

The Effect of Problem-Based Learning Integrated with Ethnoscience on Critical Thinking Skills in SMA Negeri 01 Kubu

Mitha Gita Isvida^{1*}, Ari Sunandar², Hanum Mukti Rahayu^{3*}

^{1,2,3}Biology Education, Faculty of Teacher Training and Education, Universitas Muhammadiyah Pontianak

*Corresponding author: hanumunmuhpontianak@gmail.com

APA Citation: Isvida, M. G., Sunandar, A., & Rahayu, H. M. (2024). The Effect of Problem-Based Learning Integrated with Ethnoscience on Critical Thinking Skills in SMA Negeri 01 Kubu. *Quagga: Journal of Education and Biology*, 16(1), 51-57. DOI: 10.25134/quagga.v16i1.54.

Received: 09-06-2023

Accepted: 12-11-2023

Published: 01-01-2024

Abstrack: *This research was motivated by the low critical thinking skills of students at SMAN 01 Kubu. The aim of this research is to determine the effect of the model problem-based learning integrated Ethnic on students' critical thinking skills. Sampling uses statistical tests and Effect size. The research sample was students of classes X Mia 1 and X Mia 2 at SMAN 01 Kubu. Data collection uses the Essay test method which refers to Fascione's theory. Based on the research results obtained in the experimental class, the score for the synthesis skills indicator was 71.42%, problem recognition and solving skills 74.28%, evaluation or judging skills 51.42%, analysis skills 80%, and concluding skills 60%. In the control class, scores were for synthesis skills 54.28%, problem recognition and solving skills 14.28%, evaluation or judgment skills 22.85%, analysis skills 60%, and concluding skills 40%. In calculating the effect size, a value of 1.54 was obtained, which is in the very high category.*

Keywords: *Ethnoscience, Biodiversity, Critical Thinking Skills, Problem Based Learning.*

1. INTRODUCTION

Education is a process of intentional activity on the input of students to produce a desired result according to the goals applied. (Bahriah, 2013) says that education plays a very important role in improving human resources. Education is an aspect that really determines the progress or decline of a life (Imansari & Sumarni, 2011).

In the 21st century, education is not only driven by mastery of learning materials but requires students to have cognitive skills and social skills that can help them deal with various problems (Haryanti & Febriyanto, 2017). One of the competencies needed in facing the challenges of the 21st era is critical thinking skills (Mardhiyah et al., 2021).

Thomas (2009) says that critical thinking is the most important skill for success in facing the 21st century. Critical thinking is a skill that is acquired from the learning process. Critical thinking is important for developing cognitive

abilities and storing information effectively (Herzon et al., 2018).

Based on the results of interviews with biology teachers at SMAN 01 Kubu, students' critical thinking skills are still low in learning biology. This is known from the results of interviews during biology learning students are less able to Skills Analyzing the problems given by the teacher. Students are also lacking in Synthesizing Skills on problems. In the indicators of Knowing and Problem-Solving Skills, Concluding Skills, and Evaluating or Assessing Skills are also less critical in delivering during learning. Conventional or monotonous learning patterns also have an effect because students only listen and pay attention to explanations from teachers without involving students. Teachers explain science only in outline, as a result students' curiosity is lacking and students' critical thinking skills are low, so students still have difficulty in the process of organizing to solve

existing problems and students are not directly involved in thinking critically.

The solution that can be done to improve and achieve learning objectives is that teachers must apply learning models that can motivate students and direct students to improve their critical thinking skills, to solve problems in learning provided by the teacher. Students' critical thinking skills can be improved by implementing student-centered learning. Thus, the use of the Problem Based Learning (PBL) model is a good solution because in this model there is a syntax that can be used to stimulate students' critical thinking skills ([Masrinah et al., 2019](#)).

Problem-based learning is a learning model that uses real-world problems as a context for students to learn about critical thinking and problem-solving skills, as well as to acquire essential knowledge and concepts and subject matter ([Utami, 2013](#)). Through the Problem Based Learning (PBL) model, students do not just listen, take notes, then memorize the material, but students actively think or interpret the problem, search and process data, present solutions and finally conclude ([Nuryanto et al., 2015](#)).

There are opinions from other experts in defining critical thinking, including, namely: ([Wulandari et al., 2015](#)) states that critical thinking is an intellectual process in conceptualizing, applying, analyzing, synthesizing, and or evaluating various information obtained from observation, experience, reflection, where the results of this process are used as a basis when acting. According to [Hassoubah \(2007\)](#), critical thinking is the ability to give reasons in an organized manner and evaluate the quality of a reason systematically.

Problem-based learning is also widely integrated with several examples, namely with STEM (Science Technology Engineering and Mathematics), TaRL (Teaching at the Right Level), Numbered Heads Together (NHT), and Ethnoscience. One of the appropriate integrations in this research is Ethnoscience-based Problem Based Learning because it can develop students' critical thinking skills. Ethnoscience is linking the existing culture in an area that develops in society with science learning. The application of ethnoscience-based Problem Based Learning

model can provide flexibility for students to be directly involved during the learning process so that they have a better understanding than students who learn conventionally ([Atmojo, 2012](#)). This learning can guide learners in building their own knowledge by using the unique knowledge of a community ([Rahayu & Sudarmin, 2015](#)).

The ethnoscience used in the lesson is about shuro porridge originating from Cirebon City, which was brought and preserved in Kubu Raya Regency, Kubu District to be precise. Suroan is a tradition that is still carried out by the people of Cirebon in general. This tradition is carried out during the month of Muharram ([Farah, 2018](#)). The word Suran/Suro is the term for the month of Muharram in Javanese society. The word comes from the Arabic language *asyura*, which means ten, namely the 10th day of the month of Muharram ([Aryanti & Zafi, 2020](#)). It turns out that Ashura or Suro porridge is not only a tradition, Suro porridge is full of meaning. Suro porridge is a form of expressing human gratitude for the safety that has been given by Allah SWT. Syuro porridge is still related to the learning process, especially the ingredients used in the syuro porridge. Syuro porridge is still related to biodiversity material which explains the levels of diversity and use of biodiversity.

The goal to be achieved in this study is to determine the effect of the learning model *problem-based learning* based *ethnoscience* on critical thinking skills in SMA Negeri 01 Kubu.

2. RESEARCH METHOD

The research methodology includes a quasi-experimental type. The variable consisting of two dependent variables (x) is learning *problem-based learning* (pbl) based *ethnoscience* and the independent variable (y), namely critical thinking skills. The population in this study were all of class X Mia SMA Negeri 01 Kubu, consisting of 2 classes with a total of 70 students. The design carried out in this study is *nonequivalent control grup design*. Researchers used 1 experimental class and 1 control class. This design can be described as in table 1.

Table 1. Research design

Group	Pre-test	Treatment	Post test
Control class	O ₁	X ₁	O ₂
Experimental class	O ₁	X ₂	O ₂

Source: (Sugiyono, 2011)

With O₁ = Initial Test (*pre-test*), O₂ = Final Test (*post-test*), X₁ = Control class treatment, X₂ = Experimental class treatment. The data collection technique used in this research was a written test in the form of an essay. The data collection instrument uses a written test in the form of a description adapted to the material and indicators of critical thinking skills according to (Indraswati et al., 2020), namely analyzing skills, synthesizing skills, problem recognition and solving skills, concluding skills, and evaluating or assessing skills. The form of the test given in the initial test is the same as that given in the final test. The initial test aims to measure students' initial abilities, while the final test aims to measure the level of learning outcomes of students' critical thinking skills after learning using the model *problem-based learning*. The data collection instrument was validated by 2 people, namely 1 lecturer and 1 teacher. The connection between ethnoscience and biodiversity material is identifying each ingredient used in shuro porridge. The data analysis techniques used are descriptive statistics, prerequisite tests and calculations *effect size*.

3. RESULTS AND DISCUSSION

Ethnoscience in this study is about syuro porridge which is directly related to biodiversity material. The ingredients used in the syuro porridge are rice, sweet potatoes, cassava, taro, crew plantains, soybeans, corn, and annual/hybrid coconut (Figure 1).



Figure 1. Syuro Porridge and its ingredients. a. Syuro Porridge, b. Agro Rice, c. Banana Crew,

d. Annual/Hybrid coconut, e. soybeans, f. Taro, g. Corn, h. Cassava, i. sweet potato

In the learning process students are taught about biodiversity material from syuro porridge ingredients. Syuro porridge is a typical food from Cirebon which is preserved in Kubu District. Syuro porridge is a meal to commemorate gratitude every 10th of Muharram. During this biodiversity lesson, students are asked to identify the level of diversity and benefits of the syuro porridge ingredients.

Based on research data, there are results from application of problem-based learning on critical thinking skills in the experimental class with an average of 70 % (Critical), while in the control class with an average of 50 % (Less critical) (Table 2).

Table 2. Percentage of indicators of critical thinking skills

No.	Indicators	Percentage (%)			
		Experiment	Criteria	Control	Criteria
1.	Synthesizing Skills	Critical	54,28	Quite Critical	Critical
2.	Problem Recognition and Solving Skills	Critical	14,28	Not critical	Critical
3.	Evaluating or Appraising Skills	Quite Critical	22,85	Not critical	Quite Critical
4.	Analyzing Skills	Critical	60	Quite Critical	Critical
5.	Inferencing Skills	Quite Critical	40	Not critical	Quite Critical
Average		70	Critical	50	Less critical

Based on research data, the average N-gain result in the experimental class is 61 and, in the control, class is 33 (Table 3). In addition, based on the pretest and posttest, the initial influence level of students in the experimental class was 28.28 and the control class was 38. Meanwhile, in the final measurement the results obtained in the experimental class were 89.28 and the control class was 71. This shows an increase in critical thinking skills at SMA Negeri 01 Kubu with a model *Problem based learning*.

Table 3. The average value of the pretest, posttest, and N-gain

Class	Amount	Average		Gain
		Pretest	Posttest	
Experiment	35	28,28	89,28	61
Control	35	38	71	33

Based on calculations using effect size a value of 1.54 is obtained which is included in the high category, because the ES value is greater than or equal to 1.54 ($ES \geq 0,8$) which is very high (Table 4). Based on the results of these calculations it can be concluded that the use of the model Problem Based Learning has an influence on student learning outcomes.

Table 4. Value Calculation Effect Size

Class	Average		Gain	Effect Size
	Pretest	Posttest		
Experiment	89,28	61	61	1,54
Control	71	33	33	

Discussion

In the planning stage, researchers take steps to review the subject matter, prepare a syllabus, and lesson plans, student worksheets and critical thinking skills essay instruments to determine the success of the actions taken. The implementation of action is in principle the realization of a planned action. The steps for implementing the action are as follows: Before the learning begins, the first step carried out by the teacher is a pretest question test for students to find out the students' initial knowledge of the study material to be discussed. Learning is carried out with problem-based learning steps, namely one orienting students to the problem, two organizing students to learn, three guiding individual and group investigations, four developing and presenting work, and five analyzing and evaluating the problem-solving process. Then the final stage is giving a posttest test which is carried out to determine the average increase in learning outcomes at the end of each using critical thinking indicators. So, critical thinking skills are seen from the improvement of student learning outcomes using essay question instruments.

The indicators of critical thinking skills consist of Analyzing Skill Indicators, Synthesizing Skill Indicators, Recognizing and

Problem Solving Skill Indicators, Concluding Skill Indicators, and Evaluating or Assessing Skill Indicators ([Indraswati et al., 2020](#)).

Application of the model *problem-based learning* regarding critical thinking skills in this research, for the experimental class it reached 70 % with critical criteria, while in the control class it reached 50% with less critical. This is related to research conducted by ([Al-Fikry et al., 2018](#)) that by using the model Problem Based Learning shows the average value of the experimental class is higher than the control class so it can be concluded that the model problem based learning influential because by applying the model problem based learning In this way students can think more critically in learning, students can be active in answering problems that exist in real life.

At the time of learning takes place by using the model problem-based learning, students in the class are more enthusiastic and more active when carrying out discussions with their groups. Students listen more to what is conveyed by the teacher. Meanwhile, in the learning process using the conventional model, students tend to be passive, and the learning emphasizes more on the teacher. It is also stated in a study that learning activities use model problem based learning can encourage a creative, active and participatory mindset in solving problems because students can freely develop their thinking skills ([Tri Wulandari et al., 2020](#)).

As for the steps of learning with Problem Based Learning namely (1) Orientation of students to problems, (2) Organizing students for learning, (3) Guiding individual and group experiences, (4) Developing and presenting works, (5) Analyzing and evaluating problem solving processes" ([Sam & Qohar, 2016](#)). In the learning process this research uses a model problem-based learning based ethnosience which begins with a problem orientation process, namely the giving of cases related to biodiversity material on LKS. At the time of learning in class the topic discussed was syuro porridge. Problems are given by the teacher through student worksheets. At this stage, students are asked to formulate problems on topics that aim to see the relationship between discourse and the material being studied, namely biodiversity. Through these

activities students also have critical thinking skills, namely the indicators of analytical skills.

The second stage is organizing students. In the learning process, the teacher divides students into several groups and guides students to discuss. Students carry out discussions to solve problems in worksheets that already contain several questions from each topic. At this stage, there are indicators of synthesizing skills. This is in line with (Sartika, 2019). The skill of synthesizing is the skill of combining parts into a new formation or arrangement. Synthesis questions require readers to integrate all the information obtained from their reading material, so they can create new ideas that are not stated explicitly in their reading. These synthesis questions provide an opportunity for controlled free thinking.

Furthermore, the third stage is guiding independent and group student investigations. The teacher guides student investigations in finding information related to the problems they find. Students also must answer several questions contained in the LKS obtained via the internet or relevant sources. At this stage there are indicators of skills to recognize and solve problems. Students are also taught to recognize and solve problems independently. Learning independence is very important for students to be able to improve their learning achievement. This is in line with the opinion (Bungsu et al., 2019). Learning independence is a personal attitude that is needed by every student, where learning independence greatly influences learning outcomes. Students who have learning independence are able to analyze difficult problems, are able to work individually or in collaboration with groups and dare to put forward ideas. This independence emphasizes responsible learning activities to be able to achieve learning achievements. Independent learning can be concluded as an activity that comes from self-will, learning that is independent and does not depend on other people and is responsible for achieving the desired learning goals.

In the fourth stage, namely developing and presenting the work, the teacher guides students to present the results of each group's discussion through group representatives in rotation. At this stage there are also critical thinking skills, namely concluding skills. Students' skills are honed

because there is a process of exchanging opinions between students who present the results of discussions with other groups that ask questions. In group discussions students can also express their opinions to each other, analyze each opinion from a variety of different thoughts then jointly formulate conclusions to get an appropriate and appropriate answer, all group members take part in expressing opinions and drawing conclusions (Anggraeni et al., 2022).

Finally, the stage of analyzing and evaluating the problem-solving process. At this stage the students together with the teacher evaluate learning outcomes and conclude each topic on biodiversity material. The teacher also clarifies the results of the discussion submitted by students. The clarification carried out by the teacher aims to form concepts in the minds of students. This is in line with the opinion (Indira et al., 2018). Evaluation skills are skills to decide about the value to be measured using existing criteria. At this stage students can synergize cognitive aspects in assessing a fact or concept. To be able to improve evaluation skills, students are expected to be able to use appropriate, complete, and correct strategies in solving a problem.

Problem based learning applied in learning because it provides many advantages, including problems presented at the beginning of learning, then students deepen their knowledge to solve problems that are solved through group work so that it adds to students' experience in terms of collaboration and group interaction (Budianti & Airlanda, 2019). In line with the statement (Apriyani et al., 2019) that through the stages of learning Problem Based Learning starting from formulating questions, gathering information, making conclusions, presenting works, to evaluating the truth will train students' critical thinking skills. In contrast to the control group, the results of students' critical thinking skills were lower. This is because learning is done by lecture and question and answer method. Students only listen to the teacher's explanation without being directly involved in learning. With such learning it makes students less active in understanding the material so that it causes students' critical thinking skills to not improve and be less active.

4. CONCLUSION

Based on research data and data analysis results, it can be concluded that the application of the model *Problem based learning integrated with ethnoscience* has a significant effect in improving students' critical thinking skills on biodiversity material. The average implementation of the model *problem-based learning* the critical thinking skills in the experimental class reached 89.42% with very critical criteria, while in the control class it reached 70.57% with critical criteria. On calculations *effect size* Also obtained was a value of 0.89 which was included in the high category.

5. REFERENCES

- al-Fikry, I., Yusrizal, Y., & Syukri, M. (2018). Pengaruh Model Problem Based Learning Terhadap Kemampuan Berpikir Kritis Peserta Didik Pada Materi Kalor. *Jurnal Pendidikan Sains Indonesia*, 6(1), 17–23. <https://doi.org/10.24815/jpsi.v6i1.10776>
- Anggraeni, N., Rustini, T., Wahyuningsih, Y., & Indonesia, U. P. (2022). Keterampilan Berpikir Kritis Siswa Sekolah Dasar Pada Mata Pelajaran Ips Di Kelas Tinggi. *Jurnal Review Pendidikan Dasar: Jurnal Kajian Pendidikan Dan Hasil Penelitian*, 8(1), 84–90.
- Apriyani, T. D., Fadiawati, N., Syamsuri, M. M. F., & Lampung, B. (2019). The Effectiveness Of Problem-Based Learning On The Hoax Information To Improve Students' Critical Thinking. *International Journal Of Chemistry Education Research*, 3(1), 15–22. <https://doi.org/10.20885/ijcer.vol3.iss1.art>
- Aryanti, R., & Zafi, A. A. (2020). Tradisi Satu Suro Di Tanah Jawa Dalam. *Al-Iman: Jurnal Keislaman Dan Kemasyarakatan*, 4(2), 342–361.
- Atmojo, S. E. (2012). Terhadap Profesi Pengrajin Tempe Dalam. 1(2), 115–122. <https://doi.org/10.15294/jpii.v1i2>
- Bahriah, E. S. (2013). Meningkatkan Literasi Sains Siswa Pada Aspek Proses Sains Melalui Pembelajaran Berbasis Multimedia Interaktif. *Prosiding Seminar Nasional Pendidikan Ipa Fitk Uin Syarif Hidayatullah Jakarta*, 79–84.
- Budiarti, I., & Airlanda, G. S. (2019). Pendidikan Penerapan Model Problem Based Learning Berbasis Kearifan Lokal Untuk Meningkatkan Keterampilan Berpikir Kritis. *Jurnal Riset Teknologi Dan Inovasi Pendidikan*, 2(1), 167–183.
- Bungsu, T. Kurniawan, Vilardi, M., Akbar, P., & Bernard, M. (2019). Pengaruh Kemandirian Belajar Terhadap Hasil Belajar Matematika Di Smkn 1 Cihampelas. *Journal On Education*, 01(02), 382–389. <https://doi.org/10.31004/joe.v1i2.78>
- Farah, N. (2018). Nilai-Nilai Filosofis Dalam Tradisi. *Jurnal Kajian Islam Dan Budaya*, 16(2), 303–327. <https://doi.org/10.24090/ibda.v16i2.1346>
- Haryanti, Y. D., & Febriyanto, B. (2017). Model Problem Based Learning Membangun. *Jurnal Cakrawala Pendas*, 3(2), 57–63. <https://www.unma.ac.id/jurnal/index.php/cp/article/viewfile/596/559>
- Hassoubah, Z. I. (2007). *Developing Creative And Critical Thinking Skills : Cara Berpikir Kreatif Dan Kritis*. Bandung: Yayasan Nuansa Cendia.
- Herzon, H. H., Utomo, D. H., & Malang, G. U. N. (2018). Pengaruh Problem-Based Learning (Pbl) Terhadap Keterampilan Berpikir Kritis. *Jurnal Pendidikan; Teori, Penelitian, Dan Pengembangan*, 3(1), 42–46.
- Imansari, M., & Sumarni, W. (2011). Analisis Literasi Kimia Peserta Didik Melalui Pembelajaran Inkuiri Terbimbing Bermuatan Etnosains. *Jurnal Inovasi Pendidikan Kimia*, 12(2), 2201–2211. <https://doi.org/10.15294/jipk.v12i2.15480>
- Indira, T., Somakim, S., & Susanty, E. (2018). Kemampuan Berpikir Kritis Siswa Smp Melalui Pendekatan Pendidikan Matematika Realistik Indonesia. *Histogram: Jurnal Pendidikan Matematika*, 1(2), 75. <https://doi.org/10.31100/histogram.v1i2.25>
- Indraswati, D., Marhayani, D. A., Sutisna, D., Widodo, A., & Mauliyda, M. A. (2020). Critical Thinking Dan Problem Solving Dalam Pembelajaran Ips Untuk Menjawab Tantangan Abad 21. *Sosial Horizon: Jurnal*

- Pendidikan Sosial*, 7(1), 12–28.
<https://doi.org/10.31571/Sosial.V7i1.1540>
- Mardhiyah, R. H., Aldriani, S. N. F., Chitta, F., & Zulfikar, M. R. (2021). Pentingnya Keterampilan Belajar Di Abad 21 Sebagai Tuntutan Dalam Pengembangan Sumber Daya Manusia. *Jurnal Pendidikan*, 12(1), 29–40.
<https://doi.org/10.31849/Lectura.V12i1.5813>
- Masrinah, E. N., Aripin, I., Gaffar, A. A., Biologi-Fkip, P. S. P., & Majalengka, U. (2019). Problem Based Learning (Pbl) Untuk Meningkatkan. *Seminar Nasional Pendidikan*, 924–932.
- Nuryanto, Utami, B., & S, A. N. C. (2015). Penerapan Model Pembelajaran Problem Based Learning (Pbl) Dilengkapi Macromedia Flash Untuk Meningkatkan Kemampuan Berpikir Kritis Pokok Termokimia Kelas Xi Siswa Sma Negeri 2 Karanganyar Tahun Pelajaran 2014 / 2015. *Jurnal Pendidikan Kimia*, 4(4), 87–94.
- Rahayu, W. E., & Sudarmin. (2015). Pengembangan Modul Ipa Terpadu Berbasis Etnosains Tema Energi Dalam Kehidupan Untuk Menanamkan Jiwa Konservasi Siswa. *Unnes Science Education Journal*, 4(2), 919–926.
<https://doi.org/10.15294/Usej.V4i2.7943>
- Sam, H. N., & Qohar, A. (2016). Pembelajaran Berbasis Masalah Berdasarkan Langkah - Langkah Polya Untuk Meningkatkan Kemampuan Menyelesaikan Soal Cerita Matematika. *Kreano, Jurnal Matematika Kreatif-Inovatif*, 6(2), 156.
<https://doi.org/10.15294/Kreano.V6i2.5188>
- Sartika, I. (2019). Kemampuan Berpikir Kritis Dalam Pendekatan Matematika Realistik Di Sekolah Dasar. *AR-RIAYAH: Jurnal Pendidikan Dasar*, 3(2), 101.
<https://doi.org/10.29240/Jpd.V3i2.1151>
- Sugiyono. (2011). *Metode Penelitian Kuantitatif, Kualitatif, Dan R & D*. Bandung: Alfabeta.
- Thomas, I. (2009). Critical Thinking, Transformative Learning, Sustainable Education, And Problem-Based Learning In Universitie. *Journal Of Transformative Education*, 7(3), 245–264.
<https://doi.org/10.1177/1541344610385753>
- Tri Wulandari, Kadir, A., Fua, J. La, & Zainuddin. (2020). Pengaruh Model Problem Based Learning Berbasis Multimedia Terhadap Kemampuan Berpikir Kritis Dan Hasil Belajar IPA. *Jurnal Kulidawa*, 1(1), 29–34.
- Utami, R. (2013). Model Pembelajaran Berbasis Masalah Dengan Langkah Penyelesaian Berdasarkan Polya Dan Krulik-Rudnick Ditinjau Dari Kreativitas Siswa. *Delta: Jurnal Ilmiah Pendidikan Matematika*, 1(1), 82–98.
<https://dx.doi.org/10.31941/Delta.V1i1.464>
- Wulandari, A. Y. P., Muh.Tawil, & Amin, B. D. (2015). Penerapan Pembelajaran Fisika Berbasis Hands On Activities Untuk Meningkatkan Kemampuan Berpikir Kritis Siswa Kelas X MAN 2 Model Makassar. *Jurnal Pendidikan Fisika*, 3(2), 105–115.
<https://doi.org/10.26618/Jpf.V3i2>