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Application of Scientific Approach Assisted by Baamboozle to Improve Cognitive Learning Outcomes On Substance Pressure Material for Class VIII SMP

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Abstract- This research aims to describe the improvement in students' cognitive learning outcomes through the application of a scientific approach assisted by baamboozle in substance pressure material in class VIII SMP and to determine the differences in students' cognitive learning outcomes between classes that apply a scientific approach assisted by bamboozle and classes that apply conventional learning on substance pressure material in class VIII SMP. The type of research used is a quasi experiment with a nonequivalent posttest only control group design. This research was conducted at SMPN 20 Pekanbaru in the even semester of the 2023/2024 academic year. The samples in this research were class VIII 7 as the experimental class and VIII 6 as the control class. The research instrument was in the form of written questions consisting of 10 multiple-choice questions that were adjusted to the revised Bloom's taxonomy. The posttest of cognitive learning outcomes was carried out after learning the material on substance pressure in both classes. The posttest cognitive learning data were then analyzed descriptively and inferentially. The results of data processing showed that the average learning outcomes of the experimental class were 70.49 (good category) and the average learning outcomes of the control class were 59.25 (pretty good category). Inferential analysis showed that there was a significant difference between the class that implemented the scientific approach assisted by bamboozle and the class that implemented conventional learning.

Keywords: *Cognitive Learning Outcomes, Scientific Approach, Baamboozle, Substance Pressure*

1 Introduction

Education is a human nature that exists from generation to generation throughout the existence of human life. The fundamental goal in education is to develop innovative capacity so that all changes that are beneficial to the resilience and progress of life can be realized. So that in the educational process is centered on the development of 3 psychological potentials including: rasa, cipta and karsa. Thus, there are certain expectations whose direction is aimed at spiritual, moral and intellectual intelligence (Zulkifli Musthan, 2015).

Physical science learning is one of the main elements in the development and realization of science and technology. Every country is competing to find products, especially the results of science and technology. Science and technology cannot be separated from one of the main elements, namely physics, which is beneficial for technological development. Physics is also part of education for all students. Thus physics has a very important role (Ariani and Agustini, 2018). Science learning is also expected to provide skills (psychomotor), scientific attitude abilities (affective), understanding, habits and appreciation in finding

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answers to problems. Because these characteristics are what distinguish it from other learning (Niki Dian Permana, Azhar, and Ika Desianna, 2023).

Indonesia's success in improving knowledge in the Education 4.0 era is determined by the quality of teachers. Teachers must have expertise, be able to adapt to new technologies, and be ready to face global challenges. Therefore, schools must prepare themselves for new literacy and data literacy in education, namely the ability to read, analyze and use information from data in the digital world. In addition, teachers must be able to use digital learning media and assess student learning outcomes properly (Azhar, 2022).

Teacher-centered learning can make students passive, bored, and lack of interest in the learning process so that it is very difficult to achieve learning objectives. Currently, there are still many teachers who use the lecture method in teaching and learning activities, and the current learning system still makes teachers the center of learning, not students (Wijayanti, et al., 2024).

The results of observations and interviews with teachers of SMP Negeri 20 Pekanbaru, it was found that in general, science learning in schools still uses conventional teacher-centered learning methods that make students less active in the learning process. In addition, teachers also rarely use interesting learning media. This makes students less interested and easily bored during learning, so that many of the students have difficulty understanding science lessons. Therefore, teachers need to create a learning atmosphere in the classroom that is interesting and fun so that students' learning outcomes can be better. The lack of learning information sources can hinder the achievement of the objectives of the learning process, for this reason a strategy is needed in the learning process including choosing the right learning model by utilizing interactive learning media as a tool in delivering it.

Quality learning can be achieved by teachers need to have creative teaching strategies and techniques so that the presentation of learning materials can be interesting, fun and enjoyable for students. Therefore, in the learning process, teachers need to have the right learning strategy to increase activity and improve students' learning outcomes. The accuracy of the teacher in varying learning strategies in the delivery of material will be able to stimulate students to be involved in the learning process. The learning process can be said to be successful when students achieve the expected competencies. This is a reflection of the student's ability to master a material (Delta Apriani, et al., 2017).

Rianti and Dibia (2020) in determining science learning media at school, the right approach is needed according to the characteristics of students. One way to optimize students' concentration on learning science is by applying an approach that is appropriate to the ongoing learning process. Through the application of the scientific approach, the central role of the teacher can be minimized because all students will be involved in solving the problems given by the teacher (Anindyta and Suwarjo in Pinatih and Putra, 2021).

According to Chriswanti (2016) the scientific approach is a learning approach where students play an active role in the process. The acquisition processing skills used by students will be able to find and develop their own facts and concepts as well as foster and develop attitudes and values. From these theories, it can be concluded that learning using a scientific approach can help teachers provide understanding to students to know, understand, and practice what is being studied scientifically (Humaira, 2021).

Suitable learning media is needed in realizing the teaching and learning process which has a good impact on student learning outcomes (Indriani, et al., 2024). Learning media is a communication tool that can convey material and concepts during learning activities. Learning media lays concrete foundations for thinking and accelerates the teaching and learning process. Students really need learning media in science subjects, because in general students are very difficult to understand and evaluate a lesson discussed. The more students understand a concept of the lesson, the goal of quality education is achieved (Sumiharsono, 2017).

One of the current interactive learning media is baamboozle. Baamboozle is a web-based educational game that can be used in groups with games in the form of quizzes. In this game, educators can create their own games through the website directly according to the learning objectives. Using points as a benchmark

for students in understanding learning will make them more active in interacting while providing an evaluation in the delivery of material (Yuniar, et al., 2023).

Based on the description of the problem above, the researcher is interested in conducting research with the title "Application of the Scientific Approach Assisted by Baamboozle to Improve Cognitive Learning Outcomes on Substance Pressure Material Class VIII SMP".

2 Research Metodology

2.1 Research Type

The type of research used in this study is quasi experiment research. The design used in this research is nonequivalent posttest only control group design. The research design of nonequivalent posttest only control group design can be seen in Table 1.

Table 1: Research Desain

Group	Treatment	Posttest
Experiment	X	Y
Control	-	Y

Source: (Rukminingsih., et al., 2020)

Description:
X = Treatment using a scientific approach assisted by baamboozle
Y = Posttest of experimental class and control class

2.2 Time and Place

This research was conducted in one of the Junior High Schools in Pekanbaru City, namely SMP Negeri 20 Pekanbaru. The implementation time is the even semester of the 2023/2024 academic year.

2.3 Research Subject

The population in this study were all VIII grade students of SMPN 20 Pekanbaru which amounted to 322 people. The sample of this study was class VIII 7 as the experimental class and VIII 6 as the control class with a total of 81 students.

2.4 Data Collection Method

The data collection method used in this study is a written test with multiple choice questions. This test was given to both classes, namely experimental and control classes after the end of the meeting of substance pressure material. The results of the data obtained from the written test become primary data. Giving this posttest aims to determine the improvement of students' learning outcomes in the cognitive domain for substance pressure material.

2.5 Research Instrument

The research instrument used in this study was a written test on substance pressure material to assess student learning outcomes in the cognitive domain. This test amounted to 10 multiple choice questions. Making questions in this cognitive domain, adjusted to the level of Bloom's taxonomy.

2.6 Data Analysis Technique

The data analysis techniques that will be used are descriptive analysis techniques and inferential analysis techniques. Descriptive analysis is used to describe the data that has been collected as it is without intending to make general conclusions or generalizations (Sutisna, 2020). In this research, descriptive analysis techniques were used to obtain a comparison of the cognitive learning outcomes of students before treatment and after treatment and to obtain differences in student learning outcomes between classes using a scientific approach assisted by baamboozle and classes using conventional learning, where this difference

was obtained from comparing the average score obtained between the experimental class and the control class without the need to test its significance. Assessment of posttest cognitive learning outcomes is by using the following equation:

$$\textbf{Cognitive Test Score} = \frac{\textbf{score obtained by the student}}{\textbf{maximum score}} \times \textbf{100\%} \quad (\textbf{3.1})$$

The average cognitive learning outcomes of students are then categorized into the classification of very good, good, pretty good, and not good. The predicate interval for student learning outcomes can be seen in Table 2.

Table 2: Categories of Students' Cognitive Learning Outcomes

Intervals	Category
$85 \leq X \leq 100$	Very Good
$70 \leq X < 85$	Good
$50 \leq X < 70$	Pretty Good
$X < 50$	Not Good

Source: (Elyana, dkk.,2017)

Inferential analysis in this research is needed to be able to determine the differences in cognitive learning outcomes of students after applying learning using a scientific approach assisted by baamboozle in experimental classes and conventional learning models in control classes through hypothesis testing. Data must pass the prerequisite test first, namely the normality test and homogeneity test to be able to conclude whether the research has success or not.

3 Results and Discussion

The research took place by applying the scientific approach assisted by baamboozle in the experimental class and conventional learning in the control class. The learning process took place in each class for five meetings. In the experimental class, students were given group assignments in the form of LKPD at each meeting, then given a quiz using the baamboozle game. At the end of learning, both classes were given a posttest using the same questions. The posttest aims to see how the learning outcomes of students in the experimental class and control class.

3.1 Descriptive Analysis Results

Cognitive learning outcomes data used in this study are the results of the posttest of substance pressure material after applying the scientific approach aided by baamboozle in class VIII 7 and conventional learning in class VIII 6. Based on the data on cognitive learning outcomes obtained, the cognitive learning outcomes for each category on substance pressure material in the experimental class with the application of the scientific approach aided by baamboozle and in the control class with the application of conventional learning can be seen in Table 3.

Table 3: Students' Cognitive Learning Outcomes

Interval Score	Category	Experimental Class		Control Class	
		Number of Students	Percentage (%)	Number of Students	Percentage (%)
$85 \leq x \leq 100$	Very Good	8	19,5	3	7,5
$70 \leq x \leq 85$	Good	18	43,9	11	27,5
$50 \leq x < 70$	Pretty Good	13	31,7	18	45
$x < 50$	Not Good	2	4,9	8	20
Average of Class		70,49		59,25	
Category		Good		Pretty Good	

Based on Table 3, it can be seen that there is a difference in the percentage of students' cognitive learning outcomes in the experimental class that applies the scientific approach assisted by baamboozle with the control class that applies conventional learning. In the experimental class, the average cognitive learning outcomes were 70.49 with a good category and in the control class it was 59.25 with a pretty good category. This indicated that the average cognitive learning outcomes of students on substance pressure material had a difference, with the experimental class having a greater average learning outcome compared to the control class. The data on student cognitive learning outcomes in each cognitive domain for experimental and control classes can be seen in Figure 1.

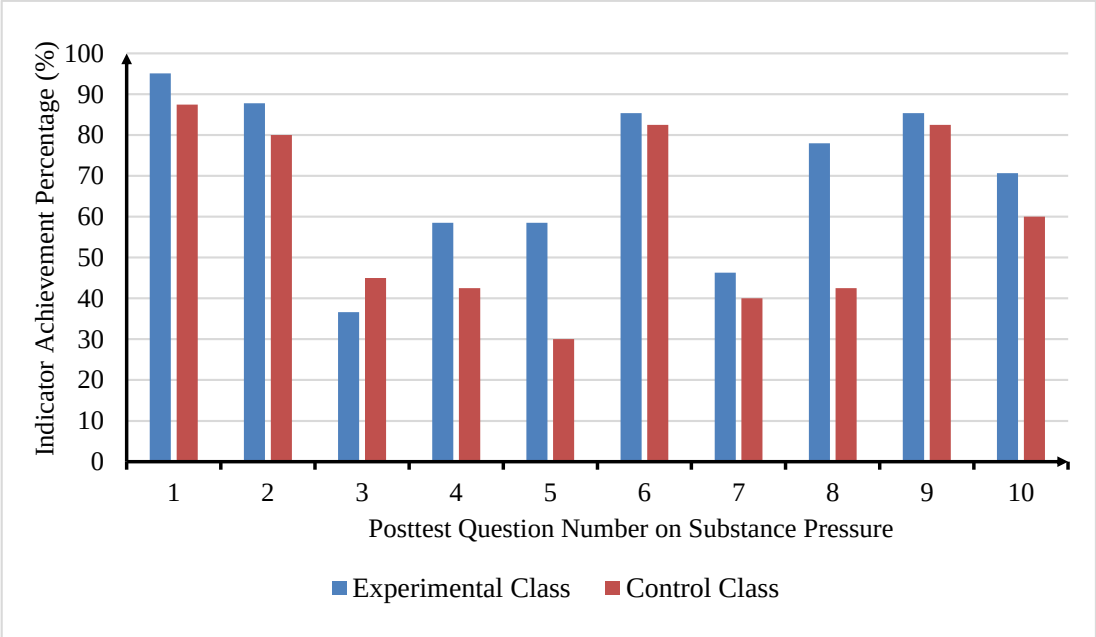

Figure 1: Comparison Chart of Cognitive Learning Outcomes for Each Indicator

Based on the graph in Figure 1, it can be seen the difference in the percentage of achievement of each indicator in the experimental class and control class. The difference in the achievement of learning outcomes is due to learning in experimental classes applying a scientific approach that provides opportunities for students to be more active in the learning process so that it can improve the ability of students to observe, ask, reason and communicate the knowledge gained from the learning process. This is in line with research conducted by Sukini (2019) that the application of the scientific approach taught to students makes students more active and shows good learning outcomes, where there is a real increase in student learning outcomes. This is in line with research conducted by Rica Ardiani, Azhar and Zulhelmi (2024) that there are significant differences in students' cognitive learning outcomes between experimental classes that apply a scientific approach assisted by hydrostatics and heat KIT and control classes that apply conventional learning because the application of a scientific approach assisted by hydrostatics and heat KIT in experimental classes has a positive effect on students' cognitive learning outcomes and is able to improve

students' cognitive learning outcomes. This is in line with research conducted by Sri Indarti (2019), the results of which showed that the application of a scientific approach to the discovery learning model in learning science on the material of balance and rotational dynamics in class VIII can improve the activities and learning outcomes of students.

In addition, the use of baamboozle educational game media also affects the improvement of student learning outcomes. This is in line with research conducted by Khamilatun Azizah, Anselmus Sudirman and Sri Mawarti (2024) that through the baamboozle media platform, students' science learning motivation increased significantly by 19%. This shows that the use of bamboozle is effective in increasing students' learning motivation so that it also affects students' learning outcomes. This is in line with research conducted by Maulana Murti, Mudeing Jais, Firdaus Rahim (2023) showing that in learning using Baamboozle media there is an increase in learning outcomes so that it can be used as a learning media that can increase the activeness and enthusiasm of students and provide a positive response to the learning media used. The same thing was also found by Deandra Khoiro Madini, Ami Samsiah and Haryono (2023) that Bamboozle learning media has a significant impact in increasing students' interest and motivation to learn. This shows the importance of using interesting and interactive learning methods and media to achieve better learning outcomes.

Based on the learning outcomes at the C2, C3 and C4 Bloom taxonomy levels that have been described, overall the experimental class has a higher average than the control class. The difference in learning outcomes between the experimental class and the control class is due to the different learning processes experienced by students, as well as the different abilities of each student in receiving and absorbing learning materials and the level of difficulty of the questions for each child that is not the same between experimental and control class students. Other factors are also caused by the level of focus of students which also varies as well as the activeness, motivation and curiosity of students which varies.

3.2 Inferential Analysis Results

Inferential analysis in this research used the help of Statistical Product and Service Solution (SPSS) version 27 software with a confidence level of 95%. The inferential analysis included normality test, homogeneous test and hypothesis testing. The series of inferential analysis can be seen in Table 4.

Tabel 4: Inferential Analysis

Learning Outcomes	Inferential Analysis Type	Group	Test Type	Sig.	Test Results
Substance Pressure	Normality Test	Experiment Control	Kolmogorov Smirnov	0,126 0,081	Normal data Normal data
	Homogeneity Test	Experiment and Control	Levene	0,862	Both classes are homogenous
	Hypothesis Test	Experiment and Control	Independent sample t test	0,003	H_0 is rejected and H_a is accepted

The normality test was carried out with the Kolmogorov-Smirnov test. Based on the output of the Kolmogorov-Smirnov test normality test, the significance value (Sig.) of the experimental class was 0.126 and the control class was 0.081. Both classes obtained a significance value greater than 0.05, which means that the experimental and control classes are normally distributed. Then the homogeneity test was carried out with the Levene test. Based on the Levene test output, the significance result (Sig.) for both classes is 0.862 where 0.862 > 0.05, this means that the two classes have the same variance or homogeneous.

The hypothesis test used in this study was the independent sample t test. Hypothesis testing was conducted to determine whether there was a significant difference in the cognitive learning outcomes of students between the experimental class that applied the scientific approach aided by baamboozle and the control class that applied conventional learning. Based on the output of the independent sample t test, the

significance result is 0.003 where if the significance value < 0.05 then H_0 is rejected and H_a is accepted, so it can be concluded that there is a significant difference in the cognitive learning outcomes of students between the experimental class that applies the scientific approach assisted by baamboozle and the control class that applies conventional learning on substance pressure material.

4 Conclusion

The conclusion obtained was that the cognitive learning outcomes of students in the experimental class who applied the scientific approach aided by baamboozle were better than the cognitive learning outcomes of students in the control class who applied conventional learning. After inferential analysis, it was found that there was a significant difference in students' cognitive learning outcomes between the class that applied the scientific approach assisted by baamboozle and the class that applied conventional learning. The conclusion that can be drawn is that learning with the application of the scientific approach assisted by bamboozle can improve students' cognitive learning outcomes on the material of substance pressure.

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