

THE INFLUENCE OF THE PjBL-HOTS LEARNING MODEL ON LEARNING OUTCOMES COGNITIVE AND METACOGNITIVE IN STUDENTS AT SMAN 5 CENTRAL MALUKU

Aska^{1*}, Dominggus Rumahlatu¹, Johanis Fritzgal Rehena¹

¹Department of Biology Education, Universitas Pattimura. Jl. Ir. M. Putuhena, Ambon 97233, Indonesia

*Corresponding Author: aska@gmail.com

Received: 10 Mey 2021

Accepted: 15 July 2022

Published: 25 September 2022

ABSTRACT

PjBL-HOTS is a learning that emphasizes contextual learning which is implemented through project activities in this project learning is carried out on a hots basis so that students can think more critically, creatively and actively in constructing learning and be able to solve problems in everyday life. This study aims to determine the effect of the PjBL-HOTS learning model on students' cognitive and metacognitive learning outcomes. This research was conducted at SMAN 5 Central Maluku on April 28 to May 28, 2021, which is located in Tulehu village. The method used is a quasi-experimental design. Based on the LSD further test, it shows that PjBLHOTS learning can affect students' cognitive learning outcomes as evidenced by the increase in cognitive and metacognitive learning outcomes with the average difference between the pretest and posttest cognitive results, which is -23.08571 and the average metacognitive value, which is 16.18081. learning that is done without a project. The results of this study indicate that the use of the PjBL-HOTS learning model can affect students' cognitive and metacognitive learning outcomes.

Keywords: *PjBL-HOTS, cognitive, metacognitive*

To cite this article:

Aska., Rumahlatu, D., Rehena, J.F. 2022. The influence of the PjBL-HOTS learning model on learning outcomes cognitive and metacognitive in students at SMAN 5 Central Maluku. *Rumphius Pattimura Biological Journal*. 4 (2), 57-61. DOI <https://doi.org/10.30598/rumphiusv4i2p057-061>

INTRODUCTION

Education is a conscious and planned effort to create a learning atmosphere and learning process. This means that the education process at school is not a process that is carried out haphazardly, but is a process that has a purpose so that students actively develop their potential to have religious spiritual strength, self-control, personality, intelligence, noble morals, and skills that needed by himself, society, nation and state. (Romdoni, 2017). Current curriculum demands expect students to have cognitive skills, abilities in the real world, and have noble character and be more active in the learning process. In future learning, the teacher as the main source of information will change into a more ideal learner with real, student-oriented problems so that students can construct their own knowledge and be actively involved in seeking information. Good learning activities are those that are able to increase students' interest and interest in learning so that students can show an enthusiastic attitude in participating in the learning process from the beginning to the end of

the lesson. Learning outcomes are changes in student behavior as a result of learning. The cognitive domain is a domain that involves brain activities through memorization, understanding, application, synthesis and evaluation (Anggraeni, 2017).

Metacognitive skills are basically already possessed by humans themselves. Metacognition is a person's ability to learn, which includes how learning should be done, what is and is not known, which consists of three stages, namely planning, monitoring and evaluation. Based on the results of observations carried out at SMA Negeri 5 Central Maluku, it was shown that PjBL is still rarely used by teachers and more often uses lecture, presentation and question and answer methods, so that students tend to memorize lesson material instead of understanding, analyzing problems and solving existing problems. may be faced every day, so that critical thinking is less trained and most students are less enthusiastic about participating in the ongoing teaching and learning process. Efforts to overcome these problems require effective learning activities to shape students so they can learn independently without forgetting cognitive and psychomotor aspects, one of which is by using project-based learning. Project Based Learning (PjBL) is a learning model that uses projects or activities as a learning process to achieve competency in attitudes, knowledge and skills. PjBL aims to deepen students' knowledge and skills during the learning process. (Fauziah, 2015).

The project-based learning model was chosen because this learning provides students with the opportunity to work more actively in developing their own, more realistic learning and producing a product. This learning model is also expected to be able to improve students' cognitive and metacognitive learning outcomes because through this model they will be trained to construct their own knowledge by being actively involved in a complex learning process. Research on the project-based learning model was also carried out by Susilowati and Sri (2013). The results of their research stated that the project-based learning model had a positive effect on student learning outcomes. This can be seen in the difference in the average scores of students in the control class and the experimental class. The average score of the experimental class taught using the project-based learning model was higher than the control class, as evidenced by the completeness of learning outcomes in the experimental class which reached 100%.

Research conducted by Niswara, et al (2019), states that there is an influence of implementing the Project Based Learning model on High Order Thinking Students critical thinking criteria skills are proven in the results of the normality test analysis and hypothesis test (t-test) which show that the distribution is normal, and the hypothesis data is accepted. Research conducted by Insyasiska, et al (2015), namely that Project Based Learning can influence student learning motivation to be 14% higher, student creativity increases by 31.1%, critical thinking skills increase by 34% and through contextual project learning, cognitive abilities students also increased 28.9% compared to learning provided without a project. Apart from that, research conducted by Arifa, et al (2018) explains that the application of the Project Based Learning learning model can improve students' metacognitiveness as evidenced by students' metacognitive scores having a higher average and learning outcomes that exceed the predetermined KKM limits and experience significant improvement better in the next cycle.

METHOD

This type of research is quantitative descriptive. The method used is a quasi-experimental design, with a Nonequivalent Control Group Design research design. This design uses two groups, namely the experimental group is taught using a project based learning model while the control group is taught using the lecture and question and answer method. Before being given treatment, both groups were given an initial test in the form of a pretest to determine students' initial knowledge of the concepts being taught.

This research was carried out at SMA Negeri 5 Central Maluku from April 28 to May 28, located in Tulehu village, in the even semester of the 2021/2022 academic year.

In this research, a class random sampling technique was used to determine the classes used as samples. This sampling technique was chosen because based on observation results, it was found that each class had almost the same average ability, so that all classes were considered to have the opportunity to be sampled. After drawing lots, it was determined that the samples from this research were class X Science 2 and class X Science 3 SMA Negeri 5 Central Maluku, each numbering 35 people.

DISCUSSION RESULT

Anacova test analysis to determine the effect of using PjBL-HOTS on students' cognitive learning outcomes and obtained a calculated F value of 568,217 with a significant value of 0.00 (less than 0.05). Thus, H₀ which states there is no influence of PjBL-HOTS on students' cognitive learning outcomes is rejected and H_a is accepted, which means there is an influence of PjBL-HOTS on students' cognitive learning outcomes. Because the data produced had an influence, a further test was carried out, namely the LSD test, to determine the difference in the averages of the two samples. Anacova statistical results can be seen in the following table.

Table 1. Anacova test results (a) Cognitive

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	33461.119 ^a	2	16730.560	314.517	.000
Intercept	1357.288	1	13572.288	255.145	.000
cognitive pre_test_	5059.691	1	5059.691	95.117	.000
learning model	30225.939	1	30225.939	568.217	.000
Error	3564.024	67	53.194		
Total	269038.000	70			
Corrected Total	37025.143	69			

Based on table the PjBL-HOTS learning model, the calculated F value is 568,217 with a significant value of 0.00 (less than 0.05). Thus, H₀ which states there is no influence of PjBLHOTS on students' cognitive learning outcomes is rejected and H_a is accepted which means there is an influence of PjBL-HOTS on students' cognitive learning outcomes, because there is an influence it is continued with the LSD (Least Significance Difference) test in table 2

Table 2. Cognitive LSD Test Results

Variabel Terikat	Mean	Std.	t	df	Sig. (2tailed)
kognitif_awal - kognitif_akhir	-23.08571	23.14400	-8.346	69	.000

Based on the LSD test results, the significant value obtained is $0.000 < 0.05$, which means there is a difference in the average pretest and posttest with the average difference in cognitive pretest and posttest results being -23.08571.

Table 3. Metacognitive Anacova test results

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	13281.874 ^a	2	6640.937	219.787	.000
Intercept	10120.257	1	10120.257	334.937	.000
pre_test_kognitif	2805.165	1	2805.165	92.839	.000
model_pembelajaran	11321.731	1	11321.731	374.701	.000
Error	2024.431	67	30.215		
Total	171529.929	70			
Corrected Total	15306.304	69			

Based on the table above, the PjBL-HOTS learning model obtained a calculated F value of 568,217 with a significant value of 0.00 (less than 0.05). Thus, H₀ which states that there is no influence of PjBLHOTS on students' cognitive and metacognitive learning outcomes is rejected and H_a is accepted, which means there is an influence of PjBL-HOTS on students' cognitive and metacognitive learning outcomes. Because there is an influence, it is continued with the LSD (Least Significance Difference) test.

Table 4. Metacognitive LSD Test Results

Dependent variable	Mean	Std. Deviation	T	df	Sig. (2tailed)
metacognitive _ beginning - metacognitive _ end	-16.18081	16.62493	8.143	69	.000

Based on the results of the LSD test, the significant value obtained is $0.000 < 0.05$, which means there is a difference in the average pretest and posttest with the average difference in metacognitive pretest and posttest results being -16.18081.

PjBL is a learning model that can increase learning motivation, creativity, ability to solve problems, ability to collaborate, communicate, thus having a big influence on students' cognitive learning outcomes (Mahrawi, et al. 2019). The use of the PjBL-HOTS model can improve students' cognitive learning outcomes because this learning can emphasize contextual learning which is implemented through project activities to produce real products. In this project learning is carried out on a hots basis so that students can think more critically, creatively and actively in constructing learning and being able to solve problems in everyday life, apart from that, students are also more enthusiastic about learning. Basically, project-based learning is learning that requires students to play an active role in making decisions, solving problems in collecting data and being able to present it.

The learning stages carried out using this learning model first involve students observing the state of the ecosystem at school, starting with looking at plants, animals, abiotic and biotic factors in the school environment. Next, in the second stage, students analyze the problems that occur in the school ecosystem. Next, students will write down the results of their observations in a worksheet (LKPD) which requires them to be able to think critically and creatively. The third stage continues with planning the project to be created. At this stage students create a project in the form of a poster resulting from an analysis of the ecosystem in the surrounding environment. In the fourth stage, students prepare tools and materials to make a project. After the project has been completed, it is then reported or presented in front of the class. Project-based learning stage can improve students' cognitive learning outcomes, because learning is carried out contextually by observing the state of the school ecosystem directly, students are actively involved in analyzing and solving problems, so that the learning carried out is easy to remember and their thinking abilities increase.

CONCLUSION

1. The use of the PjBL-HOTS learning model can influence students' cognitive learning outcomes.
2. The use of the PjBL-HOTS learning model can influence student metacognitive learning outcomes.

REFERENCES

- Bakar, R. 2014. The Effect of Learning Motivation on Students' s Productive Competencies in Vocational High School, West Sumatra," *Int. J. Asian Soc. Sci.*, vol. 4, no. 6, pp. 722–732.
- Anggraeni, Anisa Lina. 2017. The Effect of Project-Based Learning on Student Learning Outcomes in Concepts Ecosystem. Thesis is not published. FITK. Natural Sciences Education, Syarif State Islamic University Hidayatullah, Jakarta.
- Arifa. A.B. Wibawanto, S. & Wirawan I.M. 2018. Application of the Project Base d Learning Model with Metacognitive Strategies to Improve Metacognition and Learning Outcomes. Malang State University. *Journal of Applied Technology Science*. IV (3).

- Erlinawati. 2018. The Influence of the Project Based Learning Model on Students' Creative Thinking Abilities and Creative Attitudes in Class X Biology Subjects at SMAN 7 Bandar Lampung. Unpublished thesis. FITK, Natural Sciences Education, Islamic University
- Fahrudin. M. F. 2015. Differences in Student Biology Learning Outcomes Using Problem Based Learning and Project Based Learning Models and Project Based Learning on Functional Concepts. Unpublished thesis. FITK, Natural Sciences Education, Islamic University
- Fauziah Lulu. 2015. The Influence of the PjBL (Project Based Learning) Learning Model on Class XI Students' Creative Thinking Skills on the Concept of Structure and Function of Plant Tissue. Unpublished thesis. FITK, Natural Sciences Education, Islamic University
- Hidayat, S. Rojabi, Y.N., & Rahmawati, N.A. 2020. Profile of Students' Metacognitive Skills on the Concept of Bacteria Class X MIPA in Tasikmalaya City. *Quangga: Journal of Education and Biology*.
- Insyasiska, D. Zubaidah, S. Susilo. H. 2015. The Influence of Project Based Learning on Students' Learning Motivation, Creativity, Critical Thinking Ability and Cognitive Ability in Biology Learning.
- Ismayanti. 2016. The Relationship Between Metacognition and Intrinsic Motivation and the Academic Achievement of Biology Students at the Faculty of Tarbiyah and Teacher Training.
- Mahrawi, M. Usman. Sari, I.J. Laila, F. Ningtias, N.A. Astrida, O.N. 2019. The influence of the project based learning (PjBL) learning model on learning outcomes in evolution courses. *Proceedings of the National Seminar Education, FKIP, Sultan Ageng Tirtayasa University*,
- Mitrayani, 2020. The Relationship Between Metacognitive Awareness and Student Biology Learning Outcomes at Muhammadiyah High Schools in Palembang City. *Biology Education Study Program. Postgraduate Program. Unpublished thesis. Postgraduate Program, Muhammadiyah University of Palembang*.