



IMPROVING THE CRITICAL THINKING ABILITY SCIENCE THROUGH PROBLEM-BASED LEARNING MODEL ASSISTED STUDENT WORKSHEET ETHNOSCIENCE

Dian Armadha Wahyuningtyas^{1*}, Fauzatul Ma'rufah Rohmanurmeta², & Sri Widyastuti³

¹²³University of PGRI Madiun/Teacher Professional Program, Indonesia

*Corresponding Author E-mail: dian.armadha@gmail.com

Abstract

This research was motivated by the results of tests of critical thinking abilities in science in the pre-cycle of fifth-grade students at Kauman 2 Ponorogo Elementary School who were at a low level. Through the initial data, it was found that 80% of the 15 students had a low category critical thinking ability test score. The purpose of this study was to improve critical thinking skills in science through a Problem-Based Learning (PBL) based learning model assisted by the Ponorogo ethnoscience worksheet. The research approach used is Classroom Action Research, which adopts the stages of the Kurt Lewin cycle. The stages used in this research include: planning, action, and reflection. The research implementation lasted for two cycles with two meetings in each cycle. Based on the results of the research that has been carried out, the percentage of students' classical completeness in cycle 1 has increased by 40% to 60%. While in cycle 2 again experienced an increase of 27% to 87%. Therefore, it can be concluded that the implementation of the Problem-Based Learning model assisted by the Ponorogo ethnoscience worksheet can improve the critical thinking ability of science students in fifth grade at the elementary school level.

Keywords:

Problem-Based Learning, Ethnoscience, Critical Thinking Ability.

Abstrak

Penelitian ini dilatarbelakangi oleh hasil tes kemampuan berpikir kritis IPA pada pra-siklus pada peserta didik kelas V SDN 2 Kauman Ponorogo yang berada pada level rendah. Melalui data awal diperoleh hasil bahwa 80% dari 15 peserta didik memiliki nilai tes kemampuan berpikir kritis dengan kategori rendah. Tujuan dari penelitian ini adalah guna meningkatkan kemampuan berpikir kritis IPA melalui model pembelajaran berbasis Problem-Based Learning (PBL) berbantu LKPD etnosains daerah Ponorogo. Pendekatan penelitian yang digunakan yakni PTK (Penelitian Tindakan Kelas) dengan mengadopsi tahapan siklus Kurt Lewin. Adapun tahapan yang digunakan dalam penelitian meliputi: perencanaan, pelaksanaan tindakan, pengamatan, dan refleksi. Pelaksanaan penelitian berlangsung selama dua siklus dengan dua kali pertemuan setiap siklusnya. Berdasarkan hasil penelitian yang telah dilaksanakan, persentase ketuntasan klasikal peserta didik pada siklus 1 mengalami kenaikan sebesar 40% menjadi 60%. Sementara pada siklus 2 kembali mengalami peningkatan sebesar 27% menjadi 87%. Oleh sebab itu dapat disimpulkan bahwa penggunaan model pembelajaran Problem-Based Learning berbantu LKPD etnosains Ponorogo dapat meningkatkan kemampuan berpikir kritis IPA peserta didik kelas V tingkat sekolah dasar.

Kata Kunci:

Problem-Based Learning, Etnosains, Kemampuan Berpikir Kritis.

INTRODUCTION

Learning is an important indicator in implementing the education process (Saifulloh & Darwis, 2020). Learning is used as a container that is functioned by educators so that a process of acquiring knowledge, mastery, knowledge, skills, and character, as well as the formation of attitudes and beliefs, can occur in students (Moh Suardi, 2018). According to Winaryati (2014), learning is believed to be able to make an impression on students if the material being taught is close to the problems and environment of students.

Science learning contains materials on natural knowledge closest to the students. Science is a human effort to understand the universe through a process of observation that has accuracy with the target, using procedures and explanations through reason, so that a conclusion is obtained (Ahmad Susanto, 2016). Science learning at the elementary school level contains material related to

natural knowledge that is close to the lives of students. Students are expected to be able to recognize and know about this natural knowledge through daily life (Sobron A N et al., 2019). Science learning fosters students' curiosity through various discoveries with direct experience carried out through scientific work (Yuliananingsih & Rokhimawan, 2020). Science skills can be honed through the ability to think critically and process by finding new concepts from learning activities (Agnafia, 2018). Therefore, to solve a science problem, students need to improve their thinking processes, one of which is by increasing their critical thinking ability.

Improving critical thinking ability is an important aspect of education which has become the business of many institutions because it is believed to produce higher academic achievement (D'Alessio et al., 2019). Critical thinking abilities can be defined as one of the life stages that need to be studied and developed (Puspita et al., 2021). Critical thinking ability is a part of the 4C ability and is part of the higher-order thinking ability. The ability to think critically is a form of implementation of higher thinking because the highest cognitive competence that students have mastered during learning activities is the ability to think critically (Indriani & Sakti, 2022). Critical thinking ability has an important role in preparing students to solve problems, explain the reasons, and evaluate information findings. So that critical thinking abilities have a very important role in learning science.

The important role of science critical thinking abilities must have owned by students from elementary school, therefore it is necessary to apply the learning that can improve this critical thinking ability. However, several studies have shown that students' natural science thinking skills are still low. Maslakhatunni'mah et al (2019) found in their research that class 7th students at the MTs level still have low critical thinking ability. In a similar study conducted by Safitri & Mediatati (2021) at Gunungtumpeng 2 Elementary School, it was found that only 3% of all students had higher critical thinking ability, while 42% were in a lower category, and 8% were in the very low category.

The two studies are consistent with the results of preliminary observations found at Kauman 2 Ponorogo Elementary School, through the results of the initial research it was found that 80% of students had scores in the lowest category of questions based on critical thinking ability in science subjects. In addition, interview data were obtained from the homeroom teacher of fifth-grade Kauman 2 Elementary School, according to him, when answering questions, both written and verbal, they were guided by memory, and there were no further statements that were critical of the questions given. In addition to answering questions, students feel confused if they do not find the appropriate sentence in the reading.

The low critical thinking ability of students can arise due to several factors. According to Rachamatika et al (2021), there are several factors that influence students' low critical thinking ability, including physical conditions, motivation, independence, and learning models. Physical factors, motivation, and independence are part of the internal factors. While the learning model is an external factor that can affect students' critical thinking abilities. The Problem-Based Learning (PBL) model is one model that can be implemented to improve student's critical thinking abilities. Problem-Based Learning (PBL) learning activities raise problems that exist in everyday life as material for discussion, so they are useful in making it easier for students to understand problems. (Rahmawati, 2019). A large number of research on the Problem-Based Learning (PBL) model provides various colors in improving the presented critical thinking abilities (Utama & Kristin, 2020).

In its implementation, the learning model can take place through the help of learning media, teaching materials, and Student Worksheets. The Student Worksheet is part of a learning tool that

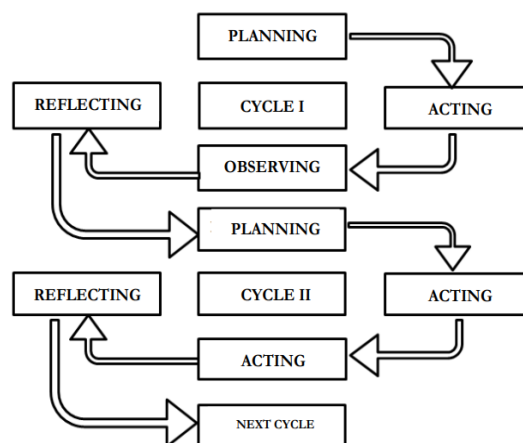
consists of a series of various exercises, questions, and information and is designed to understand various complex ideas, which guide students in carrying out their activities systematically. (Effendi et al., 2021). Student worksheets can help teachers more easily convey information on activities and work steps through attractive infographics. One type of student worksheet that can be used in the science learning process is the ethnoscience student worksheet. Ethnoscience is useful in uncovering, utilizing, and reconstructing local wisdom from local people into scientific knowledge (Parmin et al., 2022).

Ponorogo is a district located in East Java and is famous for its culture. Through a study, it is said that the many cultures in Ponorogo provide many benefits, including in the field of Education (Dwiki Adi Septian et al., 2017). The diversity of cultures in Ponorogo needs to be known and preserved since childhood. The culture in Ponorogo can be integrated with existing learning at school. One way to integrate Ponorogo culture with education is the use of ethnoscience-based student worksheets in the Ponorogo area.

Based on the explanation presented, it can be concluded that the learning model and student worksheets used by teachers can improve students' critical thinking ability in science in elementary schools. Therefore, researchers are interested in conducting a research entitled: "Improving the Critical Thinking Ability Science Through Problem-Based Learning Model Assisted Student Worksheet Ethnoscience"

METHOD

This study uses a Classroom Action Research approach. The activity step is adopted from Kurt Lewin. This research was conducted by taking initial data on the student's natural science critical thinking ability and the research included two cycles. At each cycle, two meetings were held. Each cycle is through the four stages that occur in a continuous unit cycle process. The stages of Kurt Lewin's Classroom Action Research include: planning, acting, observing, and reflecting. The following is an overview of the stages passed in this study.



Picture 1. The stages of Kurt Lewin's (Imam Rofiki et al., 2022) Classroom Action Research

This research was conducted at Kauman 2 Ponorogo Elementary School in semester II of the 2022/2023 school year from the 6th to the 18th of March 2023. The population in this research included all students at Kauman 2 Ponorogo Elementary School. While the sample used in this research was fifth-grade students consisting of 5 female students and 10 male students.

The technique used in this Classroom Action Research is the test technique. The test consists of five "water cycle" science questions and is in the form of a description with indicators of critical thinking abilities. The indicators used in making critical thinking abilities tests include: examining ideas, questioning evidence, making decisions/conclusions, presenting arguments, and stating the results. The results of the critical thinking skills test are then strengthened by the results of interviews, observations, and documentation. The categories of critical thinking skills by Dewi et al (2016) are as follows.

Table 1. Categories of Critical Thinking Ability

Percentage Interval of Critical Thinking Ability	Category
80-100	Very well
66-79	Good
56-65	Enough
40-55	Not enough
0-39	Very less

The process of implementing learning is carried out using the Problem-Based Learning model assisted by ethnoscience-based student worksheets in the Ponorogo area. The Student Worksheet used in learning contains materials and exercises related to Ponorogo culture-based science learning. The material used is fifth-grade "water cycle" material. While in this study using data analysis methods in the form of descriptive analysis. Descriptive analysis is used in determining students' critical thinking abilities. While the indicators of success used in the analysis are as follows:

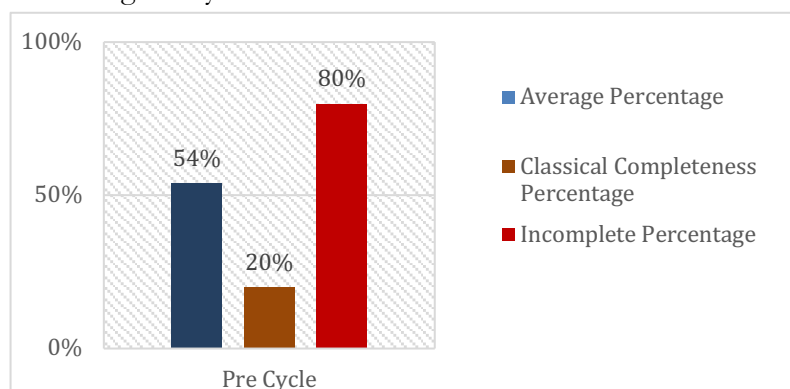
- a. At least the average percentage of a student's critical thinking ability is 80% with a good criterion score.
- b. The classical completeness of students is at least 80%, which means that the number of students who can achieve critical thinking ability is in a good category.

FINDINGS AND DISCUSSION

Findings

1. Pre-Cycle Science Critical Thinking Ability

After conducting research based on the stages that have been planned, the results of classroom action research can be obtained which consist of the results of pre-cycle, cycle 1, and cycle 2. At the beginning of the research, tests of critical thinking ability were carried out on previously studied material. The following is the percentage of the results of the pre-cycle students' critical thinking ability test.

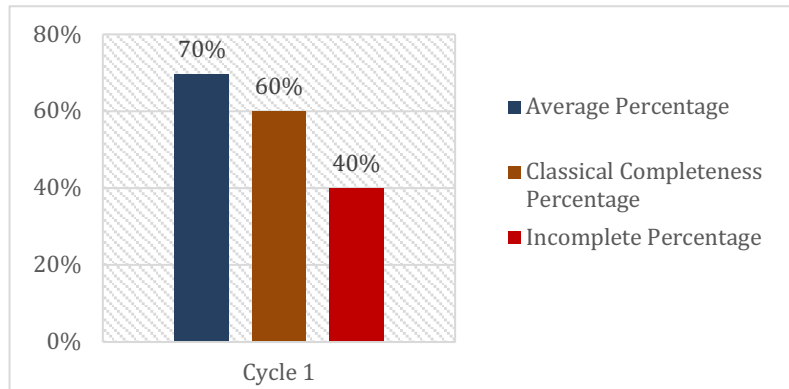


Picture 2. Percentage of Pre-Cycle Critical Thinking Ability Score

Based on Figure 2 shows the percentage of critical thinking abilities through pre-cycle activities. The percentage of the average value of the pre-cycle stage is 54%. Meanwhile, the percentage of pre-cycle classical completeness was 20% of a total of 15 students. Consists of 6 students who can achieve the criteria of critical thinking ability test completeness. While the incomplete percentage was 80%, which meant that 12 students were not able to think critically. These results indicate that the science critical thinking skills of fifth-grade students at Kauman 2 Ponorogo Elementary School are in the low criteria.

2. Science Critical Thinking Ability Cycle 1

The following is the percentage value data for critical thinking ability in cycle 1.

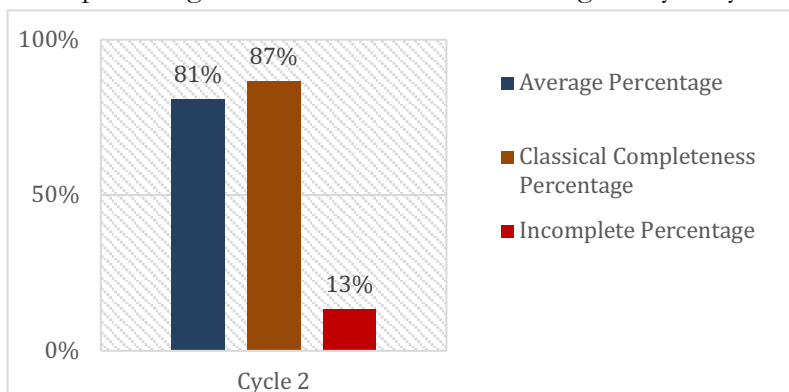


Picture 3. Percentage of Value of Critical Thinking Ability Cycle 1

Based on Picture 3, the average percentage in cycle 1 is 70%. While the percentage of classical completeness cycle 1 was obtained by 60% of a total of 15 students. Consists of 9 students who can achieve the critical thinking ability test completeness criteria. While the incomplete percentage is 40%, which means that it consists of 6 students who are not yet able to think critically. However, it can be said that in cycle 1, the percentage of students' critical thinking abilities in Science at fifth-grade Kauman 2 Elementary School has increased from before.

3. Science Critical Thinking Ability Cycle 2

The following is the percentage value data for critical thinking ability in cycle 2.



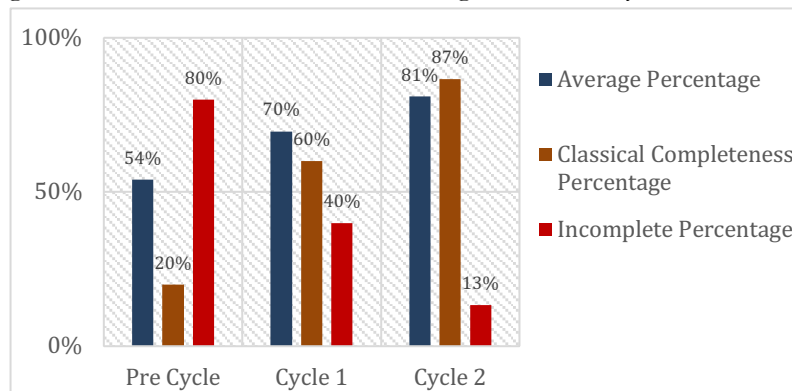
Picture 4. Percentage of Value of Critical Thinking Ability Cycle 2

Based on Picture 4 above, the average percentage in cycle 2 is 81%. While the percentage of classical completeness cycle 2 was obtained by 87% of the total 15 students. Consists of 13

students who can achieve the critical thinking ability test completeness criteria. While the incomplete percentage was 13%, which meant that 2 students were not able to think critically. So, it can be said that in cycle 2 students' critical thinking ability in science experienced an increase from the previous cycle.

4. Percentage Per Cycle Data Summary

The following is the percentage data for the recapitulation of the value of the critical thinking ability of fifth-grade students at Kauman 2 Ponorogo Elementary School.



Picture 5. Percentage Per Cycle Data Summary

Based on picture 5, the proportion of recapitulation data per cycle is obtained. In the data recapitulation figure, it can be seen that from pre-cycle to cycle 2, the average proportion and the proportion of completeness continued to increase, while the incomplete percentage decreased. This shows that in each cycle there is an increase in critical thinking.

Through Picture 5 it can be explained that at the pre-cycle stage, only 20% of the percentage of classical completeness was obtained. In cycle 1, the percentage of classical completeness was 60%, so there was an increase of 40% in cycle 1. Meanwhile, in cycle 2, the percentage of classical completeness was 87%, this means that there was an increase of 27% in cycle 2. Based on the description above, it can be concluded that the indicators of mastery of critical thinking skills in science class at fifth-grade Kauman 2 Ponorogo Elementary School have been achieved.

Discussion

Through Classroom Action Research, it was found that the student's critical thinking skills in science by class grade-fifth Kauman 2 Ponorogo Elementary School have increased. The increase from pre-cycle to cycle 1 was 40% and from cycle 1 to cycle 2 the increase reached 27%. This indicates that the treatment used in this research can improve the critical thinking ability of students at class fifth-grade Elementary School.

In its implementation, this study uses the Problem-Based Learning model assisted by student worksheets ethnoscience in the Ponorogo area. So, it can be concluded that through the use of the Problem-Based Learning (PBL) model assisted by the Ponorogo regional ethnoscience worksheet, elementary school students can improve their critical thinking abilities in science. This is in the same line with several research results which state that Problem-Based Learning is a choice of learning models that can improve students' critical thinking ability. (Fristadi & Bharata, 2015; Kong et al., 2014; Nafiah & Suyanto, 2014).

Learning using the Problem-Based Learning (PBL) model has been proven to make it easy for teachers to be able to bring real-world problems in science learning. By the opinion, Saputra (2020) that Problem-Based Learning (PBL) is learning that emphasizes real (authentic) problems that are unstructured and open as a context for students to develop skills in problem-solving and critical thinking while studying to be able to build knowledge of new. Real-world problems related to science in this study are associated with using ethnoscience-based worksheets in the Ponorogo area.

This study proves that ethnoscience worksheets can help students improve their critical thinking ability, especially in science subjects. Aji (2017) states that ethnoscience can support students in solving problems and helping students think critically. Similar research results were also found in research (Risdianto et al., 2020; Sudarmin et al., 2018), through the results of their research it was found that ethnoscience can be improved students' critical thinking ability. So, it can be concluded that science critical thinking ability can be improved through the Problem-Based Learning (PBL) learning model based on ethnoscience worksheets.

CONCLUSION

Based on this Classroom Action Research, it was concluded that the application of Problem-Based Learning through the help of Ponorogo ethnoscience-based student worksheets can improve the critical thinking skills of fifth-grade students at Kauman 2 Ponorogo Elementary School. This is indicated by the percentage of students' classical completeness which seems to always increase in each cycle. The percentage of students' classical completeness in the pre-cycle was only 20%, in cycle 1 it increased to 60%. Furthermore, in cycle 2, it again experienced an increase of 27% so it reached 87%. This significant increase was influenced by the learning model and tools used, so as to improve student's critical thinking ability in science.

REFERENCES

- Agnafia, D. N. (2018). Analisis Kemampuan Berpikir Kritis Siswa dalam Pembelajaran Biologi. *Florea*, 6(1), 45–53.
- Ahmad Susanto. (2016). *Teori Belajar dan Pembelajaran di Sekolah Dasar*. Kencana Prenada Media Group.
https://books.google.co.id/books/about/Teori_Belajar_dan_Pembelajaran_di_Sekola.html?hl=id&id=IeVNDwAAQBAJ&redir_esc=y
- Aji, S. D. (2017). Etnosains dalam membentuk kemampuan berpikir kritis dan kerja ilmiah siswa. *Seminar Nasional Pendidikan Fisika III*, 7–11. <http://e-journal.unipma.ac.id/index.php/snfp>
- D'Alessio, F. A., Avolio, B. E., & Charles, V. (2019). Studying the impact of critical thinking on the academic performance of executive MBA students. *Thinking Skills and Creativity*, 31, 275–283. <https://doi.org/10.1016/J.TSC.2019.02.002>
- Dewi, M. R., Mudakir, I., & Murdiyah, S. (2016). Pengaruh Model Pembelajaran Kolaboratif berbasis Lesson Study terhadap Kemampuan Berpikir Kritis Siswa. *Jurnal Edukasi UNEJ*, 32, 29–33.
- Dwiki Adi Septian, Agus Kristiyanto, & Sapta Kunta Purnama. (2017). Analisis Pembinaan Prestasi Olahraga Panahan pada PERPANI Kabupaten Ponorogo. *Prosiding Seminar Nasional Profesionalisme Tenaga Profesi PJOK*, 93–100.

- Effendi, R., Herpratiwi, H., & Sutiarmo, S. (2021). Pengembangan LKPD Matematika Berbasis Problem Based Learning di Sekolah Dasar. *Jurnal Basicedu*, 5(2), 920–929. <https://doi.org/10.31004/basicedu.v5i2.846>
- Fristadi, R., & Bharata, H. (2015). Meningkatkan Kemampuan Berpikir Kritis Siswa Dengan Problem Based Learning. *Seminar Nasional Matematika Dan Pendidikan Matematika UNY*, 597–602.
- Imam Rofiki, Endi Zunaedy Pasaribu, & Sukarman Purba. (2022). *Pedoman Penelitian Tindakan Kelas (PTK) Secara Teoretis dan Praktis*. Yayasan Kita Menulis.
- Indriani, F. F., & Sakti, N. C. (2022). Pengembangan e-LKPD Berbasis Komik untuk Meningkatkan Kemampuan Berpikir Kritis Peserta Didik Kelas XI IPS SMA. *Jurnal PTK Dan Pendidikan*, 8(1), 65–77. <https://doi.org/10.18592/ptk.v8i1.6414>
- Kong, L. N., Qin, B., Zhou, Y. qing, Mou, S. yu, & Gao, H. M. (2014). The Effectiveness of Problem-Based Learning on Development of Nursing Students' Critical Thinking: A Systematic Review and Meta-analysis. *International Journal of Nursing Studies*, 51(3), 458–469. <https://doi.org/10.1016/J.IJNURSTU.2013.06.009>
- Maslakhatunni'mah, D., Safitri, L. B., & Agnafia, D. N. (2019). Analisis Kemampuan Berpikir Kritis pada Mata Pelajaran IPA Siswa Kelas VII SMP. *Seminar Nasional Sains*, 179–185.
- Moh Suardi. (2018). *Belajar dan Pembelajaran* (Vol. 1). <https://books.google.co.id/books?id=kQ1SDwAAQBAJ&printsec=copyright&hl=id#v=onepage&q&f=false>
- Nafiah, Y. N., & Suyanto, W. (2014). Penerapan Model Problem-Based Learning untuk Meningkatkan Keterampilan Berpikir Kritis dan Hasil Belajar Siswa. *Jurnal Pendidikan Vokasi*, 4(1), 125–143.
- Parmin, P., Savitri, E. N., Khusniati, M., & El Islami, R. A. Z. (2022). The prospective science teachers' skills in reconstructing indigenous knowledge of local culture on breast milk using pare (*Momordica charantia*). *International Journal of Educational Research Open*, 3, 100193. <https://doi.org/10.1016/J.IJEDRO.2022.100193>
- Puspita, V., Parma Dewi, I., Taratak Paneh No, J., Korong Gadang Kecamatan Kuranji, K., Padang, K., kunci, K., Berfikir Kritis, K., & Investigasi Matematika, P. (2021). Efektifitas E-LKPD berbasis Pendekatan Investigasi terhadap Kemampuan Berfikir Kritis Siswa Sekolah Dasar. *Jurnal Cendekia: Jurnal Pendidikan Matematika*, 5(1), 86–96.
- Rachamatika, T., Syarif Sumantri, M., Purwanto, A., Wicaksono, J. W., Arif, A., & Iasha, V. (2021). Pengaruh Model Pembelajaran Dan Kemandirian Belajar Terhadap Kemampuan Berpikir Kritis IPA Siswa Kelas V SDN Di Jakarta Timur. *Buana Pendidikan*, 17(1), 59–69. http://jurnal.unipasby.ac.id/index.php/jurnal_buana_pendidikan/index
- Rahmawati. (2019). Pelaksanaan Model Pembelajaran Problem Based Learning untuk Meningkatkan Hasil Belajar Al-Quran Hadits Materi Mujahadah An Nafs, Husnuzzan dan Ukhuwah. *Jurnal PTK & Pendidikan*, 5(1), 23–28.
- Risdianto, E., Dinissjah, M. J., Nirwana, & Kristiawan, M. (2020). The effect of Ethnoscience-based Direct Instruction Learning Model in Physics Learning on Students' Critical Thinking Skill. *Universal Journal of Educational Research*, 8(2), 611–615. <https://doi.org/10.13189/ujer.2020.080233>
- Safitri, W. C. D., & Mediatati, N. (2021). Penerapan Model Discovery Learning Dalam Pembelajaran IPA Untuk Meningkatkan Kemampuan Berpikir Kritis Dan Hasil Belajar Siswa Sekolah Dasar. *Jurnal Basicedu*, 5(3), 1321–1328. <https://doi.org/10.31004/basicedu.v5i3.925>

- Saifulloh, A. M., & Darwis, M. (2020). Manajemen Pembelajaran dalam Meningkatkan Efektivitas Proses Belajar Mengajar di Masa Pandemi COVID-19. *Bidayatuna*, 3(2), 286–311. <http://jurnal.staialhidayahbogor.ac.id/index.php/jim/article/view/688/491>,
- Saputra, H. (2020). “Pembelajaran Berbasis Masalah (Problem Based Learning).” *Perpustakaan LAI Agus Salim*, 1–9.
- Sobron A N, Bayu, & Rani. (2019). Persepsi Siswa dalam Studi Pengaruh Daring Learning terhadap Minar Belajar IPA. *SCAFFOLDING: Jurnal Pendidikan Islam Dan Multikulturalisme*, 1(2), 30–38.
- Sudarmin, S., Mursiti, S., & Asih, A. G. (2018). The Use of Scientific Direct Instruction Model with Video Learning of Ethnoscience to Improve Students’ Critical Thinking Skills. *IOP Conference Series: Journal of Physics*, 1006(1), 1–7. <https://doi.org/10.1088/1742-6596/1006/1/012011>
- Utama, K. H., & Kristin, F. (2020). Meta-Analysis Pengaruh Model Pembelajaran Problem Based Learning (PBL) Terhadap Kemampuan Berpikir Kritis IPA Di Sekolah Dasar. *Jurnal Basicedu*, 4(4), 889–898. <https://doi.org/10.31004/basicedu.v4i4.482>
- Winaryati, E. (2014). Model Pembelajaran “Wisata Lokal” Pada Pembelajaran Sains Berbasis Kurikulum 2013. *Prosiding Seminar Nasional Kimia, FMIPA UNY.*, 39–47.
- Yuliananingsih, Y., & Rokhimawan, M. A. (2020). Analisis Keterampilan Proses Sains Dasar pada Buku Tematik Kelas V Tema Panas dan Perpindahannya. *AULADUNA: Jurnal Pendidikan Dasar Islam*, 7(1), 81–89. <https://doi.org/10.24252/auladuna.v7i1a8.2020>

