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ENVIRONMENTAL CRITICAL THINKING: THE ROLE OF PROBLEM BASED LEARNING INTEGRATED WITH INSTAGRAM GREENPEACEID

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ABSTRACK

Abstrack: This study was motivated by increasing environmental damage. Critical thinking abilities are developed through education, which helps students get ready for future environmental issues. Geography learning at MAN 1 Malang is still dominated by a teacher-centred learning model, which is ineffective in developing students' critical thinking abilities. The purpose of this study is to investigate how Grade XI students' critical thinking abilities are affected when the Problem-Based Learning (PBL) model integrated with Instagram Greenpeaceid. The method used is a quasi-experimental design with a post-test only control group, involving an experimental class and a control class. The experimental class uses PBL integrated Instagram, while the control class uses the Direct Instruction method. There was a substantial difference between the two classes, based on the independent sample t-test results, which revealed significance at 0.005 < 0.05. These results show that using Instagram Greenpeaceid integrated with the PBL paradigm successfully improves students' critical thinking abilities through logical, argumentative, and collaborative discussion and presentation activities. This integration also supports the achievement of 21st-century competencies in geography education.
Keywords: Problem Based Learning; Instagram Greenpeaceid; Critical Thinking Abilities.

Abstrak*: Penelitian ini dilatar belakangi oleh kerusakan lingkungan yang semakin meningkat. Pendidikan berperan penting dalam mengembangkan keterampilan berpikir kritis guna mempersiapkan siswa menghadapi tantangan lingkungan di masa depan. Pembelajaran geografi di MAN 1 Malang masih didominasi model teacher centered, yang kurang efektif dalam mengembangkan kemampuan berpikir kritis siswa. Penelitian ini bertujuan mengkaji pengaruh model Problem-Based Learning (PBL) terintegrasi Instagram Greenpeaceid terhadap keterampilan berpikir kritis siswa kelas XI. Metode yang digunakan adalah quasi-experiment dengan desain post-test only control group, melibatkan kelas eksperimen dan kontrol. Kelas eksperimen menggunakan PBL terintegrasi Instagram, sedangkan kelas kontrol menggunakan Direct Instruction. Hasil uji independent sample t-test menunjukkan signifikansi 0,005 < 0,05, yang berarti terdapat perbedaan signifikan antara kedua kelas. Temuan ini menunjukkan bahwa penerapan model PBL terintegrasi Instagram Greenpeaceid efektif meningkatkan keterampilan berpikir kritis siswa melalui kegiatan diskusi dan presentasi yang logis, argumentatif, dan kolaboratif. Integrasi ini juga mendukung pencapaian kompetensi abad ke-21 dalam pembelajaran geografi.*
Kata Kunci: *Problem Based Learning; Instagram Greenpeaceid; Kemampuan Berpikir Kritis.*

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A. BACKGROUND

The issue of environmental damage is increasing and has become a global issue, including in Indonesia. Problems such as climate change, ecosystem degradation, and decreased quality of natural resources are triggered by human activities that ignore environmental impacts and low public awareness of conservation (Maharani, 2024; Purnami et al., 2021; Santika et al., 2022). To overcome this, education is crucial in shaping environmentally friendly consciousness and actions. Through education, individuals can understand the impact of their actions and are encouraged to make positive changes. Education also plays a role in shaping 21st century skills, such as critical thinking, creativity, communication, collaboration (4C), which are needed to face environmental challenges through active and interactive learning (Hidayatullah et al., 2025; Rosnaeni, 2021). Critical thinking as part of the 4Cs, is important to help students analyze information, make decisions, and find solutions to various problems. This ability can be honed through learning models that encourage student activity, creativity, and interaction, so that the material becomes more contextual and easy to understand (Kusumawati dkk., 2022).

Problem Based Learning (PBL) is an alternative learning model that can be used. PBL is among the most successful approaches to teaching for developing students' critical thinking abilities. By putting challenges at the forefront of the learning process, this paradigm puts the students at the center of the learning process. This approach encourages students to be active, independent, and able to connect geography concepts with real problems. During the educational process, students are trained to identify problems, collect and analyze data, and develop solutions based on their own understanding (Aini et al., 2023; Violina et al., 2021). Orienting students to the problem, organizing their learning, guiding individual and group investigations, creating and developing work, and analyzing and evaluating the problem-solving process are the five stages of PBL syntax, which is intended to help students gain critical thinking abilities (Sumarmi, 2012). Through this process, it not only improves students' understanding but also directly trains various critical thinking indicators that are essential in learning.

The PBL learning model is in line with the development of education that integrates digital technology as part of the learning process. One form of technology utilization is the use of social media, such as Instagram, which is one of the most widely used platforms (Efendi et al., 2025). Based on data from Databoks Katadata, Instagram users in Indonesia are dominated by young age groups, especially teenagers and young adults. 13-17 year olds account for 12.2 percent of users, while 18-24 year olds and 25-34 year olds account for 37.3 percent and 32.2 percent respectively. Thus, it can be concluded that around 81.7 percent of Instagram users are in the age range of 13 to 34 years, making this platform highly relevant among teenagers (Annur, 2021).

In problem-based learning, Instagram can be utilized as a source of information and analysis media to explore environmental issues more broadly. The platform provides a variety of educational content that can help students understand real environmental conditions without having to be in the location directly (Efendi et al., 2025). One example is Greenpeaceid's Instagram account that focuses on environmental issues, which often shares data, images, and research results regarding the impact of pollution and environmental change. By analyzing and discussing information from Greenpeaceid's Instagram, students can

develop critical thinking abilities, such as identifying problems, providing arguments, and drawing conclusions based on facts. The integration of digital media in PBL also makes students more active in discussing, collaborating, and finding data-based solutions to the environmental problems studied.

Environmental material in Phase F Geography is relevant to be applied in this study because it discusses various environmental issues such as climate crisis, deforestation, and pollution, which have a direct impact on daily life. Students' critical thinking abilities can be improved by using environmental materials that use the Problem Based Learning (PBL) approach, which encourages them to independently research information and evaluate challenging issues (Aini et al., 2023; Istni et al., 2022). In addition, the application of digital technology in PBL not only creates more meaningful learning, but also helps students strengthen their critical thinking abilities to comprehend environmental issues. However, this potential has not been fully utilized in the field, because there are still many schools that apply teacher-centered learning models, so that students' active participation and development of critical thinking have not run optimally.

Based on the results of observations and interviews, Geography teachers at MAN 1 Malang still use teacher-centered learning models such as direct instruction models with lecture, question and answer and memorization methods that often make students sleepy and unfocused in learning (Fasya et al., 2023; Helyati & Wardhani, 2019). Critical thinking abilities are frequently harder to develop using the prevalent teacher style in the educational process (Silaban & Sriyati, 2024). This is evidenced by the results of the Midterm Assessment (PTS) of geography subjects which show that some students have not reached the Minimum Completion Criteria. Based on these problems, innovation is needed in learning models that can encourage active student participation and foster critical thinking abilities, among these is the use of the PBL model integrated with Greenpeaceid Instagram media that is relevant to the context of student life.

This study examines the effect of applying the PBL model by utilizing Greenpeaceid's Instagram account as a supporting medium in improving students' critical thinking abilities in geography class XI at MAN 1 Malang. The urgency of this research is based on the importance of critical thinking abilities in understanding and analyzing increasingly complex environmental issues. This research focuses on environmental material in the Merdeka Phase F Curriculum for the 2024/2025 school year, especially on environmental material. This study also compares critical thinking abilities between students who learn with the PBL model integrated with Greenpeaceid Instagram and students who use the direct instruction model with the lecture method. Therefore, this study aims to determine the effect of applying the PBL model integrated with Greenpeaceid Instagram on students' critical thinking abilities in geography learning.

B. METHOD OF IMPLEMENTATION

The present study employed a quasi-experimental method with a posttest-only control group design to ascertain the discrepancy in the outcomes of classes treated using the Problem Based Learning (PBL) model and classes utilising the Direct Instruction model through the lecture method. The implementation of two classes, both of which encompass the same subject matter, yet differ in their respective learning approaches, is hereby proposed. Table 1 displays the comprehensive research design.

Table 1. Research Design

Group	Treatment	Posttest
Experiment Class	X	O_1
Control Class	-	O_2

Description:
X = PBL model treatment with the help of Greenpeaceid Instagram
\- = Direct Instruction model treatment with lecture method
O_1 = Posttest at the end of the activity for the experimental class
O_2 = Posttest at the end of the activity for the control class

MAN 1 Malang's XI social studies students made up the study's population. Purposive sampling, which chooses samples according to predetermined goals, was used to choose the samples. Additionally, two classes with nearly equal abilities are the focus of sampling. Two groups of samples were used in this study: class XI-G, which served as the experimental class, and class XI-H, which served as the control class. Classes in the study were selected based on the similarity of academic ability taken from the value of the Mid-Semester Assessment of Geography subjects.

Tests and observations were used to gather the research data. The test conducted was a posttest after being given treatment. The test instrument is in the form of 20 multiple choice questions and 5 essay questions that are in the C4 cognitive domain based on critical thinking indicators. This instrument has been tested on XII-I class totaling 31 students to determine the validity and reliability of the instrument. The question items to be used must be valid while the instrument must be reliable.

Prerequisite tests, such as normality and homogeneity tests and hypothesis testing, will then be used to assess the collected data. The normality test is carried out using Kolmogorov-Smirnov with a significant level of 5% (0.05). Meanwhile, the homogeneity test will be tested using the Levene Statistic test formula. After conducting the prerequisite test, the hypothesis test will be carried out using the Independent Sample T-test with a sig level of 0.05 whose purpose is to determine the average difference between the two data groups. Hypothesis testing in this study is as follows: H_0: There is no effect of PBL learning model on students' critical thinking abilities. H_1: There is an effect of PBL learning model on students' critical thinking abilities.

The basis for hypothesis testing decisions used in this research activity is as follows: if the p-value> 0.05 then H_0 is accepted while $H_1$is rejected. If the p-value ≤ 0.05 then H_0 is rejected while H_1 is accepted

C. RESULTS AND DISCUCCION

1. RESULTS

The results of the research are presented in tabular form, displaying how critical thinking abilities are distributed. The scores for the control group and the experimental group are presented in Table 2.

Table 2. Data on Critical Thinking Ability of Experimental and Control Class Students

		Experimental Class		Control Class	
Score	**Category**	**Frequency**	**Percentage**	**Frequency**	**Percentage**
91-100	Very good	6	18,1%	-	-
80-90	Good	18	54,5%	12	37,5%
65-79	Fair	9	27,2%	16	50%

50-64	Less	-	-	3	9,3%
≤50	Very less	-	-	1	3,1%
Total		**33**	**100%**	**32**	**100%**

An independent sample t-test was used to examine the study's hypotheses with a significance level of 0.05. It had previously been established that the data had satisfied the prerequisites of normality and homogeneity. The results of the tests are presented in Table 3.

Table 3. T-test Calculation Results

Class	N	Average score	Significance
Experiment	33	83	0,005
Control	32	76	

According to Table 3, the class that uses the Problem Based Learning integrated Greenpeaceid Instagram outperforms the class that does not receive the same treatment in terms of average critical thinking scores. Both groups' significance values in the significance column are 0.005 or less than 0.05. This score indicates that H0 is rejected and H1 is accepted, showing that the ability for critical thought of MAN 1 Malang grade XI pupils are impacted by the Problem Based Learning integrated with Greenpeaceid Instagram.

2. DISCUSSION

According to the research, there are disparities in the critical thinking abilities of the pupils in the treated class and the class that does not receive the same treatment. The significant difference in the average score is influenced by the syntax of the Problem Based Learning model integrated with Greenpeaceid Instagram which can train students in developing critical thinking abilities, especially in the ability to provide arguments and evaluation indicators. This happens because the application of the Problem Based Learning model integrated with Greenpeaceid Instagram effectively trains students in designing systematic arguments, and evaluating a problem critically. Through this model, students are accustomed to analyzing information, identifying problems, and developing solutions based on logical and fact-based thinking (Wardani, 2023).

The difference in critical thinking abilities cannot be separated from the characteristics of the PBL model which uses problems as the basis for learning and encourages students to engage in the problem-solving process**.** The use of Greenpeaceid's Instagram account in learning also supports the development of critical thinking abilities. This account provides quick access to environmental information relevant to learning, especially in the environmental field. Greenpeaceid Instagram acts as a medium to access a variety of informative visual content related to environmental issues, which is mainly applied to the problem orientation syntax and inquiry syntax in the PBL model. Content such as infographics, videos, and photos trigger students' curiosity and encourage them to think critically in identifying the root of the problem, evaluating information, and developing logical solutions (Efendi et al., 2025). Thus, the integration of Instagram in PBL not only accelerates information retrieval but also strengthens critical thinking abilities. One of the main activities in PBL that supports this is group discussion and presentation.

Group discussions in PBL train students to think critically, especially when faced with environmental issues presented through Greenpeaceid's Instagram media. Active involvement in discussions encourages students to seek information, analyze data, and solve problems. This process not only expands knowledge, but also hones critical thinking abilities, such as providing arguments based on data,

identifying cause-and-effect relationships, and formulating logical solutions (Islam et al., 2021). This is reflected in the results of students' discussions related to the problem of air pollution in Jakarta. Students identified that *"polusi menyebabkan penyakit jangka pendek seperti iritasi mata dan ISPA, serta jangka panjang seperti asma dan risiko kanker. Penyebab utamanya adalah emisi kendaraan bermotor, aktivitas industri, dan pembakaran sampah, ditambah faktor lain seperti kepadatan penduduk dan kurangnya ruang terbuka hijau. Untuk mengatasinya, siswa mengusulkan solusi seperti penggunaan transportasi umum, pengembangan energi ramah lingkungan, dan peningkatan kesadaran masyarakat, yang memerlukan kerja sama antara pemerintah dan masyarakat."*

The results of student discussions related to air pollution in Jakarta show that the PBL model encourages students to analyze problems in depth. Students are able to identify the impacts and causes of pollution and formulate comprehensive solutions, such as reducing vehicle emissions, developing environmentally friendly energy, and the active role of government and society. Group discussions in PBL play an important role in training critical thinking abilities, especially in data-based argumentation, cause-and-effect analysis, and formulating rational solutions, because students are trained to express opinions and are directly involved in the learning process (Apriyani & Alberida, 2023; Izzah et al., 2021). Whereas in the control class with the direct learning model, students' argumentation skills only appeared through oral answers to the teacher's questions. This makes students less trained to develop structured and data-based arguments, because oral delivery does not provide space for deeper analysis. This difference is one of the causes of the difference in critical thinking abilities between the experimental and control classes. In addition, presentation activities in the experimental class also had an influence in training students' critical thinking.

Presentation activities in learning encourage students to organize thoughts in a structured manner, communicate ideas clearly, and receive feedback to enrich understanding. In this stage, students not only present the results of the discussion, but also ask each other questions and respond to the issues presented by other groups. This two-way interaction broadens viewpoints and creates an active learning atmosphere (Badriyah et al., 2025; Kaspari & Masruroh, 2024). Presentation activities contribute to sharpening critical thinking abilities through the process of conveying ideas and arguments, students are trained to organize opinions logically, select relevant data, and formulate solutions to problems. This activity also sharpens students' communication skills and self-confidence, because they are trained to speak, discuss, and express opinions. In this way, students learn to convey their ideas clearly and effectively (Badriyah et al., 2025).

This can be seen in student presentations related to air pollution solutions in Jakarta, where students convey arguments based on data and analysis, and are able to respond to questions from other students with logical answers and supported by facts, such as the importance of public transportation, renewable energy, and the active role of government and society. Students also included data from several news articles as support, which shows active involvement in finding information. In the question and answer session, students asked each other questions, responded, and expressed opinions on the proposed solutions. This activity not only shows students' communication and collaboration skills, but also shows students' ability to evaluate. This process trains students to identify arguments, see problems from various points of view, and provide responses to problems (Wiratna et al., 2023). In contrast, in the control class that used the direct learning

model, students' evaluative skills tended to be less honed because there were no presentation activities or question and answer sessions that allowed students to actively question and respond to problems.

After the presentation and discussion activities between groups in the experimental class, the teacher conducted evaluation and reflection as the closing of learning. This activity aims to find out the opinions, understanding, and difficulties experienced by students during the problem solving process. In addition, the teacher also provides reinforcement of the material and draws conclusions together as a form of strengthening understanding of the concepts that have been learned. At this stage, students are invited to reflect on the thinking process they go through, identify effective strategies, and recognize the obstacles that arise during the activity. Students are also encouraged to link learning experiences with key concepts in learning (Ervina et al., 2023; Panjaitan et al., 2022; Sari et al., 2022). This activity not only provides input for teachers in designing further learning, but also helps students understand the material and gain knowledge more deeply, thus creating a more meaningful learning process (Aini et al., 2023).

Based on these findings, it can be stated that the application of the Problem Based Learning (PBL) model integrated with Greenpeaceid Instagram media significantly influences students' critical thinking abilities, as findings of the independent sample t-test, which display a significance value of Sig. (2-tailed) 0.005, support this. Through a series of activities in PBL, starting from problem identification, group discussion, presentation of results, to reflection on learning, training students to be actively involved in the process of higher-level thinking. These activities not only encourage students to analyze and evaluate information critically, but also form argumentative and collaborative skills that are important in dealing with problems (Badriyah et al., 2025; Murdilah et al., 2025). These results show that PBL combined with relevant and contextual media is able to create a meaningful learning atmosphere and in accordance with the needs of 21st century competencies.

According to research by Aini et al. (2023), students can strengthen their critical thinking abilities by using Google Classroom when combined with the Problem Based Learning method. Students can cultivate ideas and explore their thoughts in order to build and solve challenges with the help of Google Classroom and the Problem Based Learning paradigm. Meanwhile, research conducted by Wulandari et al. (2025) outlined how students' critical thinking abilities in geography classes are significantly enhanced by the Problem Based Learning method with the support of live worksheets. This model directs students to connect theory with practice, so they can solve real problems more effectively. In addition, the PBL model can also train students in group cooperation, find sources of information from various media, and develop new knowledge.

D. CONCLUSIONS AND SUGGESTIONS

The study's findings indicate that the application of the PBL approach when integrated with Greenpeaceid Instagram content significantly improves the critical thinking abilities of MAN 1 Malang class XI geography students. Students' critical thinking abilities in the experimental class, which used the PBL methodology integrated with Greenpeaceid Instagram content, outperformed the control group in terms of average score, which received lecture instruction. This is because the Problem Based Learning model's syntax is used, particularly in presentations and discussion exercises that can help students hone their critical thinking abilities.

The suggestions from the researchers are that the Problem Based Learning model can continue to be applied further in the learning process not only for environmental materials, but also for other materials that can be adapted to the Problem Based Learning model. In addition, it is also recommended to develop further research by adding other variables, such as creativity, communication skills, and collaboration, to strengthen its effectiveness in training students to have 21st century competencies.

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REFERENCES

Aini, A. N., Wirahayu, Y. A., & Budijanto, B. (2023). Pengaruh Model Problem Based Learning Berbantuan Google Classroom Terhadap Kemampuan Berpikir Kritis Siswa pada Mata Pelajaran Geografi. *Jurnal Integrasi Dan Harmoni Inovatif Ilmu-Ilmu Sosial (JIHI3S)*, *2*(12). https://doi.org/10.17977/um063v2i12p1236-1248

Annur, C. M. (2021, November 15). *Ada 91 Juta Pengguna Instagram di Indonesia, Mayoritas Usia Berapa?* Https://Databoks.Katadata.Co.Id/Datapublish/2021/11/15/Ada-91-Juta-Pengguna-Instagram-Di-Indonesia-Mayoritas-Usia-Berapa.

Apriyani, N. D., & Alberida, H. (2023). Pengaruh Model Problem Base Learning (PBL) terhadap Keterampilan Argumentasi Peserta Didik pada Pembelajaran Biologi: Literature Review. *BIOCHEPHY: Journal Of Science Education*, *03*(1).

Badriyah, S., Hartika, Z., & Gusmanelli. (2025). Analisis Keterampilan Berpikir Kritis Siswa Setelah Menerapkan Model Pembelajaran PBL (Problem Based Learning). *Jurnal Budi Pekerti Agama Islam*, *3*(1), 01–09. https://doi.org/10.61132/jbpai.v3i1.829

Efendi, A., Hasmawati, F., & Apriko, S. (2025). Analisis Pengunaan Media TikTok untuk Meningkatkan Kepedulian Lingkungan Siswa SMAN 1 Air Salek (Studi Kasus pada Akun Tik Tok @Pandawaragroup). *Interaction Communication Studies Journal*, *1*(4), 13. https://doi.org/10.47134/interaction.v1i4.3811

Ervina, A., Suharto, Y., & Rahmawati, R. (2023). Penerapan Model Problem Based Learning untuk Meningkatkan Kemampuan Berpikir Kritis Siswa Kelas X. *Journal of Geographical Sciences and Education*, *1*(2), 64–78. https://doi.org/10.69606/geography.v1i2.60

Fasya, M. A. H., Purwanto, P., & Susilo, S. (2023). Pengaruh Problem Based Learning Berbantuan Google Classroom Terhadap Kemampuan Berpikir Geografi Siswa IPS SMA Negeri 1 Talun. *Jurnal Integrasi Dan Harmoni Inovatif Ilmu-Ilmu Sosial (JIHI3S)*, *2*(12). https://doi.org/10.17977/um063v2i12p1164-1178

Helyati, & Wardhani, S. (2019). Peningkatan Hasil Belajar Siswa Melalui Model Discovery Learning Pada Materi Sel Improving Students' Learning Outcomes Through Discovery Learning Model On Cell Material. *Didaktika Biologi: Jurnal Penelitian Pendidikan Biologi*, *3*(2), 89–95. https://doi.org/https://doi.org/10.32502/dikbio.v2i2.1900

Hidayatullah, I. A., Sahrina, A., Purwanto, & Deffinika, I. (2025). Exploring Clungup Mangrove Conservation Through Virtual Field Trip Media : to Improve Students Critical Thinking Capability . *Jurnal Kajian, Penelitian Dan Pengembangan Pendidikan*, *13*(1), 112–125.

Islam, M. N., Sumarmi, S., Putra, A. K., Sugiyati, P., & Salsabilah, S. (2021). The Effect of Interactive Blended-Problem Based Learning Assisted Virtual Classroom on Critical

Thinking Skills of Students of The Society Era 5.0. *Jurnal Geografi Gea*, *21*(2). https://doi.org/10.17509/gea.v21i2.38862

Istni, T., Utomo, D. H., & Utaya, S. (2022). Pengaruh Model Problem Based Learning (PBL) Berbantuan LKPD Terhadap Kemampuan Berpikir Kritis Mata Pelajaran Geografi Siswa Kelas XI IPS MA Bilingual Batu. *Jurnal Integrasi Dan Harmoni Inovatif Ilmu-Ilmu Sosial (JIHI3S)*, *2*(2). https://doi.org/10.17977/um063v2i2p194-203

Izzah, AR. A., Ningsih, R., & Sancaya, S. A. (2021). Bimbingan Peningkatan Kemampuan Berpikir Kritis Siswa melalui Penggunaan Teknik Diskusi Kelompok. *Prosiding Konseling Kearifan Nusantara (KKN)*, *2*.

Kaspari, A., & Masruroh, H. (2024). Peningkatan Hasil Belajar Kognitif Melalui Gamification Learning: Penerapan Model Team Games Tournament pada Materi Mitigasi Bencana. *Paedagoria : Jurnal Kajian, Penelitian Dan Pengembangan Kependidikan*, *15*(2), 146–155.

Kusumawati, I. T., Soebagyo, J., & Nuriadin, I. (2022). Literature Study of Critical Thinking Ability with the Application of the PBL Model in the Constructivism Theory Approach. *JURNAL MathEdu (Mathematic Education Journal)*, *5*(1).

Maharani, E. P. (2024). Profil Tingkatan Literasi Lingkungan pada Peserta Didik Tingkat SMP. *JIMAD: Jurnal Ilmiah Mutiara Pendidikan*, *2*, 1982. https://doi.org/10.26740/jpps.v10n2.p1976-1982

Murdilah, U., Mira, & Farhurohman, O. (2025). Implementasi Pembelajaran Berbasis Problem Based Learning untuk Meningkatkan Kemampuan Berfikir Kritis Siswa. *Jurnal Nakula : Pusat Ilmu Pendidikan, Bahasa dan Ilmu Sosial*, *3*(1), 90. https://doi.org/10.61132/nakula.v3i1.1452

Panjaitan, I., Bukit, N., & Simanjuntak, M. P. (2022, September 20). The Effect of Problem Based Learning (PBL)Assisted by PhET Applications on Physics Problem Solving Ability of Students. https://doi.org/10.4108/eai.20-9-2022.2324696

Purnami, W., Ashadi, Suranto, Sarwanto, Sumintono, B., & Wahyu, Y. (2021). Investigation Of Person Ability And Item Fit Instruments Of Eco Critical Thinking Skills In Basic Science Concept Materials For Elementary Pre-Service Teachers. *Jurnal Pendidikan IPA Indonesia*, *10*(1). https://doi.org/10.15294/jpii.v10i1.25239

Rosnaeni, R. (2021). Karakteristik dan Asesmen Pembelajaran Abad 21. *Jurnal Basicedu*, *5*(5). https://doi.org/10.31004/basicedu.v5i5.1548

Santika, I. G. N., Suastra, I. W., & Arnyana, I. B. P. (2022). Membentuk Karakter Peduli Lingkungan pada Siswa Sekolah Dasar Melalui Pembelajaran IPA. *Jurnal Education And Development*, *10*(1).

Sari, D. T., Aula, A. W., Nugraheni, V. A., Dina, Z. K., & Romdhoni, W. (2022). Penerapan Pembelajaran Berbasis Masalah Pada Siswa Sd Untuk Menumbuhkan Kemampuan Berpikir Kritis. *Prosiding Seminar Nasional Pendidikan Guru Sekolah Dasar*, *2*(1), 82–96. https://doi.org/10.25134/prosidingsemnaspgsd.v2i1.30

Silaban, O. R., & Sriyati, S. (2024). Tinjauan Pedagogi Biologi Berbasis Kearifan Lokal Naniura-Sashimi Batak. *Biodik: Jurnal Ilmiah Pendidikan Biologi*, *10*(2), 22–29. https://doi.org/10.22437/biodik.v10i2.32255

Sumarmi. (2012). *Model-model pembelajaran geografi*. Aditya Media Publishing.

Violina, T. A., Handoyo, B., & Soelistijo, D. (2021). Pengaruh model problem based learning terhadap kemampuan berpikir kritis pada kompetensi atmosfer siswa kelas X MIA SMAN 3 Batu. *Jurnal Integrasi Dan Harmoni Inovatif Ilmu-Ilmu Sosial*, *1*(4). https://doi.org/10.17977/um063v1i4p488-493

Wardani, D. A. W. (2023). Problem Based Learning: Membuka Peluang Kolaborasi Dan Pengembangan Skill Siswa. *Jurnal Penelitian Dan Penjaminan Mutu*, *4*(1).

Wiratna, M. M., Hestuaji, Y., Nisa, A. F., & Sulistyawati, E. (2023). Penguatan Profil Pelajar Pancasila Dimensi Bernalar Kritis Pada Pembelajaran Ipas Melalui Model Problem Based Learning. *Pendas : Jurnal Ilmiah Pendidikan Dasar*, *8*(3).

Wulandari, L. T., Soekamto, H., Hartono, R., & Suharto, Y. (2025). Pengaruh Model Problem Based Learning Berbantuan Live Worksheet pada Mata Pelajaran Geografi Terhadap Kemampuan Berpikir Kritis Siswa SMA. *Jurnal Integrasi Dan Harmoni Inovatif Ilmu-Ilmu Sosial*, *5*(1), 1. https://doi.org/10.17977/um063.v5.i1.2025.1