected was two classes where one class, namely class IV C, became the control class, while the other class, class IVB, became the experimental class with 34 students each.

Thematic learning outcomes test for class IV science content was selected data collection technique, where the test was carried out after learning activities (post-test) (Sriyanti, 2019). The test given to both groups is the same, where the test is in the form of multiple choice questions. The treatment given to the experimental class was teaching and learning activities with a Problem Based Learning model with Wordwall media. In contrast, the control group was not given such treatment.

Then, the data was compiled and analyzed. Before testing the hypothesis, it is necessary to test the hypothesis requirements to ensure that the data is normal and homogeneous. The normality test was carried out using the Liliefors test to ensure that the data obtained were normally distributed (Rinaldi, Novalia, & Syazali, 2020). The homogeneity test with Fisher's test aimed so that researchers could ensure that the variance research data was uniform or homogeneous (Payadnya & Jayantika, 2018). This study tested the hypothesis by conducting a t-test.

Results and Discussion

Description of Learning Outcomes

The data used in this study were data from the results of class IV learning on the theme of 8 science content on force and motion material. The data from student learning outcomes were obtained from the post-test scores by giving questions to the experimental and control classes. The experimental class's post-test questions were given after post-test treatment with the Problem Based Learning model assisted by Wordwall media. At the sae tie, the post-test questions in the control class were given without receiving treatment from the Problem Based Learning model assisted by Wordwall media in the natural science learning process.

Experimental Class

Table 2. Experimental Class

No	Value	f_i	f_k	x^2	$f_i x_i$	$f_i x_i^2$
1	64	2	2	4096	128	8192
2	68	1	3	4624	68	4624
3	72	1	4	5184	72	5184
4	76	3	7	5776	228	17328
5	80	5	12	6400	400	32000
6	84	5	17	7056	420	35280
7	88	13	30	7744	1144	100672
8	92	4	34	8464	368	33856
Total		34		49344	2828	237136
Average					83,18	
Variance					57,97	
Standart Deviation					7,61	

The table above shows that the experimental class consisted of 34 students, where the highest score obtained was 92, while the lowest score achieved was 64. The standard deviation obtained is 7.61, the mean or average value was 83, 18, median 84.89, mode 85.91.

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Table 3. Experimental Class Frequency Distribution

No	Interval Class	Middle Value (X_i)	Real Limit	Frequency		
				Absolute	Cumulative	Relative (%)
1	64 – 68	66	63,5 – 68,5	3	3	8,82%
2	69 – 73	71	68,5 – 73,5	2	5	5,88%
3	74 – 78	76	73,5 – 78,5	2	7	5,88%
4	79 – 83	81	78,5 – 83,5	5	12	14,71%
5	84 – 88	86	83,5 – 88,5	18	30	52,94%
6	89 – 93	91	88,5 – 93,5	4	34	11,76%
		∑		34	34	100%

According to the frequency distribution data in the experimental class, as many as 52.94% or 18 students scored between 84-88. While the values with the lowest frequency were 69-73 and 74-78, respectively two students or 5.88%, as shown in the graph below:

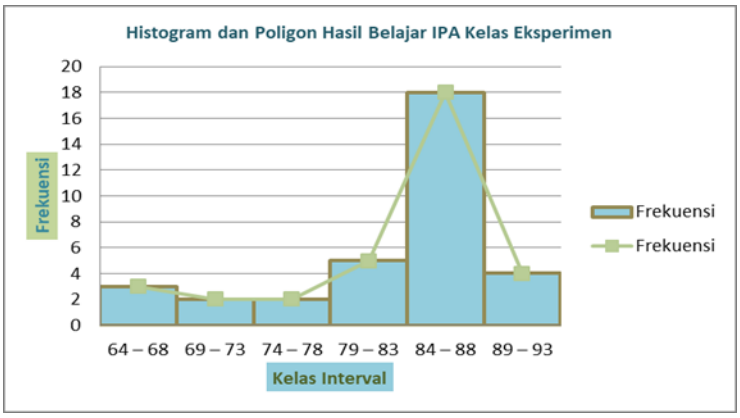

Figure 1. Experimental Class Histogram and Polygon

Control Class

Table 4. Control Class

No	Value	f_i	f_k	x_i^2	$f_i x_i$	$f_i x_i^2$
1	44	2	2	1936	88	3872
2	48	2	4	2304	96	4608
3	56	5	9	3136	280	15680
4	60	5	14	3600	300	18000
5	64	3	17	4096	192	12288
6	68	6	23	4624	408	27744
7	72	7	30	5184	504	36288
8	76	2	32	5776	152	11552
9	80	1	33	6400	80	6400
10	84	1	34	7056	84	7056
Total		34		44112	2184	143488
Average				64,24		
Variance				96,91		
Standar Deviation				9,84		

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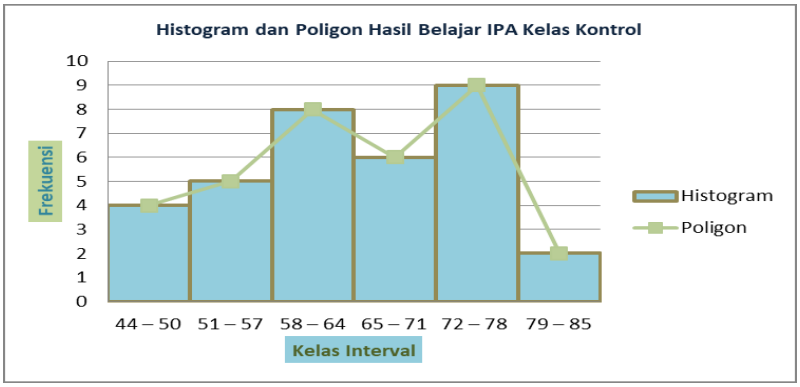
The table above shows that the control class consists of 34 students, where the highest scores obtained were 84, while the lowest score achieved was 44. The total number of students in the control class were 34 students. The mean or average value was 64.24, the median was 88.5, the mode was 73.6, and the standard deviation was 9.84.

Table 4. Frequency Distribution of Control Class

No	Interval Class	Middle Value (X_i)	Real Limit	Frequency		
				absolute	cumulative	relative (%)
1	44 – 50	47	43,5 – 50,5	4	4	11,76%
2	51 – 57	54	50,5 – 57,5	5	9	14,71%
3	58 – 64	61	57,5 – 64,5	8	17	23,53%
4	65 – 71	68	64,5 – 71,5	6	23	17,65%
5	72 – 78	75	71,5 – 78,5	9	32	26,47%
6	79 – 85	82	78,5 – 85,5	2	34	5,88%
		∑		34	34	100%

Based on the frequency distribution table in the control class, it can be seen that as many as 26.47% or nine students scored between 72 – 78, while the value with the lowest frequency was at a value of 79 – 85, which two students obtained or with a percentage of 5.88 % summarized in the graph below:

Figure 1. Experimental Class Histogram and Polygon



Normality Test

Table 5. Liliefors Test Results

Class	α	N	x^2 count	x^2 table	Criteria	Description
Eksperimental	0,05	34	0,1467	0,152	x^2 hitung < x^2 tabel	Normal
Control		34	0,0972			Normal

Value of x^2 count experimental class was 0.1467. While the value of x^2 table on α= 0,05 as well as n = 34 was 0,152. Because of value x^2 count < x^2 table then H_0 was accepted, which

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means that the experimental class can be said to be normally distributed**.** Value of x^2 count control class was equal to 0,0972 and x^2 table on α = 0,05 as well as n = 34 was 0,152. Because value x^2 count < x^2 table then H_0 was accepted so that the data obtained from the control class can be said to have been normally distributed**.**

Homogeneity Test

Table 6. KR-20 Test Results

Class	Number of Samples	*α*	Variance	F_{count}	F_{table}	Criteria	Descriptiom
Eksperimental	34	0,05	57,97	1,6717	1,79	$F_{count}<F_{table}$	Both data are homogeneous
Control	34		96,91				

F_{count} obtained value was 1.6717 while the F_{table} obtained was 1.79 with dk of denominator = 33 and dk of numerator = 33 and = 0.05. The result means that F_{count} = 1,6717 < F_{table} = 1,79, so that the data from the two groups can be said to be homogeneous**.**

Hypothesis Test

Table 7. Results of Hypothesis Testing with t-test

Class	Number of Samples	*A*	Average	S_{gab}	t_{count}	t_{table}
Eksperimental	34	0,05	83,18	8,8	8,97	1,688
Control	34		64,24			

T-test carried out on α = 0,05 and dk = 66 get score t_{count} = 8,97 > t_{table}= 1,688, then H_1 was accepted. So, the researcher concluded the Problem Based Learning model that was applied using the help of Wordwall affected the thematic learning outcomes of the students' science content of SDN Pasir Putih 03 grade IV, mainly on the material of force and motion. This research is in line with Aditya Dewana's (2017) research which explained that the PBL model's influence on the learning outcomes of fourth-grade students at SDN 12 Pontianak with t_{count} =2,314 > t_{table} = 2,012. And the research conducted by Ayu Ade Anjelina Putri et al. (2018) explained that the influence of the PBL model assisted by picture media on the natural science learning outcomes of third-grade primary school students with t_{count} = 4,75 > t_{table} = 2,042.

The results from this study were the influenced of the PBL model assisted by Wordwall media in thematic learning of science content which produced scores above the Minimum Completeness Criteria. Learning outcomes in the experimental class treated as a PBL model assisted by Wordwall media, resulted in an average score of 83.18, which was already above the Minimum Completeness Criteria. While the learning outcomes in the control class that did not receive treatment resulted in a low average score of 64.24, which was still below the Minimum Completeness Criteria. The results above have been proven by calculating the hypothesis using the t-test. Based on the calculation results, it can be proven that the experimental and control classes have different learning outcomes in science after being given treatment using the PBL model assisted by Wordwall media during the learning process.

The results of this study were supported by Maryana's research (2019), which concluded that the PBL model affected science learning outcomes for class V SD Negeri 35 Palembang with the results of sig. (2 tailed) of 0.000 < 0.05. Another study from Ana Fitriana et al. (2022) concluded that the PBL model's effect on science learning outcomes for class V SD Sumur Welut III by obtaining a sig value. (2 tailed) of 0.003 < 0.05.

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Conclusion

This study found that the PBL model assisted by Wordwall media significantly affected the science learning outcomes of fourth-grade students on the theme of force and motion eight at SDN Pasir Putih 03, so it could be concluded that H_1 was accepted. This was proven based on the mean obtained by the experimental class that received treatment at the post-test score > the control class score without treatment, which was 83.18 > 64.24, and the t-test value of the post-test score of the class, which was the score $t_{count} > t_{table}$. (8.97 > 1.688).

Recommendation

Referring to the findings of this study, the recommendations submitted include the following: (1) it is hoped that teachers can develop the teaching and learning process by utilizing the PBL model in all lessons, not only limited to science, which is varied with teaching materials and learning media that are fun and creative so that teachers can focus their learning on students. (2) it is hoped that students can practice harder to solve a problem in everyday life or problems. Moreover, it would be more independent in learning activities by actively asking the teacher and discussing with friends in class to make it easier for students to understand the concepts and materials, especially science subjects. (3) it is hoped that the school can provide support, motivation, and guidance to teachers so that they can use the 21st-century learning model and vary it with learning media that attract students' attention. It is also hoped that the school will provide adequate learning tools and media.

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