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Effect of the Guided Inquiry Learning Model on Students' Scientific Literacy Skills in Ecology Material

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Abstract: The low scientific literacy skills of students in Indonesia, as reflected in the results of the Programme for International Student Assessment (PISA), indicate the need for the implementation of learning models that are able to develop students' scientific thinking skills. This study aims to determine the effect of the guided inquiry learning model on students' scientific literacy skills in ecology material. This study uses a quantitative approach with a quasi-experimental design using a Nonequivalent Control Group Design. The research sample consisted of two classes: the experimental class, which implemented the guided inquiry learning model, and the control class, which used the direct learning model. The research instrument was a scientific literacy test consisting of validated multiple-choice questions. Data analysis was carried out using normality and homogeneity tests, N-gain calculations to assess increases in scientific literacy skills, and independent-samples t-tests to test the research hypothesis. The results showed that the average pretest scores for the experimental and control classes were 37.92 and 38.02, respectively, indicating that the two classes' initial abilities were relatively similar. After treatment, the average posttest score for the experimental class increased to 77.60, while the control class's score reached 65.10. The independent sample t-test results showed a significance value of 0.000 (<0.05), thus accepting the alternative hypothesis. Based on the study's results, the guided inquiry learning model significantly improved students' scientific literacy in ecology. This finding suggests that the implementation of the guided inquiry learning model can be an effective alternative in improving students' scientific literacy skills through learning activities centered on investigation, problem-solving, and active student involvement in the scientific process.

Keywords: Ecology; Guided Inquiry; Scientific Literacy.

Introduction

The 21st century demands an education system that prepares students not only with academic competence but also with the ability to adapt to the rapid advancement of science and technology [1]. One essential competency is scientific literacy, which refers to an individual's ability to understand, evaluate, and apply scientific knowledge in various real-life contexts. Scientific literacy plays a crucial role in fostering critical thinking, evidence-based decision-making, and problem-solving skills to address increasingly complex social, environmental, and technological challenges [2]. Therefore, science education has a strategic role in developing this competency through learning that emphasizes not only conceptual understanding but also the ability to explain natural phenomena and apply scientific concepts in everyday life [3].

However, Indonesian students' scientific literacy remains relatively low. Results from the Programme for International Student Assessment (PISA) indicate that Indonesia's science literacy score declined from 403 in 2015 to 396 in 2018, and further decreased to 383 in 2022 [4]. These scores remain below the OECD average, indicating that many students continue to have difficulty explaining scientific phenomena, evaluating scientific evidence, and applying scientific knowledge to solve real-world problems [5]. This condition suggests that science instruction in schools still needs improvement to better develop competencies aligned with the demands of the 21st century and the latest international assessment framework [6].

The low level of scientific literacy is influenced by several factors, including teacher-centered instructional practices that provide students with limited opportunities to engage in scientific activities. Students tend to receive information passively through lectures, while opportunities for observation, experimentation, scientific discussion, and inquiry remain limited [7]. Furthermore, the underutilization of laboratory facilities, the limited implementation of contextual learning, and the lack of activities that encourage students to construct knowledge through direct experience result in students memorizing concepts rather than understanding their connections to real-world phenomena [8]. Recent international studies have also demonstrated that inquiry-based learning, authentic learning experiences, and contextual problem-solving significantly improve students' scientific literacy [9].

One instructional approach considered effective in addressing these issues is the Guided Inquiry Learning Model. This model places students at the center of the learning process by engaging them in systematic investigations under the teacher's guidance throughout each stage of learning [10]. Through identifying problems, formulating hypotheses, collecting and analyzing data, and drawing conclusions based on scientific evidence, students

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are provided with opportunities to construct their own understanding of the concepts being studied. At the same time, this process develops scientific thinking skills, which constitute the core of scientific literacy [11]. Numerous national and international studies have reported that implementing guided inquiry learning enhances students' ability to explain scientific phenomena, develop science process skills, think critically, construct scientific arguments, and use scientific evidence in decision-making [12].

Ecology is a highly relevant subject for developing scientific literacy because it examines the relationships between living organisms and their environment through authentic phenomena closely related to students' daily lives, such as environmental pollution, ecosystem changes, biodiversity, climate change, and the impacts of human activities on environmental balance. These characteristics enable students to conduct direct observations, collect data, analyze cause-and-effect relationships, and formulate evidence-based solutions. Consequently, ecology provides an appropriate context for developing the three core scientific literacy competencies emphasized in the PISA 2025 Framework: explaining phenomena scientifically, evaluating and designing scientific investigations, and interpreting scientific data and evidence critically [13].

The novelty of this study lies in implementing the Guided Inquiry Learning Model in ecology instruction, using the PISA 2025 scientific literacy competency framework as the basis for developing indicators, assessment instruments, and analyses of students' scientific literacy. Unlike previous studies, which generally relied on earlier PISA frameworks or focused solely on scientific knowledge, this study comprehensively integrates the three scientific literacy competencies outlined in the PISA 2025 framework into both the instructional process and student assessment.

Based on preliminary observations and interviews with science teachers at SMP Negeri 35 Medan, classroom instruction remains predominantly lecture-based, while laboratory activities and scientific investigations have not been implemented effectively despite the availability of science laboratory facilities. This situation has limited students' development of scientific literacy, as reflected in the initial (pretest) assessment results, which showed an average score of 45.83. Therefore, there is a need to implement a learning model that actively engages students in scientific inquiry to more effectively develop their scientific literacy.

Based on the above considerations, this study is expected to provide more up-to-date empirical evidence regarding the effectiveness of the Guided Inquiry Learning Model in improving students' scientific literacy in ecology at SMP Negeri 35 Medan during the 2025/2026 Academic Year.

Research Methods

This study employed a quantitative quasi-experimental design with a Nonequivalent Control Group Design. This design was selected because the researcher was unable to randomly assign participants; therefore, the experimental and control groups were determined based on existing classroom assignments. Both groups were administered a pretest before the treatment and a posttest after the treatment to measure students' initial scientific literacy and the changes in it following the learning process. This design enabled a more objective analysis of the learning model's effect on students' scientific literacy [14].

The study was conducted at SMP Negeri 35 Medan during the second semester of the 2025/2026 academic year. The population consisted of all seventh-grade students, while the sample was selected through purposive sampling based on students' equivalent academic abilities. The sample comprised Class VII-6 as the experimental group (32 students) and Class VII-7 as the control group (32 students).

The treatment was implemented over 10 instructional periods on the topic of ecology. The experimental group received instruction using the Guided Inquiry Learning Model, whereas the control group received direct instruction, following the teaching practices commonly implemented at the school.

The Guided Inquiry Learning Model was implemented systematically according to its instructional syntax in each lesson, consisting of: (1) orientation and problem presentation, in which the teacher introduced contextual phenomena related to ecology; (2) problem identification and hypothesis formulation, in which students identified the problem and proposed tentative hypotheses; (3) data collection, through observation, discussion, analysis of various learning resources, or laboratory activities appropriate to the lesson; (4) data analysis and interpretation, in which students processed and analyzed the collected data to test their hypotheses; and (5) conclusion and reflection, in which students presented the results of their investigations, discussed their findings, and related them to the scientific concepts being studied. These stages were designed to provide active, systematic, and meaningful learning experiences that promote the development of students' scientific literacy[15].

To ensure implementation fidelity, the researcher used the same lesson modules, Student Worksheets (LKPD), and instructional materials throughout all learning sessions. In addition, the implementation of each instructional stage was monitored using observation sheets to ensure consistent adherence to the Guided Inquiry Learning Model and the research design.

The research instrument was a 30-item multiple-choice scientific literacy test developed based on the scientific literacy competencies outlined in the PISA 2025 framework, namely: explaining phenomena scientifically, evaluating and designing scientific investigations, and interpreting scientific data and evidence. Prior to its administration, the instrument underwent content validity evaluation by expert validators. The validation results indicated that all test items met the required validity criteria and were therefore suitable for use as research instruments.

Data were analyzed using IBM SPSS Statistics Version 22. The analysis included descriptive statistics to obtain the mean and standard deviation, N-gain analysis to determine improvements in students' scientific literacy [16], assumption tests consisting of the Shapiro–Wilk test for normality and Levene's Test for homogeneity of variance, and an Independent Samples t-test at a significance level of 0.05 to examine the effect of the learning model on students' scientific literacy [17].

Results and Discussion

The results of this study present an analysis of students' scientific literacy data obtained from pretests and posttests in both the experimental and control classes. The analysis was conducted to determine the equivalence of students' initial abilities, the fulfillment of prerequisite tests, and the effect of implementing the guided inquiry learning model on improving students' scientific literacy skills.

Table 1. Independent Samples T-Test Results for Pretest

Data	Class	Mean	Sig.	Sig. Level
Pretest	Experimental	37.92	0.833	> 0.05
	Control	38.02		

Based on Table 1, the results of the Independent Samples T-Test on the pretest data indicate that the significance value of 0.833 exceeds the established significance level of 0.05. This indicates that there is no significant difference in initial scientific literacy between the experimental and control classes.

Table 2. Normality Test

Data	Class	Sig.	Criteria
Pretest	Control	0.127	Normally distributed
	Experimental	0.222	Normally distributed
Posttest	Control	0.086	Normally distributed
	Experimental	0.122	Normally distributed

Based on the results of the normality test using the Shapiro-Wilk method presented in Table 2, the significance (Sig.) values for the pretest data are 0.127 for the control class and 0.222 for the experimental class. Meanwhile, for the posttest data, the significance values are 0.086 for the control class and 0.122 for the experimental class. These values indicate that all data are normally distributed, as each significance value is greater than 0.05.

Table 3. Uji Homogenitas

Data	Levene Statistic	Sig.	Sig. Level	Description
Pretest	0.006	0.939	> 0.05	Homogeneously distributed
Posttest	0.760	0.387	> 0.05	Homogeneously distributed

The normality test using the Shapiro-Wilk method is presented in Table 2; the significance (Sig.) values for the pretest data are 0.127 for the control class and 0.222 for the experimental class. Meanwhile, for the posttest data, the significance values are 0.086 for the control class and 0.122 for the experimental class. These values indicate that all data are normally distributed, as each significance value is greater than 0.05.

Table 4. Uji Independent sample T test Postest

Data	Class	Mean	Sig.	Sig. Level
Posttest	Experimental	77.60	0.000	< 0.05
	Control	65.10		

The independent Samples T-Test on the posttest data after the treatment yielded a significance value of 0.000 (p=0.000) with a t-value of -6.970. This significance value is lower than the predetermined significance level of 0.05. Therefore, the null hypothesis (H_0) is rejected, and the alternative hypothesis (H_a) is accepted.

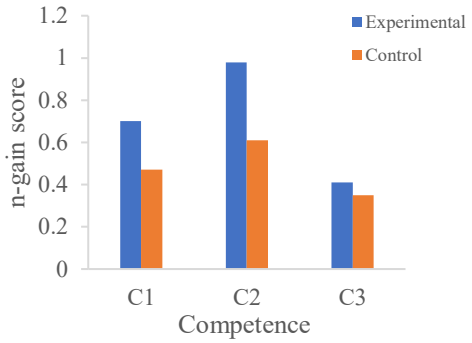


Figure 1. Improvement of Scientific Literacy Indicators

Figure 1, which shows improvements in scientific literacy for each indicator, the experimental class achieved higher scores on the indicators of explaining phenomena scientifically and constructing and evaluating investigations than the control class. Meanwhile, for the indicator of investigating, evaluating, and using scientific information for decision-making, both classes show relatively similar scores. This indicates that the improvement in this indicator is less pronounced than in the other indicators.

Based on the results of the hypothesis test, there was a significant difference in the posttest scores between the experimental and control groups. These findings indicate that implementing the Guided Inquiry Learning Model had a significant effect on students' scientific literacy in ecology. This instructional model provided students with opportunities to actively participate in the learning process through inquiry activities, construct concepts independently, and connect scientific concepts with phenomena encountered in everyday life. These findings are consistent with constructivist learning theory, which posits that knowledge is actively constructed by learners through learning experiences and interactions with their environment. Through these experiences, students not only developed a deeper understanding of ecological concepts but also enhanced their scientific thinking skills, which form the foundation of scientific literacy [18].

The improvement in scientific literacy observed in the experimental group can be explained by the stages of the Guided Inquiry Learning Model implemented throughout the study. The learning process began with a video presenting a contextual problem illustrating interactions within ecosystems, intended to stimulate students' curiosity about the observed phenomena. Students were then guided to formulate hypotheses through group discussions based on the identified problems. During the investigation stage, students conducted direct observations in the school environment to identify biotic and abiotic components and examine the relationships among ecosystem components. The observational data were subsequently analyzed collaboratively by comparing the findings with the hypotheses formulated earlier. In the final stage, each group presented the results of its investigation, followed by class discussions and concept reinforcement by the teacher. This sequence of activities provided meaningful learning experiences because students acquired knowledge through direct inquiry, making the learning process more active, contextual, and effective in enhancing scientific literacy [19].

Analysis of the scientific literacy competencies revealed that the greatest improvement in the experimental group occurred in the indicators of explaining phenomena scientifically and in constructing, evaluating, and designing scientific investigations. These improvements can be attributed to the fact that both competencies were explicitly practiced throughout every stage of the Guided Inquiry Learning Model. Students were trained to identify problems, formulate hypotheses, conduct observations, collect data, analyze observational findings, and draw conclusions based on scientific evidence. These activities provided students with authentic experiences in applying ecological concepts to explain phenomena occurring in their surrounding environment. In contrast, instruction in the control group remained predominantly teacher-centered, limiting students' opportunities to conduct independent scientific investigations, which consequently resulted in lower gains in scientific literacy compared with the experimental group [20].

Meanwhile, the improvement in the indicator of investigating, evaluating, and using scientific information for decision-making was relatively lower than that of the other indicators. This finding suggests that this competency is more complex because it requires students to evaluate information critically, consider alternative solutions to problems, and make decisions based on scientific evidence. Although observation, discussion, and presentation activities provided opportunities for students to develop these skills, the duration of the intervention was not sufficient to maximize their achievement. Therefore, this competency requires more intensive and sustained practice through instructional approaches that consistently engage students in contextual problem-solving and evidence-based decision-making [21].

The findings of this study reinforce those of previous research demonstrating that the Guided Inquiry Learning Model is effective in improving students' scientific literacy, science process skills, and critical thinking abilities. However, previous studies have also reported that students' abilities to evaluate scientific information and make evidence-based decisions tend to develop more slowly than their abilities to explain scientific phenomena or conduct scientific investigations. These findings suggest that the effectiveness of the Guided Inquiry Learning Model is influenced by factors such as instructional duration, subject-matter characteristics, and students' engagement in scientific inquiry activities.

This study has several limitations. First, it was conducted in only one school with a relatively small sample size, limiting the generalizability of the findings. Second, the instructional intervention lasted only ten instructional periods, which may not have been sufficient to fully develop all aspects of scientific literacy, particularly evidence-based decision-making skills. Third, scientific literacy was assessed solely through a multiple-choice test, which may not comprehensively capture students' abilities in scientific argumentation and inquiry. Therefore, future studies are recommended to involve larger and more diverse samples, implement longer instructional interventions, and employ a wider range of assessment methods, such as performance assessments, scientific argumentation tasks, and interviews, to provide a more comprehensive evaluation of students' scientific literacy.

Conclusion

Based on the data analysis and processing, it can be concluded that the implementation of the Guided Inquiry Learning Model had a significant effect on students' scientific literacy in ecology at SMP Negeri 35 Medan during the 2025/2026 academic year. This conclusion is supported by the results of the Independent Samples t-test on the posttest data, which yielded a significance value of 0.000 ($p < 0.05$). Therefore, the alternative hypothesis (H_a) was accepted, while the null hypothesis (H_0) was rejected. The findings indicate that the Guided Inquiry Learning Model effectively increased students' active engagement in observing, investigating, analyzing, interpreting data, and drawing conclusions based on scientific evidence, thereby producing a positive impact on the development of their scientific literacy. Regarding the scientific literacy competencies, the greatest improvement was observed in explaining phenomena scientifically and in evaluating and designing scientific investigations, whereas the smallest improvement occurred in interpreting and using scientific information for decision-making. These findings suggest that evidence-based decision-making skills require more intensive and sustained practice, supported by learning experiences that provide students with opportunities to analyze scientific issues within authentic real-life contexts. This study advances science education by demonstrating that the Guided Inquiry Learning Model is an effective instructional approach for developing scientific literacy competencies in line with the PISA 2025 framework. Therefore, junior high school science teachers are encouraged to consistently implement inquiry-based learning by incorporating contextual problems, scientific investigations, and classroom discussions to provide students with more meaningful learning experiences while fostering their scientific thinking skills.

Author's Contribution

P. Sihotang: Designed the research, conducted data collection, performed data analysis, and prepared the manuscript. H. Pranoto: Provided conceptual guidance, supervised the research methodology, and reviewed and revised the manuscript.

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References

[1] I. Abraham and Y. Supriyati, "Desain kuasi eksperimen dalam pendidikan: Literatur," *Jurnal Ilmiah Mandala Education*, vol. 8, no. 3, pp. 2476–2482, 2022, doi: 0.58258/jime.v8i3.3800

[2] I. R. Agustina, A. Andinasari, and L. Lia, "Kemampuan literasi sains pada materi zat melalui model pembelajaran inkuiri terbimbing berbantuan multimedia," *Jurnal Pendidikan Fisika FKIP UM*

Metro, vol. 8, no. 1, pp. 1–10, 2020, doi:10.24127/jpf.v8i1.2491

[3] M. T. S. Pramudyawan and A. Doyan, "Pengaruh Model Pembelajaran Inkuiri Terbimbing Berbantuan Kit Alat Percobaan Usaha dan Energi terhadap Penguasaan Konsep Fisika Peserta didik," Jurnal Penelitian Pendidikan IPA, vol. 6, no. 1, pp. 40–44, 2020, doi: 10.29303/jppipa.v6i1.290

[4] M. Albina, "Model penelitian eksperimental dalam pendidikan: Jenis, tujuan, dan aplikasinya," *Jurnal Media Akademik (JMA)*, vol. 3, no. 6, pp. 1–4, 2025, doi: 10.62281/v3i6.2365.

[5] R. Pratama, M. Alamsyah, M. F. Siburian, G. Marhento, J. Jupriadi, G. L. Jonathan, and W. Susanti, "Analisis Kemampuan Literasi Sains Peserta Didik pada Mata Pelajaran IPA," Jurnal Pendidikan MIPA, vol. 14, no. 2, pp. 576–581, 2024, doi: 10.37630/jpm.v14i2.1619.

[6] P. A. Y. Sari, N. Andriani, and W. R. Rizaldi, "Implementasi Pembelajaran Ipa Berbasis Inkuiri Terbimbing Terhadap Kemampuan Literasi Sains Materi Pesawat Sederhana," Jurnal Literasi Pendidikan Fisika (Jlpf), vol. 1, no. 2, pp. 131–137, 2020, doi: 10.30872/jlpf.v1i02.352.

[7] I. K. Suparya, I. W. Suastra, and I. B. P. Arnyana, "Rendahnya Literasi Sains: Faktor Penyebab Dan Alternatif Solusinya," Jurnal Ilmiah Pendidikan Citra Bakti, vol. 9, no. 1, pp. 153–166, 2022, doi: 10.38048/jipcb.v9i1.580.

[8] F. Yusmar and R. E. Fadilah, "Analisis Rendahnya Literasi Sains Peserta Didik Indonesia: Hasil Pisa Dan Faktor Penyebab," Lensa (Lentera Sains): Jurnal Pendidikan Ipa, vol. 13, no. 1, pp. 11–19, 2023, doi: 10.24929/lensa.v13i1.283.

[9] I. W. Ekayogi, "Model pembelajaran inkuiri terbimbing berbantuan Google Workspace for Education untuk meningkatkan hasil belajar IPA," *Jurnal Didaktika Pendidikan Dasar*, vol. 6, no. 2, pp. 433–452, 2022, doi: 10.26811/didaktika.v6i2.495

[10] Y. Erdani, L. Hakim, and L. Lia, "Pengaruh model pembelajaran inkuiri terbimbing terhadap kemampuan literasi sains siswa di SMP Negeri 35 Palembang," *Jurnal Pendidikan Fisika dan Teknologi*, vol. 6, no. 1, pp. 45–52, 2020, doi: 10.29303/jpft.v6i1.1549

[11] E. Jamnais et al., "Analisis kemampuan berpikir kreatif siswa kelas VII pada mata pelajaran IPA," Jurnal Natural Science Educational Research, vol. 7, no. 1, pp. 68–76, 2024.

[12] F. Fahruddin, N. Nurwahidah, and I. Rubianti, "Pengaruh model pembelajaran inkuiri terbimbing terhadap peningkatan literasi sains siswa kelas X MAN 1 Kota Bima Tahun Pelajaran 2022/2023," *JUPENJI: Jurnal Pendidikan Jompa Indonesia*, vol. 2, no. 2, pp. 83–87, 2023, doi: 10.57218/jupenji.Vol2.Iss2.241.

[13] S. Fitrianingrum, N. Ngatman, and R. Rokhmaniyah, "Model inkuiri terbimbing dengan multimedia untuk meningkatkan keterampilan proses sains dalam pembelajaran IPAS materi perubahan bumi pada siswa kelas V SD Negeri 1 Wonosari Tahun Ajaran 2023/2024," *Kalam Cendekia: Jurnal Ilmiah Kependidikan*, vol. 13, no. 1, pp. 483–490, 2025, doi: 10.20961/jkc.v13i1.88683.

[14] H. Fuadi, A. Z. Robbia, J. Jamaluddin, and A. W. Jufri, "Analisis faktor penyebab rendahnya kemampuan literasi sains peserta didik," *Jurnal Ilmiah Profesi Pendidikan*, vol. 5, no. 2, pp. 108–116, 2020, doi: 10.29303/jipp.v5i2.122

[16] J. Rohaili, D. Setiadi, and K. Kusmiyati, "Pengaruh penerapan bahan ajar model inkuiri terbimbing terintegrasi kearifan lokal berbasis outcome based education (OBE) melalui penggunaan media online terhadap literasi sains," *Jurnal Pijar Mipa*, vol. 16, no. 2, pp. 157–162, 2021, doi: 10.29303/jpm.v16i2.2379.

[17] K. Harto and K. Hawa, "Refleksi hasil PISA dan TIMSS di Indonesia: Upaya peningkatan kompetensi literasi siswa madrasah melalui AKMI," *Pendas: Jurnal Ilmiah Pendidikan Dasar*, vol. 10, no. 2, pp. 391–405, 2025, doi: 10.23969/jp.v10i02.24505.

[18] A. Arbadilah, E. Juliyanto, and N. Dewantari, "Efektivitas Model Pembelajaran Inkuiri Terbimbing Berbantuan Powtoon untuk Meningkatkan Kemampuan Literasi Sains pada Materi Zat dan Perubahannya," *Jurnal Pendidikan Matematika Dan Sains*, vol. 13, no. 2, pp. 431–443, 2025, doi: 10.21831/jpms.v13i2.90153.

[19] M. Jannah, E. Sudibyo, and R. W. Mursyidah, "Analisis keterampilan literasi sains siswa melalui implementasi model pembelajaran guided inquiry," *Pensa E-Jurnal: Pendidikan Sains*, vol. 12, no. 3, pp. 88–92, 2024, doi: 10.26740/pensa.v12i3.62670

[20] A. K. Pratiwi, M. Makhrus, and M. Zuhdi, "Pengembangan perangkat pembelajaran berbasis model inkuiri terbimbing untuk meningkatkan kemampuan literasi sains dan sikap ilmiah peserta didik," *Jurnal Ilmiah Profesi Pendidikan*, vol. 6, no. 3, pp. 290–295, 2021, doi: 10.29303/jipp.v6i3.240.

[21] K. W. A. Siahaan, S. T. Lumbangaol, J. Marbun, A. D. Nainggolan, J. M. Ritonga, and D. P. Barus, "Pengaruh model pembelajaran inkuiri terbimbing dengan multi representasi terhadap keterampilan proses sains dan penguasaan konsep IPA," *Jurnal Basicedu*, vol. 5, no. 1, pp. 195–205, 2021, doi: 10.31004/basicedu.v5i1.614.

[22] M. R. Katili and R. M. T. Yasin, "Pengaruh media pembelajaran terhadap hasil belajar siswa pada mata pelajaran komputer dan jaringan dasar," *Jurnal Pendidikan Teknologi Informasi*, vol. 2, no. 1, pp. 1–12, 2022, doi: 10.37905/inverted.v2i1.13081

[23] M. K. B. S. B. Sukarta, "Penerapan Model Pembelajaran Berbasis Masalah dengan Media Pembelajaran Magic Board untuk Meningkatkan Kemampuan Berpikir Kritis," *Jurnal Penelitian Tindakan Kelas (JPTK)*, vol. 1, no. 3, pp. 195–200, 2023, doi: 10.61650/jptk.v1i3.367.

[24] M. Lestari and T. Indriani, "Analisis tingkat kesukaran soal persamaan dan pertidaksamaan nilai mutlak melalui pendekatan teori tes klasik," *Jurnal Pembelajaran dan Inovasi Pembelajaran Indonesia*, vol. 1, no. 2, pp. 28–33, 2023, doi:10.20961/ijolii.v1i02.1045

[25] C. C. Nisa and D. Astriani, "Penerapan model pembelajaran inkuiri terbimbing," *J. Pijar MIPA*, vol. 17, no. 4, pp. 475–479, 2022, doi: 10.29303/jpm.v17i4.3664.