International Conference on Biology Education, Natural Science, and Technology
Vol. 1 No. 1 (2023)

The Effect of PBL Learning Model Combined with Rewards and Punishment on Science Learning Outcomes

Annisa' Tri Yudhatami*, Djumadi
Biology Education Department, Faculty of Teacher Training and Education, Universitas Muhammadiyah Surakarta.
Jl. A. Yani Tromol Pos I, Pabelan, Kartasura, Surakarta 57162, Jawa Tengah, Indonesia
*Corresponding Author. e-mail address: a420190081@student.ums.ac.id

KEYWORDS:
Learning Outcomes
PBL
Rewards and Punishment

ABSTRACT

This study aims to determine the effect of PBL learning model combined with rewards and punishments on the science learning outcomes of class VII students at SMP Muhammadiyah Sinar Fajar Cawas. This study used an experimental method with a pretest-posttest control group design. This study used a control class (VII As-Syifa) totaling 14 students and an experimental class (VII Al-Qolam) totaling 15 students. The research instrument was in the form of questions and observation sheets. Analysis of learning outcomes data using independent t-test with normality test and homogeneity test. The results of the research show that the three aspects of learning outcomes have an influence on this research. The results of the calculation of cognitive aspects using the independent t-test obtained Sig.(2-tiles) 0.001<with a significance level of 5% so that Ho was rejected and Ha was accepted. The results of the calculation of the affective aspect using the independent t-test obtained Sig.(2-tiles) 0.030<with a significance level of 5% so that Ho is rejected and Ha is accepted. The results of the calculation of the psychomotor aspect using the independent t-test obtained Sig.(2-tiles) 0.000<with a significance level of 5% so that Ho was rejected and Ha was accepted. This means that there is an influence of PBL learning model combined with rewards and punishments on the science learning outcomes of class VII students at SMP Muhammadiyah Sinar Fajar Cawas.

1. INTRODUCTION

Natural Science is a science related to systematically studying the universe (Simanjorang 2018). Science material is applied to all levels of education, one of which is the SMP/MTs education level which is developed and implemented in an integrated manner (Linda et al. 2021) Integrated science is a combination of three basic science fields, namely physics, chemistry and biology (Wibowo et al. 2021). Natural Science occupies a prime position in creating a holistic and general scientific picture of the world (Jumanov 2022) because natural science is not only a collection of natural knowledge that contains facts, concepts, principles, but also contains a process of discovery (Purwanti et al. 2019). So that science requires students to develop knowledge, understanding, experimenting skills, and scientific attitudes such as being honest, this requires interaction between the components of teachers, students, materials to manage learning well (Tegeh et al. 2019).

Based on the results of observations and interviews, SMP Muhammadiyah Sinar Fajar Cawas is one of the private Islamic schools that implements Islamic boarding school-based education with all school activities inseparable from Islamic values (diniyah). This school has problems in the learning process, based on the results of interviews with the VII grade science teacher, the Mathematics subject teacher is used as a temporary substitute teacher as a tutor for

VII grade science subjects. In the learning process the teacher often focuses on the teacher (teacher center) by focusing students on listening, taking notes, memorizing this is done by the teacher because he wants students to understand more about the material being taught, this has proven to result in students becoming bored, lazy, and less active . In the opinion Mabsutsah and Yushardi (2022) the above problems are due to the lack of implementation of science learning in everyday life. The teacher also explained that science subjects are quite difficult material because they require an argument or answer based on facts and processes so that they understand the material. In the opinion Umami (2021) that science subjects are quite difficult subjects because there is a lot of material that requires reasoning and understanding.

Learning is a series of activities, both physical and psychological, that result in changes in behavior so that it requires good learning by providing motivation (Chusin et al. 2021). After receiving the learning experience students will gain the abilities that are given in the form of learning outcomes (Rapiadi 2022). Learning outcomes are related to changes in behavior (Wijayanti and Fauziah 2021). Changes in behavior can be seen through changes in knowledge, attitudes and skills besides that it can be measured by written tests, oral tests, and action tests (Amrah 2019). To obtain more complete information about the pros and cons of developing students' knowledge, an evaluation process by the teacher is needed (Hotimah 2020). Furthermore, these developments can be used as an increase in good development.

Actually, when the learning process takes place the teacher will be faced with a variety of student characteristics, there are students who are able to understand the material well, there are also students who experience problems (Harahap and Nasution 2018). Learning difficulty is a condition where students are hampered in understanding the material, learning difficulties are a condition that occurs a lot in class (Nuraeni and Syihabuddin 2020). So the role of the teacher as a student facilitator is needed in getting to know the character of students (Hakimah 2020). Because knowing and understanding students proves how much teacher competence is in improving the learning process (Riadi 2017). There is a solution in improving the learning process according to Rusmalina and Putra (2015) if in learning students have deficiencies in understanding the material, passive student activities and students have learning difficulties then improving education can be through improving the learning process. These efforts require teachers to play an active, creative and innovative role in conditioning the learning atmosphere so that the learning process can be carried out optimally. Basically the innovations made by the teacher are carried out according to their own technique when educating in the classroom, but the teacher should try innovation so that students' attention is not reduced, concentrated and focused (Abdurazakov and Sohibidavron 2022).

The innovation that can be used is the PBL model combined with the provision of rewards and punishment methods. The PBL model is a learning model that uses authentic problem solving or problems aimed at emphasizing students so that they are able to actively form knowledge or information independently, improve higher-order thinking skills, become independent individuals, and have self-confidence (Rusmalina and Putra 2015). In addition, the PBL learning model itself is a learning model that is able to make problems as material to motivate students to collaborate in groups or individually to solve problems and develop skills to become independent and confident learners (Rosyidah et al. 2019). However, additional ways are needed to motivate students to improve learning outcomes, one of which is to provide a combination of using the reward and punishment method, based on the results of interviews with science teachers and class VII students while teaching science, they have never applied this method, so there is a need for new innovations for the class.

Providing this method will stimulate students to increase motivation so that it affects learning outcomes because students feel cared for so they are motivated to take good actions so they don't get punished (Haris et al. 2021). The combination of the PBL model and the reward and punishment method can influence student learning outcomes to be even better. Based on the problems in this background, the researcher is motivated to conduct research by focusing on the effect of the PBL learning model combined with rewards and punishments on science learning outcomes for class VII students at SMP Muhammadiyah Sinar Fajar Cawas.

2. MATERIALS AND METHODS

This study used an experimental method in the form of true experimental research which is a research design that has the most accurate final results in its application. This design can be carried out with or without a pretest with experiment class research subjects and controls selected randomly (Rapingah et al. 2022). Taking the pretest-posttest control group design classification as said by Yani (2021) this design is similar to the non-equivalent control group design, except that in this study the experimental and control groups were selected randomly or randomly.

The subject of this study took class VII students located at SMP Muhammadiyah Sinar Fajar Cawas. The pretest-posttest control group research design involved two classes, namely class VII As-Syifa as the control class and class VII Al-Qolam as the experimental class.

Table 1. Research Implementation Techniques

Class Category	Pretest	Treatment	Posttest
Control (K1)	O1	P1	O2
Eksperimen (K2)	O1	P2	O2

Information:
K_1 : Control Class (VII As-Syifa)
K_2 : Experiment Class (VII Al-Qolam)
O_1 : Pretest results before treatment
O_2 : Posttest results after treatment
P_1 : Application with conventional learning
P_2 : The application of the PBL learning model is combined with reward and punishment methods **(Tabel 1).**

The sample used for class VII As-Syifa is 14 students and class VII Al-Qolam is 15 students. Both classes were given the same material but different treatment. The control class was given conventional learning treatment and the experimental class was given learning treatment with the PBL learning model combined with the reward and punishment method. The pre-test test is given before the learning takes place and the post-test test is given after the learning given to the two classes ends.

The learning outcomes instrument consists of psychomotor aspects, affective aspects, and cognitive aspects. Affective aspect indicators include mutual cooperation, self-confidence, discipline, and honesty. Psychomotor domain indicators include student preparation, completeness of answers, presentation skills, and skills in making presentation media. The cognitive aspects of students refer to the taxonomic bloom indicators in the form of category questions (C1)

remembering, (C2) understanding, (C3) applying, (C4) analyzing, (C5) evaluating, (C6) creating. The assessment criteria uses a Rubik's Cube with a minimum score of 1 and a maximum score of 4. Score details are (1) score 1 = if the student only has 1 aspect of all the aspects mentioned. (2) score 2 = if the student only has 2 aspects of all the aspects mentioned, (3) score 3 = if the student only has 3 aspects of all the aspects mentioned, (4) score 4 = if the student only has all the aspects mentioned . Trial Test This multiple choice instrument uses a validity test and a reliability test.

Based on the validity test of 30 multiple choice items with 19 respondents, 13 items were declared valid. Then tested the reliability of the multiple choice questions obtained by Cronbach's Alpha of 0.671. So it can be concluded that the multiple choice questions have been declared valid and reliable to be used as a research instrument to find data. The data analysis technique used an independent sample T-test which had previously been subjected to the requirements test, namely the normality and homogeneity tests. The normality test is a test that is applied to find out whether the usage variable data has a normal distribution (Pratama and Permatasari 2021). Homogeneity test is a statistical test requirement to show that sample data from the population have the same variation or data characteristics or not (Nurhaswinda et al. 2023). Hypothesis testing is carried out to obtain logical conclusions from research results presented in the form of numbers. Hypothesis presentation is carried out by analysis of variation or ANOVA with a significance level of $\alpha = 0.05$ (Supriyanto et al. 2022).

3. RESULTS AND DISCUSSION

1.1. Results

This study contains student learning outcomes which include cognitive aspects, affective aspects, and psychomotor aspects. This research was conducted at Muhammadiyah Sinar Fajar Cawas Middle School in the 2023/2024 academic year in class VII even semester in March 2023. This research is a true experimental research by taking a pretest-posttest control group. The purpose of this study was to examine the influence of the PBL learning model combined with rewards and punishments on the science learning outcomes of class VII students. The material used in this study is the Earth and the Solar System. The following research results are obtained:

Tabel 2. Data Description Pretest and Posttest Results as a Cognitive Aspect Students.

Descriptive Statistics					
	N	**Min**	**Max**	**Mean**	**Std. Deviation**
Experimental Class Pretest Value	15	17	63	38.13	13.876
Experimental Class Posttest Value	15	60	87	71.07	7.056
Control Class Pretest Value	14	0	53	34.71	12.893
Control Class Posttest Value	14	40	73	57.43	11.099

Based on (**Table 2**), Statistical description data from the pretest and posttest results as a cognitive aspect in the experimental class and control class obtained the average value of the experimental class higher than the control class in the science subject on Earth and the Solar System. In the experimental class, the PBL learning model combined with the reward and punishment method produced an average pre-test score of 38.13 and a post-test average score of 71.07. whereas in the control class the conventional learning model treatment produced an average pretest score of 34.71 and an average posttest score of 57.34. based on this average value, the

experimental class experienced an increase of 32.94 and the control class experienced an increase of 22.71

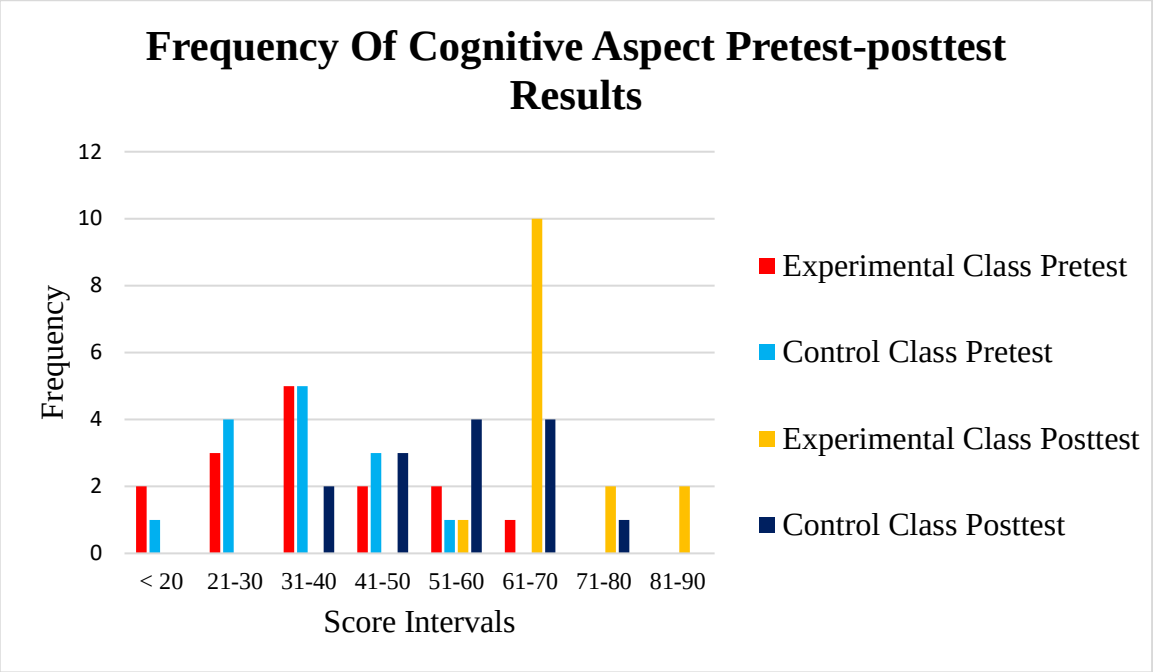

Figure 1. Histogram of Pretest and Posttest Results as Cognitive Aspects of Students.

Based on (**Figure.1)** From the histogram above, it can be seen that the experimental class and the control class at the time of the pretest, there were many students who scored in the less good category with a score of less than 60. However, during the posttest, the results of the students' cognitive aspects increased. However, there are differences in the frequency (number of students) who get the highest score among the existing score intervals. In the experimental class, the treatment of the PBL learning model combined with the reward and punishment method on the posttest results resulted in 10 students obtaining score intervals of 61-70 and there were 2 students obtaining the highest score intervals of 81-90. Whereas in the control class that was given treatment with conventional learning models the highest post-test results were found in the score intervals between 51-60 and 61-70 obtained by 4 students in each score interval.

Table 3. Test Independent Sample Test Cognitive Aspects

No.	Class VII	Sig. (2-tailed)	Decision
1.	Experiment Class-Control Class	0.001	H_0 is rejected and H_a is accepted

Based on (**Table** 3), the Independent Sample Test, which is a statistical test that tests the truth or falsity of two random samples, is capable of producing two interpretations through the Sig value. (2-tailed) of 0.001 <0.005 then according to the basis of decision making in the Independent Sample Test it can be concluded that H_0 is rejected and H_a is accepted which shows that there is a large influence on differences in learning outcomes in the cognitive aspect of the experimental class which is significant by giving the PBL learning model combined with reward and punishment.

Table 4. Description Data Science Learning Outcomes on Students Affective Aspects.

No.	Class VII	N	Min	Max	Mean	Std.Deviation
1.	Experiment Class	15	75	100	95	7.434
2.	Control Class	14	75	94	87	7.670

Based on (**Table 4**), Statistical description data from the affective aspect learning outcomes in the experimental class and control class obtained the average value of the experimental class higher than the control class in the Earth and Solar System science subjects. In the experimental class, the PBL learning model combined with the reward and punishment method from 15 students or respondents produced a minimum score of 75, a maximum score of 100 and an average affective aspect score of 95. Whereas in the control class the conventional learning model treatment of the number of students or 14 respondents produced a minimum score of 75, a maximum score of 94 and an average value of the affective aspect of 87.

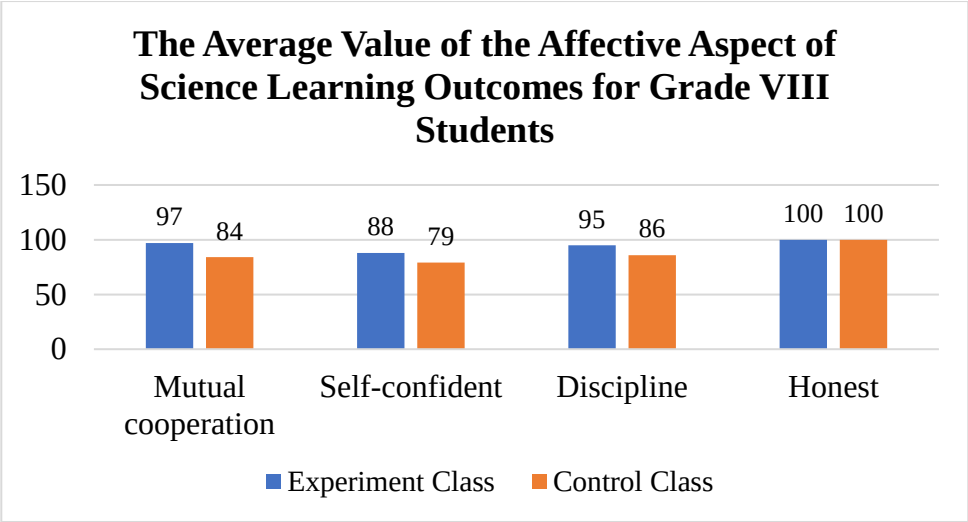

Figure 2. The Average Value of the Affective Aspect of Science Learning Outcomes for Class VIII Students

Based on (**Figure 2**), The histogram above shows the difference in the average science learning outcomes in the affective aspect per indicator which includes indicators (mutual cooperation, self-confidence, discipline and honesty). The experimental class treated with the PBL learning model combined with reward and punishment resulted in a relatively high value of the affective aspects of the indicator compared to the control class with the conventional learning model. However, there are similarities in the learning outcomes of the affective aspects of the honesty indicator which is worth 100.

Table 5. Independent Sample Test Affective Aspects

No.	Class VII	Sig. (2-tailed)	Decision
1.	Experiment Class-Control Class	0.031	H_0 is rejected and H_a is accepted

Based on (**Table 5**), the Independent Sample Test from two samples taken randomly is able to produce two interpretations through the Sig value. (2-tailed) of 0.031 <0.005, according to the basis for decision making in the Independent Sample Test it can be concluded that H_0 is rejected and H_a is accepted which shows that there is a large influence on differences in learning outcomes

in the affective aspect of the experimental class which is significant by giving the PBL learning model combined with reward and punishment.

Table 6. Description Data Science Learning Outcomes on Students Psychomotor Aspects.

No.	Class VII	N	Min	Max	Mean	Std.Deviation
1.	Experiment Class	15	94	100	98	2.928
2.	Control Class	14	81	94	88.14	5.376

Based on (**Table 6**), Statistical description data from the results of learning psychomotor aspects in the experimental class and control class obtained the average value of the experimental class higher than the control class in the Earth and Solar System science subjects. In the experimental class, the PBL learning model combined with the reward and punishment method from 15 students or respondents produced a minimum score of 94, a maximum score of 100 and an average value of the psychomotor aspects of 98. Whereas in the control class the conventional learning model treatment of the number of students or 14 respondents produced a minimum score of 81, a maximum score of 94 and an average value of the psychomotor aspect of 88.14..

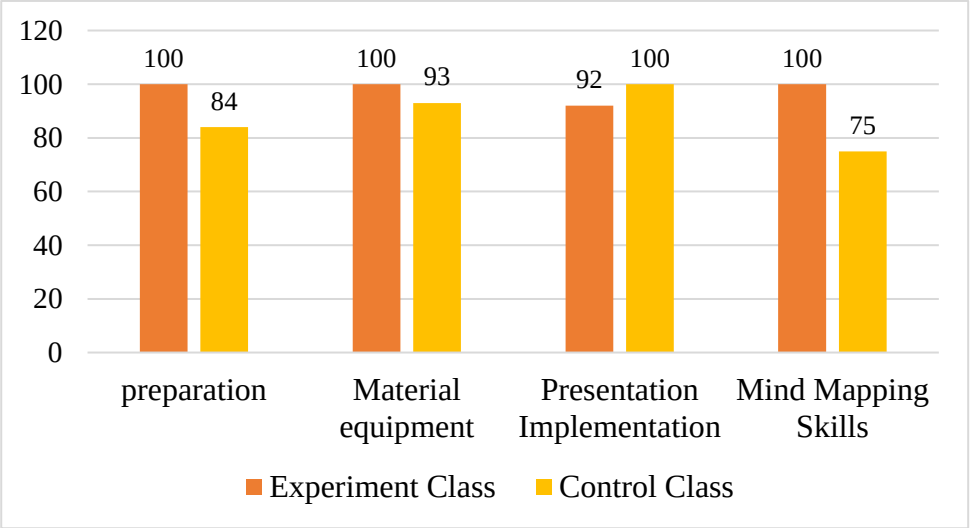

Figure 3. The Average Value of the Psychomotor Aspects of Science Learning Outcomes for Grade VIII Students

Based on (**Figure.3**) The histogram above shows the difference in the average science learning outcomes in the psychomotor aspect per indicator which includes indicators (preparation, completeness of material, implementation of presentations and skills in making Mind Maps). The experimental class treated with the PBL learning model combined with reward and punishment resulted in a relatively high indicator of psychomotor aspects compared to the control class with the conventional learning model.

Table 7. Independent Sample Test Psychomotor Aspects

No.	Class VII	Sig. (2-tailed)	Decision
1.	Experiment Class-Control Class	0.000	H_0 is rejected and H_a is accepted

Based on (**Table 5**), the Independent Sample Test from two samples taken randomly is able to produce two interpretations through the Sig value. (2-tailed) of 0.000> 0.005 then according to the basis of decision making in the Independent Sample Test it can be concluded that H0 is rejected and Ha is accepted which shows that there is a large influence on differences in learning outcomes in the psychomotor aspect of the experimental class which is significant by giving the PBL learning model combined with rewards and punishment.

1.2. Discussion

Science Learning Outcomes on Cognitive Aspect

The results showed that there were differences in learning outcomes from the cognitive aspect between the treatment class of the PBL learning model combined with rewards and punishment (Experimental Class) and the conventional treatment class (Control Class). Based on the analysis it is clear that the application of the PBL learning model and the combination with the reward and punishment method has an effect on cognitive aspects of learning outcomes. The results of this study are supported by previous research which showed the same results. Among them the research conducted by Ulfiana and Fitria (2022) states that the PBL learning model has a good impact on students with the PBL model students become accustomed to dealing with problems, fosters a sense of social cooperation between students and teachers, increases students' abilities to solve problems with such influence the PBL model on science cognitive learning outcomes in the experimental class is superior to the average score of 83.8 compared to the control class with conventional learning the average value is 74.44 and researchers Amirudin et al. (2020) stated that the reward and punishment method can improve student learning outcomes because students are more enthusiastic in learning so that their scores increase.

The effect of learning applied in the experimental class produced significant results as evidenced by the learning outcomes of the cognitive aspects of the experimental class students being higher than the control class. Differences in the average value of cognitive aspects in the control class which can be caused by differences in student learning activities that are less active and enthusiastic in participating in learning. In addition, control class students experience boredom because students feel often with conventional learning models that only listen to explanations from the teacher, take notes, discussion and presentation. Because of the low desire of students to learn so that it has a big effect on their learning outcomes. The low desire for student learning is one of the problems that often occurs in students and the teacher should provide direction to students so that they try to achieve learning in accordance with the specified results. Hidayati et al. (2022) in the learning process experimental class students were involved in the stages or syntax of the Problem Based Learning learning model starting with giving orientation to a problem to students, organizing students to research, assisting investigations, developing investigative results, identifying and evaluating (Junaidi 2020). In its implementation, the syntax of the PBL model is strived to be coherent so that it can help students find and solve problems that are presented in everyday life. The application of learning in the experimental class begins with the orientation stage of students being given a phenomenon or problem that aims to generate curiosity so that they are motivated to be involved in problem solving. In line with opinion Artinta and Fauziyah (2021)

the motivation that arises in students can influence student curiosity because when students are curious about something, students will focus on learning activities, seek deeper information and remember the expected messages, try to solve problems by asking questions. to the teacher and tend to do the task until it is finished.

Then the stage of organizing students to learn and the teacher as a facilitator helps by collaborating between students to look for or research problems jointly organize and determine tasks related to the problem. Followed by the independent and group investigation stages at the end of student learning will collect experimental results by making hypotheses and providing solutions. This presentation stage in the presentation process is carried out by explaining student learning outcomes which are carried out in turns either individually or in groups. The final phase of students by analyzing and evaluating student learning outcomes to harmonize the information obtained by students and teachers (Wati 2018).

In their learning, the experimental class also combines the PBL model with the reward and punishment method because during learning students experience many problems that support the successful application of the problem-based learning model, namely student enthusiasm, because the PBL model itself has weaknesses in its application which can occur if students feel lacking. interested, enthusiastic and motivated in the material presented so that students feel doubtful and reluctant to want to study the problems so that the material being taught is not resolved properly (Hayun and Syawaly 2019). To prevent this failure, the researcher presents this method to provide attraction or enthusiasm for students so that learning can run smoothly and the acquisition of learning outcomes increases.

In its application, when research in the experimental class begins with making an agreement between the teacher and students in which there are rules during learning students are asked to comply with these rules for students who are able to carry out these rules will get rewards and for students who violate there will be punishment. During the application of this method, students who are able to comply well with the rules that apply in class will get a compliment that builds student enthusiasm, for students who are brave or able to do assignments well can give prizes, this can increase student motivation and perceptions to get prizes for their behavior. The application of punishment in the experimental class is more aimed at strengthening in the form of motivation and examples of events that can stop negative actions.

Science Learning Outcomes on Affective Aspects

From the results of the study, it was shown that there were differences in learning outcomes from the affective aspects of students who used the PBL learning model combined with reward and punishment with those who only used conventional learning. This is evident from the hypothesis test that H0 is rejected and Ha is accepted, so it can be concluded that the application of the PBL learning model has an impact on improving student affective learning outcomes.

The use of the PBL model combined with the reward and punishment method helps students' affective learning outcomes. The problem-based learning model is a problem-oriented learning model that is used as a problem as student material for organizing students to study, guiding students to work in a group or individually, so that students are able to develop and present their work, analyze and evaluate at the end of problem solving so that students are indirectly active and have an impact on improving learning achievement (Fitria 2019). The results of this study are supported by several previous studies conducted by Ratnasari et al. (2022) which states that the PBL learning model plays an active role in increasing students' social activity, and self-confidence

in expressing opinions in class so that their research proves that learning outcomes in the affective aspect have increased by 76.61%.

From the picture above it can be seen that the average value of the affective aspect of science learning outcomes for class VIII students has not that much difference between the experimental class and the control class. However, the experimental class treated with the PBL learning model combined with reward and punishment on the affective aspect still had a high average result compared to the average results of the control class with conventional learning treatment. However, for the honest indicator, the control class has the same results as the experimental class, which is equal to 100. The indicators shown represent aspects of each individual's attitude, one of which is honesty, and act (Saeful 2021)

Based on the results of observations with the science subject teacher, the experimental class students had differences with the control class, the difference lies in the attitudes or affective aspects of students when learning takes place. The experimental class is a class that is difficult to control in class, so it requires extra effort so it needs help with the addition of the reward and punishment method. This is supported by researchers Nayla and Lestari (2021)who state that the reward and punishment method has a big impact on improving the affective component. the behavior and cognitive of students in the application of many teachers and volunteers who apply this method because of its ease of application and the magnitude of the impact on students.

The learning outcomes in the affective domain of the control class were lower than the experimental class because the control class only applied conventional learning models where previously many teachers often used this model so that students felt they needed a different learning model than usual. In addition, the conventional learning model does not provide a place for students to be active in learning. Students are only focused on taking notes, listening to explanations from the teacher and doing what is ordered by the teacher so that students feel bored and less interested in learning.

Science Learning Outcomes on Psychomotor Aspect

Based on the decision to test the hypothesis, it was found that H0 was rejected and Ha was accepted, so it can be concluded that the application of the PBL learning model has an impact on improving student psychomotor aspects of learning outcomes. The results of this study are also supported by Azizi (2019) that the PBL learning model shows an advantage over student learning outcomes, namely problem solving skills have a positive impact on students. Students who have succeeded in acquiring problem-solving skills will appear curious, try to identify, look for answers that are easy to understand, select relevant information, organize the workflow and evaluate work results (Elyani et al. 2019). The PBL model also influences students to develop students' psychomotor abilities related to communication, socializing, presenting and reasoning (Ardianti et al. 2021) this is obtained from the active and creative learning process contained in the PBL model where students are able to develop their own skills through the process ask questions, discuss, be able to reflect on the results obtained, so that learning outcomes can increase through real activities solving the cases presented (Gumuruh and Adinata 2020).

The control class psychomotor learning outcomes were lower than the experimental class because the control class only used conventional learning models. Based on the results of observations, this model has often been used by science subject teachers of class VII so that it is difficult for students to acquire skills in the learning process. According to Devita and Budiyanto (2022) the conventional model is a traditional learning model in which there are lecture, question and answer, discussion and assignment methods. The conventional model itself is a teacher-

centered learning model so that it is difficult for students to develop psychomotor skills because there are very few opportunities to be active in class. In line with Taqwan and Haji (2019) based on his research, the results of the problem-solving abilities in the experimental class (outdorlerning) were higher than the control class (conventional). The average value was 78.79 with 73.89. This is because the conventional model is often applied during learning so that students learn as usual by listening to lectures, working on these questions makes students quickly get bored and unenthusiastic so that students are lazy to think and just wait for the teacher's instructions.

Even so, during the experimental class learning there were also problems in motivating students to learn because the application of the PBL model felt less motivating for students to learn so it needed a combination that was able to increase student motivation, namely the reward and reward method. The Rewards and Punishment methods are positive steps that can stimulate students to respond to teachers in learning this method which comes from behavioristic theory (Akhiruddin et al 2019). This method has been agreed by experts as the most effective method. (Wahyudin 2003). It is proven that the experimental class was able to complete the learning well and obtained higher psychomotor learning outcomes than the control class.

The Influence of the Problem Based Learning Learning Model Combined with the Reward and Punishment Method on Science Learning Outcomes.

From the analysis of the hypothesis, it shows that there is an influence of the problem-based learning model with the reward and punishment method on student learning outcomes (cognitive aspects, affective aspects, and psychomotor aspects). The decision making for this hypothesis uses SPSS version 23 with an independent sample t-test where the significant value is Sig. (2-tailed) < 0.05. This shows that there is an influence between the learning model combined with the method used on student learning outcomes.

According to (Qomarudin 2021) that learning activities cannot be separated from input, process and output systems which consist of components of objectives, materials, methods, media, and evaluation. This can be seen from the application of the problem-based learning model combined with the reward and punishment method which influences the learning objectives in increasing student learning outcomes in the cognitive, affective, and psychomotor domains. The application of the problem-based learning learning model is a learning model that invites students to get used to and be active in solving the problems they face because this learning model has a risk of learning success, so there is a need for other ways or additional ways by presenting reward and punishment methods. This method is an old way that is believed by researchers in maximizing the learning process such as being able to improve cognitive aspects, affective domains, and psychomotor domains. That way there is a good influence between the application of the problem-based learning model combined with the reward and punishment method on science learning outcomes in this study.

4. CONCLUSIONS

From the presentation of research data it can be concluded that there are differences in student learning outcomes given the treatment of the PBL learning model combined with higher rewards and punishments compared to learning outcomes using conventional learning models in natural science learning on earth and the solar system.

The difference can be seen from the average value of each aspect of learning outcomes after the implementation of learning in the experimental class and the control class. In addition, it can be seen from the results of the independent sample t-test which shows that the calculation of

cognitive aspects with the independent t-test obtained Sig.(2-tiled) 0.001 <with a significance level of 5% so that Ho is rejected and Ha is accepted. The results of the calculation of the affective aspect using the independent t-test obtained Sig.(2-tiled) 0.030<with a significance level of 5% so that Ho is rejected and Ha is accepted. The results of the calculation of the psychomotor aspect using the independent t-test obtained Sig.(2-tiled) 0.000<with a significance level of 5% so that Ho was rejected and Ha was accepted. This means that there is an influence of the PBL learning model combined with rewards and punishments on the science learning outcomes of class VII students of SMP Muhammadiyah Sinar Fajar Cawas.

5. ACKNOWLEDGMENTS

Thank you to SMP Muhammadiyah Sinar Fajar Cawas for giving permission and facilitating the implementation of this research and supporting research activities on the influence of the PBL learning model combined with rewards and punishments on science learning outcomes for class VII students at SMP Muhammadiyah Sinar Fajar Cawas, as well as to colleagues colleagues who contributed to the research.

6. REFERENCES

Abdurazakov, F. A., and Sohibidavron, K. M. 2022. Interactive Methods Used In The Formation Of Creative Activity (On The Example Of Primary School Students). *Galaxy international interdisciplinary research journal* 10(1): 257.

Akhiruddin, Sujarwo, Atmowardoyo, H., and Nurhikmah. 2019. *Belajar dan Pembelajaran*. CV.Cahaya Bintang Cemerlang, Gowa.

Amirudin, Nurlaeli, A., and Muzaki, I. A. 2020. Pengaruh Metode Reward and Punisment Terhadap Hasil Belajar Siswa Pada Bidang Studi Pendidikan Agama Islam (Studi Kasus di SDIT Tahfizh Qur'an Al-Jabar Karawang). *TARBAWY: Indonesian Journal of Islamic Education* 7(2): 148.

Amrah. 2019. Peningkatan Hasil Belajar Ipa Siswa Kelas V Tema 6 Panas Dan Perpindahannya Dengan Menggunakan Pendekatan Konstruktivisme. *Jurnal Pendidikan Tambusai* 3(1): 451.

Ardianti, R., Sujarwanto, E., and Surahman, E. 2021. Problem-based Learning: Apa dan Bagaimana. : *Journal for Physics Education and Applied Physics* 3(1): 31–33.

Artinta, S. V., and Fauziyah, H. N. 2021. Faktor yang Mempengaruhi Rasa Ingin Tahu dan Kemampuan Memecahkan Masalah Siswa pada Mata Pelajaran IPA SMP. *Jurnal Tadris IPA Indonesia* 1(2): 113.

Azizi, A. 2019. Implemetasi Problem Based Learning (PBL) dengan Bermain Peran (BP) Terhadap Kemampuan Memecahkan Masalah. *Jurnal Pendidikan Mandala* 4(5): 189–190.

Chusin, M. M., Ardrian, R., Satriyanto, B., Hanifah, D. P., Lubis, R., Wellyana, Fitriani, A., Noviyanto, T. S. H., Herlinam, M., Wardani, K. D. K. A., Parera, M. M. A. E., and Fahdian, R. 2021. *Strategi Belajar Inovatif*. Pradina Pustaka, Sukoharjo.

Devita, R., and Budiyanto, C. 2022. Pengaruh Metode Pembelajaran Konvensional Terhadap Kecerdasan Naturalis Siswa Pada Pembelajaran IPA di Kelas IV SDN 1 Mekarsari Saat Pandemi COVID-19. *Jurnal Pendidikan Sekolah Dasar* 3(1): 32.

Elyani, R., Izzati, N., and Perdana, S. A. 2019. Analisis Efektivitas Model Pembelajaran ARIAS Berbantu LKS Dalam Meningkatkan Kemampuan Pemecahan Masalah Matematis Siswa. *Jurnal Kiprah* 7(2): 50–51.

Fitria, Y. 2019. Mampukah Model Problem Based Learning meningkatkan Prestasi Belajar Sains Mahasiswa Calon Guru Sekolah Dasar. *Jurnal Inovasi Pendidikan dan Pembelajran Sekolah Dasar* 3(1): 87.

Gumuruh, A. R., and Adinata, T. P. 2020. Peningkatan Hasil Belajar PKN Melalui Model Pembelajaran Berbasis Masalah Siswa Kelas VII di SMP Negeri 3 Negara. *Jurnal Cendikia* 1(1): 49.

Hakimah, N. L. 2020. Pengaruh Gender Terhadap Hasil Belajar Siswa Kelas VII SMP Darul Ulum 5 Jombang Mata Pelajaran IPA Materi Pemanasan Gelobal Menggunakan Model Pembelajaran Discovery Learning. *Jurnal Ed-Humanistics* 5(1): 617.

Harahap, F. D. S., and Nasution, M. Y. 2018. Analisis Kesulitan Belajar Siswa Pada Materi Virus Di Kelas X Mipa Sma Negeri 1 Rantau Selatan Tahun Pembelajaran 2017/2018. *Jurnal Pelita Pendidikan* 6(2): 72.

Haris, N., Maryam, and Mukhlisa, N. 2021. Penerapan Metode Reward And Punishment Untuk Meningkatkan Hasil Belajar Siswa Sekolah Dasar Kelas Lima Di Kabupaten Baru. *Pinisi : Journal of Education* 1(2): 132–143.

Hayun, M., and Syawaly, A. M. 2019. Pengaruh Penerapan Model Pembelajaran Problem Based LearningTerhadap Kemampuan Representasi Matematis Siswa Sekolah Dasar. *J u r n a l I n s t r u k s i o n a l* , 2(1): 13.

Hidayati, R., Triyanto, M., Sulastri, A., and Muhammad, H. 2022. Faktor Penyebab Menurunnya Motivasi Belajar Siswa Kelas IV SDN 1 Peresak. *Jurnal Educatio* 8(3): 1154.

Hotimah, H. 2020. Penerapan Metode Pembelajaran Problem Based Learning Dalam Meningkatkan Kemampuan Bercerita Pada Siswa Sekolah Dasar 5. *Jurnal Edukasi* 7(3): 8.

Jumanov, M. 2022. Forming Ecological Thinking In Students On The Basis Of Interdisciplinary Relationships Akhmadjon. *International Scientific Reserch Journal* 3(8): 241.

Junaidi. 2020. Implementasi Modul Pembelajaran Problem Based Learning Dalam Meningkatkan Sikap Berfikir Kritis. *Jurnal Pendidikan dan Pembelajaran Ilmu Pengetahuan Sosia* 9(1): 30–31.

Linda, R., Zulfarina, Mas'ud, and Putra, T. P. 2021. Peningkatan Kemandirian dan Hasil Belajar Peserta Didik Melalui Implementasi E-Modul Interaktif IPA Terpadu Tipe Connected Pada Materi Energi SMP/MTS. *Jurnal Pendidikan Sains Indonesia* 9(2): 192.

Mabsutsah, N., and Yushardi. 2022. Analisis Kebutuhan Guru terhadap E Module Berbasis STEAM dan Kurikulum Merdeka pada Materi Pemanasan Global. *Jurnal Pendidikan MIPA* 12(2): 205.

Nayla, R., and Lestari, T. 2021. Pengaruh Metode Reward dan Punishment Terhadap Perkembangan Moral Siswa Sekolah Dasar. *Jurnal Pendidikan* 5(2): 3–6.

Nuraeni, and Syihabuddin, S. A. 2020. Mengatasi Kesulitan Belajar Siswa dengan Pendekatan Kognitif. *Jurnal Pembelajaran dan Inovasi Pendidikan* 1(1): 24.

Nurhaswinda, Cahya, I., Wirna, M., and Aulia, M. 2023. *Statistik Pendidikan (Teori dan Praktik dalam Pendidikan)*. Guepedia, Bogor.

Pratama, S. A., and Permatasari, R. I. 2021. Pengaruh Penerapan Standar Operasional Prosedur Kompetensi Terhadap Produktivitas Kerja Karyawan Divisi Eksopr PT.Dua Kuda Indonesia. *Journal Ilmiah M-Progress* 11(1): 43.

Purwanti, E., Nurrohman, E., and Pra, H. S. 2019. *Kajian IPA (Untuk Mahasiswa Pendidikan Guru Sekolah Dasar)*. Universitas Muhammadiyah Malang, Malang.

Qomarudin, A. 2021. Aktivitas Pembelajaran Sebagai Suatu Sistem. *Jurnal Pendidikan Agama Islam* 4(1): 29.

Rapiadi. 2022. *Monograf Pengaruh Kemandirian Belajar Siswa dan Motivasi Trhadap Hasil Belajar Pendidikan Agama Buddha*. Insan Cendikia Mandiri, Solok.

Rapingah, S., Sugiarto, M., Sabir, M., Haryanto, M. T., Nurmalasari, V., and Alfalisyado, M. I. G. 2022. *Buku Ajar Metode Penelitian*. CV. Feniks Muda Sejahtera, Palu.

Ratnasari, D., Santoso, J. T. B., and Kardoyo. 2022. Pengaruh Pembelajaran PBL Berbasis Mind Mapping Terhadap Hasil Belajar Mata Pelajaran Ekonomi. *Jurnal Sarya Widya* 38(2): 158.

Riadi, A. 2017. Kompetensi Guru Dalam Pelaksanaan Evaluasi Pembelajaran. *Ittihad Jurnal Kopertais Wilayah XI Kalimantan* 15(28): 53.

Rosyidah, N. D., Nagara, D. T., and Supriana, E. 2019. Model Problem Based Learning (Pbl) Dalam Meningkatkan Motivasi Belajar dan Pemahaman Konsep Siswa. *Seminar Nasional Pendidikan Fisika* 4(1): 46–47.

Rusmalina, and Putra, A. P. 2015. Meningkatkan Hasil Belajar dan Aktivitas Siswa pada Konsep Virus melalui Model Pembelajaran Berdasarkan Masalah Increasing the Learning Result and Student Activity on Virus Concept through Problem Based Learning. *Seminar Nasional XII Pendidikan Biologi FKIP UNS 2015* 508–512.

Saeful, A. 2021. Implementasi Nilai Kejujuran Dalam Pendidikan. *Jurnal Tarbawi* 4(2): 127.

Simanjorang, E. 2018. Meningkatkan Hasil Belajar dan Keaktifan Belajar IPA Melalui Metode Simulasi Berbasis Bioedutainment Pada Siswa SMP Negeri 1 Selesai Tahun Ajaran 2016/2017. *Jurnal Tabularasa PPS UNIMED* 15(1): 34.

Supriyanto, Fatirul, A. N., and Walujo, D. A. 2022. Pengaruh Sterategi Problem Based Learning dan Motivasi Berprestasi terhadap Keterampilan Berpikir Kritis. *Jurnal Kumparan Fisika* 5(1): 45.

Taqwan, B., and Haji, S. 2019. Pengaruh Pembelajaran Luar Kelas (Outdoor Learning) Terhadap Kemampuan Pemecahan Masalah Siswa Kelas VII SMP Negeri 05 Seluma. *Jurnal Pendidikan Matematika Raflesia* 4(1): 17.

Tegeh, I. M., Pratiwi, N. L. A., and Simamora, A. H. 2019. Hubungan Antara Motivasi Belajar Dan Keaktifan Belajar Dengan Hasil Belajar IPA Siswa Kelas V Sd. *Jurnal IKA* 17(2): 152–153.

Ulfiana, N., and Fitria, Y. 2022. Pengaruh Model Problem Based Learning terhadap Hasil Belajar Kognitif IPA pada Pembelajaran Tematik. *Journal of Basic Education Studies* 5(1): 2325.

Umami, R. 2021. Kesulitan Dalam Memhami Materi Pelajaran IPA Yang Dikaitkan Dengan Psikologi Pendidikan. *Psikologia (Jurnal Psikologi)* 6(1): 14.

Wahyudin, M. F. A. 2003. *Menuju Kreativitas*. Gema Press, Jakarta.

Wati, Y. I. 2018. Penerapan Model PBL (Problem Based Learning) Pada Pembelajaran IPA Kelas 4 MI Nurur Rohmah Tentang Energi Panas. *Universitas Muhammadiyah Sidoarjo* 11–12.

Wibowo, S., Hatibe, A., and Werdhiana, I. K. 2021. Pengembangan Perangkat Pembelajaran IPA Terpadu Tipe Connected Materi Konsep Cahaya. *Jurnal Ilmiah Pendidikan Fisika* 5(3): 339.

Wijayanti, R. M., and Fauziah, P. Y. 2021. Perspektif dan Peran Orangtua dalam Program PJJ Masa Pandemi Covid-19 di PAUD. *Jurnal Pendidikan Anak Usia Dini* 5(2): 1305.

Yani, A. 2021. *Model Project Based Learning Untuk Meningkatkan Motivasi Belajar Pendidikan Jasmani*. Ahlimedia Book, Malang.