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The Influence of the Problem Based Learning Model Assisted by Powtoon Media on Science Learning Interest and Outcomes

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A B S T R A C T

This study aims to determine the influence of the problem based learning model assisted by powtoon media on science learning interest and outcomes of fifth grade students in cluster I, Rumbia District. This quantitative study employed a quasi-experimental design. The design used was a quasi-nonequivalent control group design. The sampling technique used was random sampling. This design aimed to determine the effect between the experimental and control classes by administering a pretest and posttest. The population in this study were fifth-grade students in Cluster I, Rumbia District. Data collection techniques used questionnaires and tests. The data analysis techniques used were independent sample t-test and MANOVA which had previously tested the prerequisites for normality and homogeneity. Based on the results of the independent sample t-test, the sig. value was 0.000 <0.05, thus H0 was rejected and H1 was accepted. In the MANOVA test results, the sig. value was 0.000 <0.05, thus H0 was rejected and H1 was accepted, meaning that there was an influence of the problem-based model assisted by powtoon media on the interests and learning outcomes of fifth-grade students in science.

1. Introduction

Education is crucial in shaping the whole person to educate and improve the nation. Based on the regulation of the Minister of Education and Culture of the Republic of Indonesia Number 22 of 2016 concerning learning process standards, learning should be organized that activates students to learn, inspires, engages, improves problem-solving skills, motivates, and facilitates all their potentials by paying attention to their physical and mental development (Permendikbud, No. 22 of 2016).

Science education emphasizes providing hands-on experiences to develop competencies that enable students to explore and understand the natural world scientifically. Science education is geared toward "finding out" and "doing," thus

helping students gain a deeper understanding of the natural world, Sumanto (Sitiatava, 2013).

The concept of science learning is not significantly different from other learning concepts, only the emphasis must be on the essence of science learning itself. Science learning must be a scientific process. Science learning cannot be done through memorization or passively listening to teachers explain concepts; students must actively engage in learning through experimentation, observation, and experimentation. Learning strategies that actively involve students, including experiments, observations, and conversations, help build understanding of science concepts (Sanjaya, 2019). Natural science is the science of natural phenomena expressed in the form of facts, concepts, principles, and laws whose truth has been tested and carried out through a series of activities in the scientific method (Kusumawati, 2022).

Based on the results of initial observations conducted at elementary schools in Cluster 1, Rumbia District, Jenenponto Regency, it was found that some students appeared less interested during science lessons. This was evidenced by students' behavior of talking with friends or being engrossed in the activities they were doing, students did not pay attention to the teacher's explanations. This condition was suspected because students felt bored with the use of conventional methods used by teachers during science lessons. The method usually used by teachers in science lessons in the classroom is the lecture method. Many students' learning outcomes have not yet reached the KKM set by the school. Low interest can cause students to not actively participate in learning activities, low involvement will hinder the process of understanding the material and ultimately affect learning outcomes.

Interest is a natural desire that arises within a person without any pressure. Interest is a crucial aspect of life. It's the tendency that drives a person to excel in various things or fields they enjoy and pursue without coercion from others (Prayunisa & Marzuki, 2024). Interest is one of the supporting components for students to be able to achieve maximum learning outcomes in a subject (Febiwanty & Mustika, 2024). Learning outcomes are the results achieved by students through their learning activities during the teaching and learning process. Therefore, the success or failure of a lesson can only be determined through learning. Learning outcomes play a crucial role in the learning process, as they can be used to determine students' abilities (Handayani & Nilamsari, 2023). Learning outcomes are clear statements that demonstrate the performance, skills, and knowledge of a particular student, as expected to be achieved as a result of learning (Buaton, 2021).

One suitable approach to addressing the aforementioned issues is the problem-based learning model, often referred to as problem-based learning, using interactive learning media such as Powtoon. The problem-based learning model is faced with a real problem that encourages students to research, describe, and find solutions related to real life realities so that students not only learn theoretically but can also experience and feel directly through practice (Widiasworo, 2017).

Problem-based learning is a learning environment that utilizes problems as learning tools before learning anything. Students are required to identify a problem, either a real-life problem or a case study. Problem-based learning is a learning model that can stimulate students to be more active and think critically, developing their knowledge and experience to solve problems directly in contextual learning. The problem-based learning model is a learning model that involves students in solving a problem through scientific method stages so that students can gain knowledge and problem-solving skills (Ngalimun, 2014).

Powtoon is an online web application program that can be used to create animated videos and help teachers present material that students find difficult to understand. It is a web-based software that helps create engaging animated videos, including text animations, cartoon animations, more lively transition effects, and an easy-to-use timeline (Marta et al., 2023). Animated video software is a learning aid presented by teachers to students in the form of animated moving images and sound. The Powtoon application can help teachers create animated videos using the provided features, tailored to students' needs (Wulandari et al., 2020). Based on the explanation above, the researcher is interested in conducting a study aimed at determining the effect of the problem-based learning model assisted by Powtoon media on students' interest and learning outcomes in science.

2. Methodology

Research Design and Type

The researcher used a quantitative approach with a quasi-experimental design. The design used was a nonequivalent control group. A quasi-experimental design involves treating two research groups differently. The study consisted of two groups: the first group received a problem-based learning model assisted by Powtoon media, called the experimental class, and the second group received conventional learning and was called the control class.

Sample

The sampling technique in this study was random sampling. Random sampling is a random sampling technique. In statistics, a sample itself is a small part that represents a larger group or whole. The sample in this study was 40 fifth-grade students of Cluster 1, Rumbia District, consisting of 2 schools: 20 fifth-grade students from UPT SD Negeri 10 as the control class and 20 fifth-grade students from UPT SD Negeri 11 Rumbia as the experimental class.

Experimental Set-Up

This study was conducted to determine the effect of problem-based learning model assisted by powtoon media on the interest and learning outcomes of science concepts of the human respiratory system of fifth-grade students in Cluster I, Rumbia District, Jeneponto Regency. The study was conducted for 5 meetings, the

first meeting was a pretest, meetings 2, 3, 4 were conducting learning, and the fifth meeting was a posttest. The experimental class used a problem-based learning model assisted by powtoon media and the control class used conventional learning. The data used in this study were obtained through test data (pretest and posttest). Learning Outcome Test

Research Instruments

Learning outcome test to determine students' learning abilities using the problem-based learning model with the aid of Powtoon media, the author used a written test consisting of 10 descriptive questions. The questions used in the control and experimental classes were the same type. Student learning completion can be achieved if the student's score meets the minimum passing grade (KKM) set by the school, which is 70. Student learning outcomes are considered effective if the average student's learning achieves the KKM in science. Learning interest questionnaire was used to determine students' learning interests in fifth-grade science. The total number of questions in this study was 24, as explained in the table. The questionnaires used in the control and experimental classes were administered after the treatment.

Statistical Analysis

Inferential statistical analysis is intended to test research hypotheses. Before conducting hypothesis testing, data normality and homogeneity tests are first performed. Inferential statistical analysis is intended to test the research hypothesis. Before conducting the hypothesis testing, data normality and homogeneity tests are first carried out. In hypothesis testing, an independent sample t-test is used to determine whether there is a difference in the mean between 2 populations by comparing the two sample means. Decision making is seen from the significance level p (Sig (2-tailed)). If $p>0.05$ then H_0 is accepted and if $p<0.05$ then H_0 is rejected and H_1 is accepted.

In this test, MANOVA (Multivariate Analysis of Variance) test is also carried out, which is a multivariate statistical analysis used in analyzing more than one dependent variable to determine whether the group averages are significantly different. Multivariate analysis of variance with the help of the SPSS 25 program. The data used in the analysis are data from interest tests and learning outcomes consisting of control and experimental classes. The criteria in making this decision are if the sig value <0.05 then H_0 is rejected and H_1 is accepted and if the sig value$>$ 0.05 then H_0 is accepted and H_1 is rejected.

3. Results and Discussion

This research was conducted in two classes, each consisting of 20 students. The control class consisted of 9 female students and 11 male students, while the experimental class consisted of 10 female students and 10 male students. The experimental class used a problem-based learning model assisted by powtoon

media and the control class used conventional learning. The data used in this study were obtained through test data (pretest and posttest). This research was conducted for five meetings in the control class and the experimental class. For the control class, at the first meeting, students were given a pretest to determine students' initial abilities and the second to fourth learning was given treatment with conventional learning in science lessons, the fifth meeting students were given a posttest to determine students' abilities after being given conventional learning. Research in the experimental class was also conducted for five meetings for the first meeting a pretest was given, the second to fourth meetings were given treatment with a problem-based learning model assisted by powtoon media, and at the fifth meeting students were given a posttest to determine students' interests and learning outcomes after learning using the problem-based learning model assisted by powtoon media.

The Powtoon media used in this study is an animated learning video designed to support the implementation of problem-based learning models in science subjects. This video presents lesson material, complemented by animated illustrations, voice-over narration, and explanatory text to engage students. Through dynamic visual displays and an interactive storyline, Powtoon helps students understand scientific concepts more concretely and encourages critical thinking in solving the problems presented. This media is also designed with consideration for the appropriateness of the material, duration, and presentation style for effective use. Powtoon helps teachers deliver material systematically and efficiently. Students can learn through a fun and meaningful visual experience. This media also enables independent learning because it can be accessed again by students. An engaging and interactive design can increase student interest and learning outcomes in the learning process. The following is a display of the Powtoon media used in the problem-based science learning process in this study, which features a combination of animation, text, and narration as a means of delivering the material.

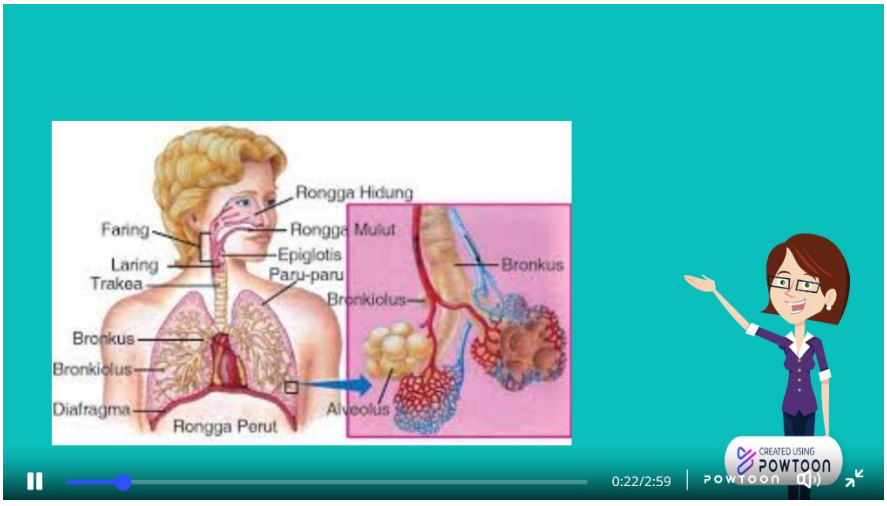

Figure 1. Display of Powtoon media used in science learning

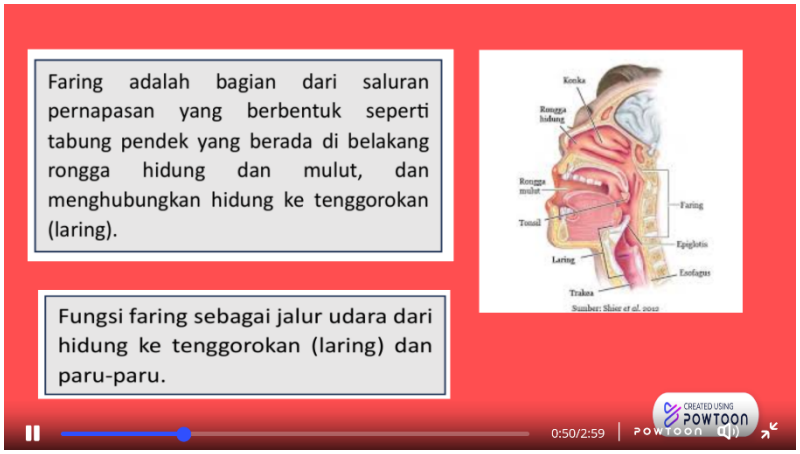

Figure 2. Display of Powtoon media used in science learning

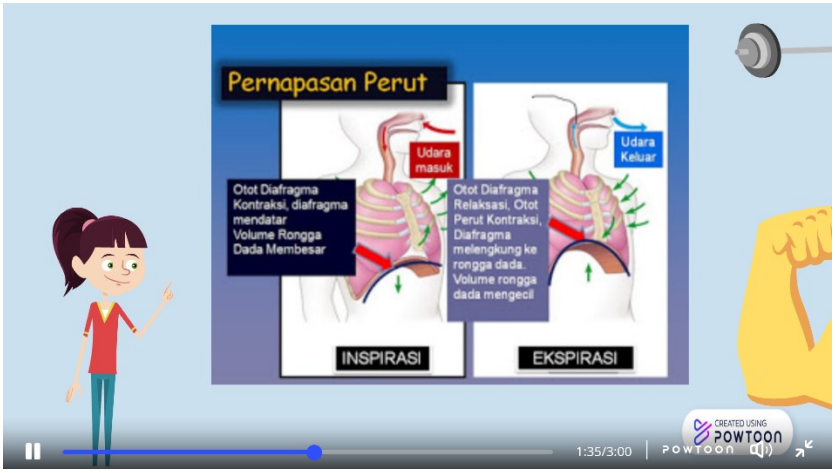

Figure 3. Display of Powtoon media used in science learning

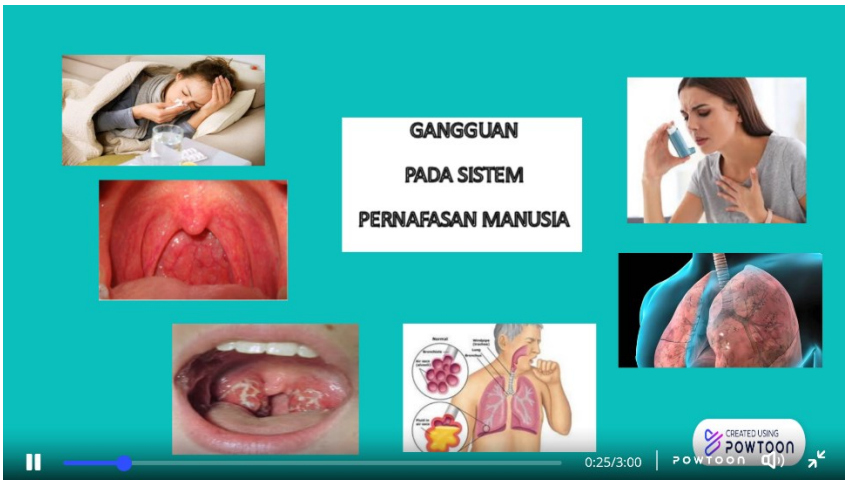

Figure 4. Display of Powtoon media used in science learning

This study found that the pretest results for students in the control class showed a generally low level of interest in learning, with an average score of 60.45. After participating in the conventional learning process, the posttest showed that the average student interest score was still low, with students only achieving a score of 69.45 on the learning interest questionnaire. This indicates that they were still in the low learning interest category. Meanwhile, in the experimental class, the pretest results showed an average student interest score of 60.10, also considered low. Students then participated in learning using the problem-based learning model assisted by Powtoon media. A posttest was given to evaluate student interest after the treatment, and the results showed an increase, with a posttest score of 88.25. Student interest in the control class after conventional learning remained low, while in the experimental class, after the implementation of the problem-based learning model assisted by Powtoon media, the average student interest increased to the high category. The results of this study indicate that the use of the problem-based learning model assisted by Powtoon media has a positive impact on student interest in learning. Student learning interest data was tested using descriptive statistics with the help of SPSS 25. Statistical data on students' learning interests in the control class can be seen in the following table.

Table 1 Statistical Data on Learning Interest of Control Class Students

Descriptive Statistics						
	N	**Minimum**	**Maximum**	**Sum**	**Mean**	**Std. Deviation**
Pretest Control	20	50	70	1209	60.45	4.161
Posttest Control	20	64	77	1389	69.45	3.395
Valid N (listwise)	20					

Based on the results of descriptive statistical analysis of the learning interest of control class students, it shows that the average pretest score obtained was 60.45. The minimum score was 50 and the maximum was 70 with a range of 20. The total score collected from all students was 1,209. Meanwhile, the posttest results showed that the average score of students' learning interest increased to 69.45. The minimum score on the posttest was 64 and the maximum score was 77, with a range of 13. The total score obtained by students on the posttest was 1,389. Despite the increase in the average posttest score, the conventional learning model has not yet reached the minimum completeness criteria (KKM) set at 70. Statistical data on the learning interests of students in the experimental class can be seen in the following table.

Table 2. Statistical Data on Learning Interest of Experimental Class Students

Descriptive Statistics						
	N	**Minimum**	**Maximum**	**Sum**	**Mean**	**Std. Deviation**
Pretest Eksperiment	20	50	70	1202	60.10	4.756
Posttest Eksperiment	20	78	97	1765	88.25	4.471
Valid N (listwise)	20					

The results of statistical analysis of the learning interest of students in the experimental class who participated in learning with the problem-based learning

model showed a significant increase. The average pretest score for students' learning interest was 60.10. The minimum score obtained by students was 50 and the maximum was 70, indicating that most students had low learning interest. After learning with the problem-based learning model, the posttest score increased to an average of 88.25, indicating that students became more evenly distributed. The minimum score increased to 78 and the maximum reached 97. This increase indicates that the problem-based learning model is able to increase students' learning interest.

Based on the prerequisite tests, namely the normality test and the homogeneity test, which are fulfilled and the data is concluded to be normal and homogeneous, the next step is to conduct a t-test to test the hypothesis. This test is used to make a decision whether the research hypothesis is accepted or rejected. If the probability value (p) is > 0.05, then H_0 is accepted, and if the probability value (p) is <0.05, then H_1 is accepted. The results of the independent sample t-test can be seen in the following table.

Tabel 3. Independent samples t- test

Independent Samples Test					
		t-test for Equality of Means			
		T	Df	Sig. (2-tailed)	Mean Difference
Minat Belajar	Equal variances assumed	-14.978	38	.000	-18.800
	Equal variances not assumed	-14.978	35.443	.000	-18.800

Based on the results of the independent samples t-test on student learning interest, the calculated t value was -14.978 with a degree of freedom (df) of 38. The t table value at a significance level of 0.05 (two-tailed) with df = 38 was ±2.024. The calculated t value of 14.978 > the t table value of 2.024 indicates a significant difference between the two groups, confirming that H1 is accepted and H0 is rejected. Furthermore, the 2-tailed significance value (Sig.) was 0.000, which is less than 0.05.

This significance value is much less than 0.05, indicating a significant difference between the average learning interest of students in the experimental and control classes. The average learning interest of students in the experimental class was higher than that of the control class, with an average difference of -18.800. Students in the experimental class who were given treatment using the problem-based learning model assisted by powtoon media had significantly higher learning interest compared to students in the control class who learned using the conventional learning model. This shows that H_0 is rejected and H_1 is accepted so it can be concluded that there is an influence of the problem-based learning model assisted by powtoon media on the interest in learning science in grade V students of cluster 1, Rumbia District.

This research is in line with the research conducted by (Sari et al. 2024) with the title "Effectiveness of Problem Based Learning Model on Interest in Learning

Science in Grade V Elementary School" Showing that the use of problem based learning model is effective in the subject of Science in grade V. This is supported by the results of the hypothesis test obtained t count 8.011> t table value 2.059 so that Ha is accepted and H0 is rejected because there is a significant average on learning interest and cognitive learning outcomes of students in the pretest and posttest.

Based on student learning outcomes data in the control class, the pretest totaled 1122 with an average of 56.10, and the posttest totaled 1291 with an average of 64.55. Meanwhile, in the experimental class, the pretest totaled 11 with an average of 55.30. The posttest totaled 1674 with an average of 83.70. The following descriptive statistical test was performed using SPSS 25. Statistical data on the learning outcomes of students in the control class can be seen in the following table.

Table 4. Statistical Data on Student Learning Outcomes in the Control Class

Descriptive Statistics						
	N	**Minimum**	**Maximum**	**Sum**	**Mean**	**Std. Deviation**
Pretest Kontrol	20	48	70	1122	56.10	6.332
Posttest Kontrol	20	55	78	1291	64.55	6.917
Valid N (listwise)	20					

Based on the results of descriptive statistics, it is known that the number of students in the control class is 20 people. The pretest score shows a minimum score of 48 and a maximum of 70, with a total score of 1122 and an average of 56.10 and a standard deviation of 6.332. Meanwhile, the posttest score in the control class has a minimum score of 55 and a maximum of 78, with a total score of 1291 and an average of 64.55, a standard deviation of 6.917. Although there is an increase in the average score, in general the posttest score is still below the KKM of 70. Statistical data on the learning outcomes of students in the experimental class can be seen in the following table.

Table 5 Statistical Data on Student Learning Outcomes in the Experimental Class

Descriptive Statistics						
	N	**Minimum**	**Maximum**	**Sum**	**Mean**	**Std. Deviation**
Pretest Eksperimen	20	48	70	1106	55.30	5.648
Posttest Eksperimen	20	75	95	1674	83.70	5.469
Valid N (listwise)	20					

Based on descriptive statistical data of 20 experimental class students. At the time of the pretest, the minimum score of students was 48 and the maximum score was 70 with a total score of 1106. The average pretest score was 55.30 with a standard deviation of 5.648. After the learning process with the problem-based learning model assisted by powtoon media, students underwent a posttest with results showing a significant increase. The minimum posttest score was 75, the maximum score was 95 with a total score of 1674. The average score increased to 83.70 with a standard deviation of 5.469. In general, this data shows that the problem-based learning model assisted by powtoon media can improve student learning outcomes,

this is indicated by increasing the average score and range of student scores, even students with minimum scores managed to meet the minimum completeness limit.

Based on the prerequisite tests, namely the normality test and the homogeneity test, which are met and the learning outcome data is concluded to be normal and homogeneous, the next step is to conduct a t-test to test the hypothesis. This test is used to make a decision whether the research hypothesis is accepted or rejected. If the probability value (p) is > 0.05, then H_0 is accepted, and if the probability value (p) is <0.05, then H_1 is accepted. The results of the independent sample t-test can be seen in the following table.

Tabel 6 Independent samples t- test

Independent Samples Test					
		t-test for Equality of Means			
		T	Df	Sig. (2-tailed)	Mean Difference
Learning outcomes	Equal variances assumed	-9.713	38	.000	-19.150
	Equal variances not assumed	-9.713	36.080	.000	-19.150

Based on the results of the independent samples t-test on student learning outcomes, the t-count value was obtained at -9.713 with a degree of freedom (df) of 38. The t-table value at a significance level of 0.05 (two-tailed) with df = 38 was ±2.024. The t-count value of 9.713 > t-table value of 2.024, thus there is a significant difference between the two groups being compared and it can be stated that H1 is accepted and H0 is rejected. In addition, it can also be seen from the significance value (Sig. 2-tailed) which is 0.000 which means it is smaller than 0.05. Therefore, it can be concluded that there is an influence of the problem-based learning model assisted by Powtoon media on the science learning outcomes of fifth-grade students in Cluster 1, Rumbia District.

This research is in line with the research conducted by (Zulfa et al. 2023) with the title "The Effect of Problem Based Learning (PBL) Model on Science Learning Outcomes of Elementary School Students" Based on the results of data processing, the significance value (2-tailed) is 0.000 <0.05. With the decision-making criteria obtained, there is an influence of the use of problem-based learning models on the science learning outcomes of fifth-grade elementary school students. In this study, the MANOVA test was used to determine the effect of the problem-based learning model on the interests and science learning outcomes of class V students in cluster 1, Rumbia District. The multivariate test results data can be seen in the following table.

Tabel 7. Multivariate Tests[a]

Multivariate Tests[a]						
Effect		Value	F	Hypothesis df	Error df	Sig.
Intercept	Pillai's Trace	.998	7686.365[b]	2.000	37.000	.000
	Wilks' Lambda	.002	7686.365[b]	2.000	37.000	.000
	Hotelling's Trace	415.479	7686.365[b]	2.000	37.000	.000
	Roy's Largest Root	415.479	7686.365[b]	2.000	37.000	.000

Kelas	Pillai's Trace	.856	109.854[b]	2.000	37.000	.000
	Wilks' Lambda	.144	109.854[b]	2.000	37.000	.000
	Hotelling's Trace	5.938	109.854[b]	2.000	37.000	.000
	Roy's Largest Root	5.938	109.854[b]	2.000	37.000	.000

a. Design: Intercept + Kelas
b. Exact statistic

Based on the table above shows the results of the Multivariate significance test that the F class for pillae trace, wilk lambda, hotelling's trace, and roy's larget root has a value of 109.854 with a significance value of 0.000. This shows that F for pillae trace, wilk lambda, hotelling's trace, and roy's larget root are all significant 0.000 <0.05, meaning H0 is rejected and H1 is accepted, so it can be concluded that there is a significant influence of the problem based learning model assisted by powtoon media on the interests and learning outcomes of science students of Class V cluster 1, Rumbia District.

4. Conclusion

Based on the analysis, it can be concluded that there are clear differences between students learning using conventional learning models and those learning using the Problem-Based Learning model with the aid of Powtoon. These differences include improvements in both learning interest and learning outcomes in science subjects. The application of the Problem-Based Learning model combined with Powtoon has been proven to create a more engaging, interactive, and meaningful learning environment for students. Students become more active in the learning process, more interested in participating in learning activities, and more easily understand the material because it is presented in a fun, animated format. Therefore, the use of the Problem-Based Learning model with the aid of Powtoon can be used as an effective alternative learning strategy to improve the quality of learning. This is highly relevant for fifth-grade students, particularly in Cluster I of Rumbia District, to encourage increased student interest and optimal learning outcomes.

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