Volume 6 Number 3 (2024)
September-December 2024
Page: 45-57

E-ISSN: 2656-4491
P-ISSN: 2656-4548
DOI: 10.37680/scaffolding.v6i3.6284

SCAFFOLDING
Jurnal Pendidikan Islam dan Multikulturalisme

ANALYSIS OF INITIAL SCIENTIFIC LITERACY MASTERY IN ELEMENTARY SCHOOLS

Nur Fadhilah Ummah[1], Suryanti[2], Binar Kurnia Prahani[3]
[123] Universitas Negeri Surabaya; Indonesia
Correspondence email; 24010855037@mhs.unesa.ac.id

Submitted: 11/06/2023 Revised: 13/08/2024 Accepted: 20/10/2024 Published: 01/12/2024

Abstract

This research aims to measure and explain mastery of scientific literacy and provide several alternatives to foster mastery of scientific literacy in elementary schools, especially at SDN Tambakrejo 2. This study is quantitative research. The population of this research was all class VI of SD Negeri Tambakrejo 2 in the 2024/2025 academic year. The research sample was one class of class VI students totaling 20 people using a cluster random sampling technique, namely by randomly selecting one class as the research sample. The data collection techniques used were tests and interviews. Data analysis techniques in research use quantitative data analysis techniques with a descriptive approach**.** The research results showed that of the 20 students, three students had a percentage of 15% in the very low category, 12 students had a percentage of 60% in the low category, four students had a percentage of 20% in the medium category, and a percentage of 5% in the high mastery category. This research concludes that the mastery of scientific literacy of class VI students at SDN Tambakrejo 2 still needs to be improved. To develop this ability, teachers can apply contextual problem-based learning. This method, supported by an appropriate learning approach, can improve students' critical thinking abilities and problem-solving skills.

Keywords Natural Science, Mastery, Scientific Literacy.

INTRODUCTION

The rapid changes in times and advancements in science and technology in the 21st century have led to a swiftly evolving and increasingly complex educational paradigm. The younger generation must equip themselves with critical thinking and problem-solving skills, creativity and innovation, communication, and collaboration, which are essential for the 21st century (Kemendikbud, 2017). Educators are required to continually enhance their competencies and develop innovative teaching strategies to optimally facilitate students in acquiring these 21st-century skills (Tarihoran, 2019). The development of scientific literacy integrated with other 21st-century skills will produce human resources who are not only capable of systematic and scientific thinking but also possess depth in addressing scientific issues and technological advancements (Khery et al., 2020).

The results of the *Programme for International Student Assessment* 2018 showed that Indonesia ranked 72nd out of 77 participating countries (PISA, 2018). By 2022, there was an improvement, but Indonesia only climbed six places (Kemendikbud, 2023). In response to this situation, the Ministry of Education, Culture, Research, and Technology implemented the Minimum Competency Assessment (AKM) program in 2021 as a comprehensive evaluation tool to measure the quality of education in each school. However, AKM remains limited to evaluating basic science understanding and does not yet encompass a comprehensive assessment of scientific literacy. The development of more complex scientific literacy skills has become a critical need to prepare students for future PISA assessments.

Currently, science education in Indonesia still requires improvement, particularly in how the science learning process can enhance attitudes, from mastery of materials to procedures and their applications for both educators and students (Fitria, 2017). Students need to be guided to understand the relevance of each concept in addressing the rapidly changing dynamics of the environment (Wati & Trihantoyo, 2020).

Scientific Literacy, as defined by Paul de Hart Hurt, refers to the ability to apply knowledge to social issues (Barokah, A., Kurniati, B., & Kaddafi, 2024). Scientific literacy enables individuals to apply scientific principles and processes in personal decision-making and actively participate in discussions on various scientific issues that impact society (*National Science Education Standards*, 1996). Furthermore, literacy encompasses the ability to understand scientific concepts, identify problems, and interpret available information to make decisions based on scientific knowledge

(OECD, 2019). Thus, scientific literacy not only emphasizes the understanding of concepts but also stimulates critical thinking processes, the ability to apply concepts in real-life situations, problem-solving skills, and decision-making regarding natural and social phenomena.

The domains of scientific literacy, which consist of context, competence or process, content/knowledge, and attitudes, are closely interconnected and refer to the process domain. PISA 2015 formulated scientific literacy competencies within the process domain, including explaining phenomena scientifically, evaluating and designing scientific investigations, and interpreting data and evidence scientifically (OECD, 2017). Thus, all dimensions—context, competence, and content—can be used as indicators to measure students' mastery of scientific literacy.

Scientific literacy is crucial because scientific thinking skills are used to understand and address social issues (Irsan, 2021). Factors contributing to the low level of scientific literacy in Indonesia include the use of inappropriate textbooks, less contextual learning, limited facilities and infrastructure, and low reading interest (Suparya et al., 2022). Students also need opportunities to actively apply their knowledge in real-life situations (Wasis, Rahayu, Y. S., Sunarti, T., & Indana, 2020). Ideally, teachers should be required to use scientific process skills to effectively teach scientific facts (Rosa, 2015), as science is a methodological approach to understanding the environment rather than merely a source of knowledge (Suryanti et al., 2020). Therefore, selecting appropriate teaching models and strategies becomes a key factor in positioning students as the main subjects in the learning process.

Observations at SDN Tambakrejo 2 revealed several findings during the learning process, including (1) the dominant use of the lecture method in teaching, (2) a focus by teachers on memorizing factual concepts without connecting them to real-life applications, and (3) the absence of experiments or direct studies conducted by teachers to facilitate investigations and problem-solving in learning. The teaching methods employed were less effective in fostering critical thinking skills and conceptual understanding required for mastering scientific literacy.

Research on scientific literacy has been conducted. The first study revealed that the understanding of science interactions reached the highest level (86.42%). Mastery of technology and society ranked second at 81.96%. Scientific thinking skills ranked third at 68.48%. The investigation of the nature of science ranked the lowest at 50.36% (Jakiah et al., 2024). The second study showed that fourth-grade Class B students achieved an average scientific literacy score categorized as "moderate" in the content aspect, "low" in the process aspect, "moderate" in the context aspect, and

"very high" in the attitude aspect (Ismawati et al., 2024). The third study indicated that the overall evaluation of scientific literacy skills achieved only 52% mastery (Dwipuspasari et al., 2023). The fourth study found that 21 students showed good performance, four students reached a very good level, and three students were at a sufficient level. The overall average score was 72.8% (Ismet et al., 2024). The fifth study revealed various indicators of scientific literacy, showing that the ability to identify scientific arguments reached 67%, understanding of research components was only 30%, problem-solving skills were 48%, statistical interpretation ability was 30%, and conclusion-drawing proficiency was 50% (Pratama et al., 2024).

Previous studies have indeed shown a significant amount of research on this topic. However, this study aims to address issues identified in aspects affecting the mastery of scientific literacy, making it a relevant area for further investigation. While there are similarities in the problems and variables, the empirical evidence relied upon in this study differs. This distinction sets it apart from prior research.

Scientific literacy integrated into environmental problem topics is crucial, considering the growing importance of addressing both local and global environmental issues. The accumulation of plastic waste and the reduction of green spaces for settlements are challenges that future generations must confront. Therefore, students need to be equipped early on with scientific literacy skills to apply scientific concepts and seek solutions to these environmental problems.

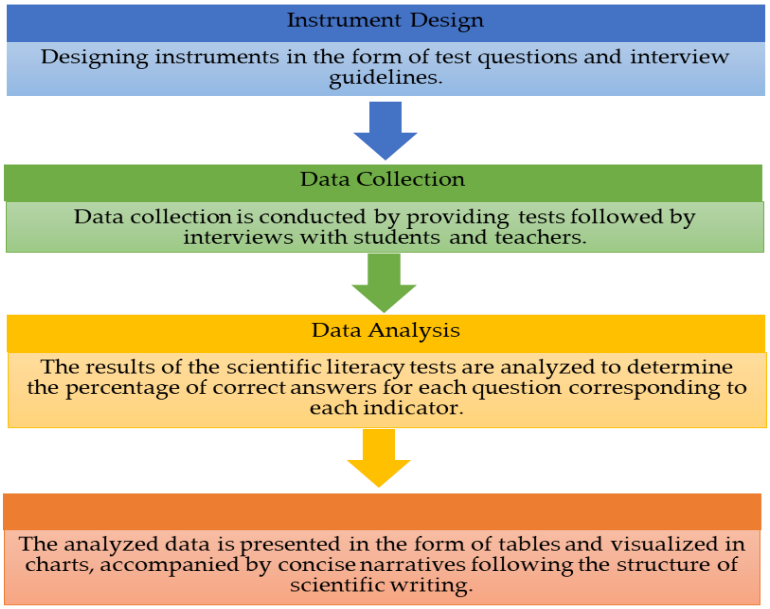
This research aims to describe the mastery of scientific literacy on the topic of various environmental issues. Mastery of scientific literacy will equip students with the ability to understand natural phenomena occurring in their surroundings through the scientific concepts they have learned. This study will serve as a foundation for developing further research related to students' mastery of scientific literacy in elementary schools.

METHOD

This research is a quantitative study. Quantitative research, based on the philosophy of positivism, is used to study populations and samples, collect data using research instruments, and analyze data quantitatively or statistically. This method is employed to test and describe the selected hypotheses (Sugiyono, 2022). The research was conducted at SDN Tambakrejo 2. The population of this study consisted of all grade VI students at SDN Tambakrejo 2 in the 2024/2025 academic year. The research sample consisted of Class VIA, with a total of 20 students. The sampling technique

used was cluster random sampling. The data used in this study were quantitative data. Quantitative data refers to data measured on a numerical scale, which can be categorized as interval data (Ramdhan, 2021). Data collection techniques in this research included tests and interviews. Tests were administered to determine the level of scientific literacy mastery and conducted individually. Interviews were conducted with respondents, namely grade VI students and teachers, to gather information about the students' understanding of scientific literacy at school. The data analysis technique was performed quantitatively using a descriptive approach. The data were presented in the form of percentages representing the achievement levels of scientific literacy. The research stages are presented in the following diagram.

Figure 1. Research Procedure on Scientific Literacy Mastery



The research process begins with designing a scientific literacy test instrument that measures aspects of competence/process and developing interview guidelines for teachers and students. Data collection was conducted by providing a written test consisting of 20 multiple-choice questions. The scientific literacy indicators measured include three indicators: (1) identifying scientific issues, (2) explaining scientific phenomena based on scientific knowledge, and (3) using scientific evidence to draw conclusions. The collected test results were processed and scored. A score of 1 was assigned for correct answers, while a score of 0 was given for incorrect answers. Subsequently, the scores were categorized according to the following test score intervals.

Table 1. Test Score Interpretation Categories

Interval	Criteria
75–100	High
50–74.9	Moderate
25–49.9	Low
<25	Very Low

After the data processing is completed, the results are presented in a simple and easily understandable format and organized into a table. Additionally, numerical data are displayed as percentages in the form of charts to enhance visual appeal and make the presentation more engaging.

FINDINGS AND DISCUSSION

Findings

After the test was conducted, the obtained data were calculated and grouped according to the assessment categories. The results of the scientific literacy test at SDN Tambakrejo 2 are presented in Table 2 below.

Table 2. Results of the Scientific Literacy Test

No	Category	Number of Students	Percentage (%)
1.	Very Low	3	15
2.	Low	12	60
3.	Moderate	4	20
4.	High	1	5
5.	Very High	0	0

In Table 2, the highest percentage falls under the low scientific literacy mastery category, which is 60%, while the lowest percentage is in the high mastery category, at 5%. The scientific literacy mastery of the grade VI students is illustrated in Figure 2 below.

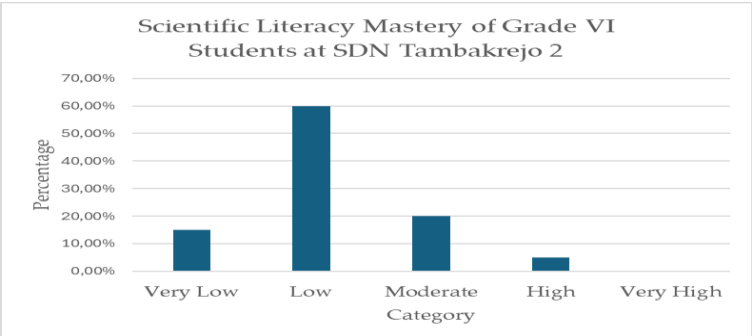


Figure 2. Chart of Scientific Literacy Mastery

Figure 2 clearly visualizes that the highest percentage of scientific literacy mastery falls under the low category, while the lowest percentage is in the high category. In addition to tests, data collection was also conducted through interviews with students and teachers. Below are the results of the interviews with the students and teachers of SDN Tambakrejo 2.

Table 3. Interview Results with Students of SDN Tambakrejo 2

Interviewer	Respondent
What do you know about scientific literacy?	"I don't know what scientific literacy is, Ma'am." (Faiq, interview, October 2, 2024)
What do you know about scientific literacy?	"Scientific literacy is part of the Natural Science subject." (Imma, interview, October 2, 2024)

Table 4. Results of Interviews with Teachers at SDN Tambakrejo 2

Interviewer	Respondent
In your opinion, what is scientific literacy?	"Scientific literacy is literacy that includes science material and is applied in daily life." (Teacher, interview, October 2, 2024)

The results of the interviews with students and teachers who teach grade VI at SDN Tambakrejo 2 indicate that both students and teachers have a reasonably good understanding of scientific literacy. Furthermore, each aspect of scientific literacy competence or process was further broken down into nine indicators, which served as guidelines for creating the test questions. The students' answers were then processed to calculate the percentage of correct answers for each scientific literacy indicator, as shown in Table 5.

Table 5. Percentage of Correct Answers Based on Scientific Literacy Indicators

Competence/Process Aspect	Scientific Literacy Indicator	Percentage of Correct Answers (%)
Identifying scientific issues	Recognizing issues that can be investigated scientifically	62.5
	Identifying keywords to find scientific information	77.5
	Recognizing steps of scientific investigation	45
Explaining scientific phenomena based on scientific knowledge	Applying scientific knowledge	37.5
	Interpreting phenomena	45
	Identifying explanations and hypotheses	25
Using scientific evidence to draw interpretations	Interpreting scientific evidence and drawing conclusions	32.5
	Identifying assumptions, evidence, and reasons	25

	Reflecting on the social implications of science and technology developments	23.8

Table 5 shows the percentage of correct answers by students based on the following indicators: (1) identifying keywords to find scientific information at 77.5%, (2) recognizing issues that can be investigated scientifically at 62.5%, (3) understanding phenomena and steps of scientific investigation at 45%, (4) applying scientific knowledge at 37.5%, (5) interpreting scientific evidence and drawing conclusions at 32.5%, and (6) finding explanations and hypotheses to interpret scientific evidence and identifying assumptions, evidence, and reasons at 25%. These results illustrate that students do not have a sufficient understanding of scientific literacy related to various environmental issues. The results indicate that students' mastery in the indicator of reflecting on the social implications of science and technology development is relatively low, which means their scientific literacy regarding the topic of various environmental issues remains inadequate. Figure 3 below illustrates the percentage of test results on scientific literacy for the topic of various environmental issues.

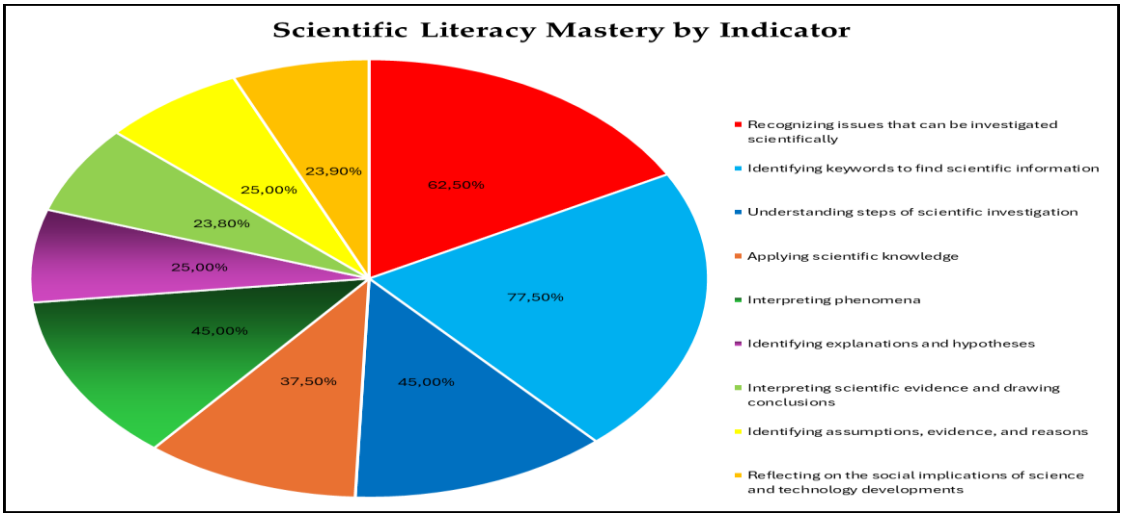


Figure 3. Graph of Scientific Literacy Mastery Percentage for Each Indicator

Figure 3 visualizes the percentage of scientific literacy mastery achievements of grade VI students at SDN Tambakrejo 2. Specifically, out of the nine scientific literacy indicators assessed, only 4 achieved a percentage of >50%. This indicates a need for improvement and enhancement in the other indicators to ensure better results across all indicators.

Discussion

The results of the scientific literacy assessment align with the observations, showing that the low mastery of scientific literacy among grade VI students at SDN Tambakrejo 2 is due to the teachers not yet implementing scientific process skills in science learning. Literacy-based and experimental learning in science subjects has not yet been applied. This finding is supported by research showing an improvement in students' scientific literacy abilities when teaching incorporates a scientific process skills approach (Suryanti et al., 2018). In the era of 4.0, teachers must assist students in analyzing, thinking critically, and solving problems in accordance with the implemented curriculum (Fatimah & Pahlevi, 2020).

The low cognitive domain in scientific literacy can be caused by several factors, including low reading interest, a lack of evaluation tools to measure scientific literacy, and limited teacher knowledge about scientific literacy (Sumanik et al., 2024). The importance of developing teacher professionalism is evident in the implementation of teaching strategies to enhance students' scientific literacy (Kinanthi et al., 2024). Teachers' ability to design science teaching strategies that integrate scientific literacy and character education can be improved through workshops aimed at enhancing teacher competence (Zukmadini et al., 2021). In addition, the development of valid and reliable scientific literacy evaluation tools will enable the assessment of students' levels of scientific literacy (Chasanah et al., 2022). It is crucial for teachers to make an effort to understand students' questions during the learning process. This requires strategies to foster questioning among students and a deep knowledge of science content (Bossér, 2024).

Three factors can be implemented to improve scientific literacy in elementary schools: providing motivation to increase students' interest in learning, actively involving students in the learning process, and creating an enjoyable learning environment (Janah et al., 2024). Enhancing scientific literacy requires learning approaches that are oriented toward real-life or contextual situations (Situmorang, 2016). Contextual-based learning can significantly enhance students' scientific literacy skills by integrating scientific concepts with everyday phenomena (Nofiana & Julianto, 2018). Similarly, the implementation of contextual learning that integrates socio-scientific issues has been proven effective in developing students' argumentation and scientific reasoning skills (Putra, 2024). Recent studies also indicate that the Problem-Based Learning (PBL) approach is effective in enhancing students' scientific literacy and critical thinking (Muniroh & Amberansyah, 2024). Moreover, the PBL model has been shown to improve scientific literacy among fifth-grade

elementary school students in Kupang (Aiman & Amelia Ramadhaniyah Ahmad, 2020). The PBL model helps teachers connect lessons with students' real-life experiences. It also enables students to actively participate in exploring and solving problems related to the subject matter (Maryana, 2019).

Several studies have also integrated the PBL model with differentiated learning strategies. The first study showed improved scientific literacy outcomes and increased student engagement in each cycle using a differentiated PBL model (Dewi et al., 2023). Supporting this, another study proved that differentiated learning within the Merdeka Curriculum enhances student learning outcomes in each cycle of goal achievement, evaluated through formative assessments (Fitra, 2022).

In science learning activities, students should be frequently challenged to practice using their scientific knowledge and skills to solve problems presented by teachers in the classroom. The use of digital technology and interactive learning media is equally important in developing scientific literacy competencies in the digital era (Subroto et al., 2023). To enhance students' scientific literacy and learning outcomes, creating question-based lesson modules is an effective approach (Putro Utomo, 2018). These various studies indicate that improving scientific literacy requires a comprehensive learning approach that involves contextual aspects, process skills, and the optimal use of technology.

CONCLUSION

Grade VI students at SDN Tambakrejo 2 still need improvement in scientific literacy. Further research can be conducted by comparing scientific literacy across various countries or regions. This will help identify elements that influence cognitive domains and attitudes, as well as determine whether the current curriculum impacts scientific literacy or if certain teaching methods are more effective in enhancing students' cognitive understanding.

REFERENCES

Aiman, U., & Amelia Ramadhaniyah Ahmad, R. (2020). Model Pembelajaran Berbasis Masalah (PBL) Terhadap Literasi Sains Siswa Kelas V Sekolah Dasar. *Jurnal Pendidikan Dasar Flobamorata*, *1*(1), 1–5. https://doi.org/10.51494/jpdf.v1i1.195

Barokah, A., Kurniati, B., & Kaddafi, T. (2024). *Studi Literatur: Analisis Literasi Sains Era Society 5.0 Di Sekolah Dasar*. *09*, 257–266.

Bossér, U. (2024). Transformation of School Science Practices to Promote Functional Scientific Literacy. *Research in Science Education*, *54*(2), 265–281. https://doi.org/10.1007/s11165-023-10138-1

Chasanah, N., Widodo, W., & Suprapto, N. (2022). Pengembangan Instrumen Asesmen Literasi

Sains Untuk Mendeskripsikan Profil Peserta Didik. *PENDIPA Journal of Science Education*, *6*(2), 474–483. https://doi.org/10.33369/pendipa.6.2.474-483

Dewi, V. C., Kuswanti, N., & Prijono, B. (2023). Implementation of a Problem-Based Learning Model based on Differentiated Learning to Improve Science Literacy Skills and Student Activities. *Jurnal Eksakta Pendidikan (JEP)*, *7*(2), 225–238. https://doi.org/10.24036/jep/vol7-iss2/772

Dwipuspasari, F., Kelana, J. B., & Wardani, D. S. (2023). Peningkatan Kemampuan Literasi Sains Dengan Menggunakan Model Problem Based Learning Berbantuan Aplikasi Canva Pada Siswa Sekolah Dasar Kelas V. *Action Research Journal Indonesia (ARJI)*, *5*(3), 138–147. https://doi.org/10.61227/arji.v5i3.134

Fatimah, S., & Pahlevi, T. (2020). Pengembangan Instrumen Penilaian Berbasis HOTS (Higher Order Thinking Skills) pada Kompetensi Dasar Menerapkan Sistem Penyimpanan Arsip SIstem Abjad, Kronologis, Geografis, Nomor, dan Subjek di Jurusan OTKP SMKN 1 Bojonegoro. *Jurnal Pendidikan Administrasi Perkantoran (JPAP)*, *8*(2), 318–328. https://doi.org/10.26740/jpap.v8n2.p318-328

Fitra, D. K. (2022). Analisis penerapan pembelajaran berdiferensiasi dalam Kurikulum Merdeka pada materi Tata Surya di kelas VII SMP. *Tunjuk Ajar: Jurnal Penelitian Ilmu Pendidikan, 5(2), 278-290.* https://doi.org/http://dx.doi.org/10.31258/jta.v5i1.278-290

Fitria, Y. (2017). Efektivitas Capaian Kompetensi Belajar Siswa dalam Pembelajaran Sains Di Sekolah Dasar. *Jurnal Inovasi Pendidikan dan Pembelajaran Sekolah Dasar*, *1*(2). https://doi.org/10.24036/jippsd.v1i2.8605

Irsan, I. (2021). Implemensi Literasi Sains dalam Pembelajaran IPA di Sekolah Dasar. *Jurnal Basicedu*. https://jbasic.org/index.php/basicedu/article/view/1682

Ismawati, F., Winarti, P., & Puspitasari, N. (2024). Analisis Kemampuan Literasi Sains dalam Pembelajaran IPAS pada Siswa Kelas IV MI Gedanganak Ungaran Timur. *WASPADA (Jurnal Wawasan Pengembangan Pendidikan)*, *12*(1), 16. https://doi.org/10.61689/waspada.v12i1.538

Ismet, I., Andriani, N., Fitonia, A., Nadia, H., Meitasari, D., & ... (2024). Exploration of Physics Concepts in Local Wisdom of South Sumatera as an Effort to Develop Students' 21st-Century Skills. *Jurnal Penelitian & ….*

Jakiah, L., Sari, N. F., & Dimenta, R. H. (2024). Analisis Kemampuan Literasi Sains pada Siswa SMA Negeri 2 Rantau Selatan pada Materi Tumbuhan Tingkat Rendah. *Al Qalam: Jurnal Ilmiah Keagamaan Dan Kemasyarakatan*, *18*(3), 1860. https://doi.org/10.35931/aq.v18i3.3490

Janah, A. N., Darmayanti, M., & Saefudin, A. (2024). Kemampuan Literasi Sains di Sekolah Dasar: Systematic Literature Review dan Bibliometric Analysis Periode Tahun 2016 - 2023. *AR-RIAYAH: Jurnal Pendidikan Dasar*, *8*(1), 43. https://doi.org/10.29240/jpd.v8i1.9327

Kemendikbud. (2017). *Kompetensi Inti dan Kompetensi Dasar Pelajaran pada Kurikulum 2013 pada Pendidikan Dasar dan Menengah*. Kemendikbud.

Kemendikbud. (2023). *Peringkat Indonesia pada PISA 2022 Naik 5-6 Posisi Dibanding 2018*.

Khery, Y., Rosma Indah, D., Aini, M., & Asma Nufida, B. (2020). Urgensi Pengembangan Pembelajaran Kimia Berbasis Kearifan Lokal dan Kepariwisataan untuk Menumbuhkan Literasi Sains Siswa. *Jurnal Kependidikan: Jurnal Hasil Penelitian Dan Kajian Kepustakaan Di Bidang Pendidikan, Pengajaran Dan Pembelajaran*, *6*(3), 460. https://doi.org/10.33394/jk.v6i3.2718

Kinanthi, G. S., Saputri, N. F., & Rosita, N. A. (2024). Pentingnya Pengembangan Kompetensi Profesionalisme Guru dalam Menghadapi Transformasi Pendidikan Abad 21. *Social, Humanities, and Educational Studies (SHES): Conference Series*, *7*(3). https://doi.org/10.20961/shes.v7i3.91652

Maryana, M. (2019). Pengaruh Model Pembelajaran Problem Based Learning (PBL) Terhadap Hasil Belajar Siswa Materi Perpindahan Kalor Kelas V SD Negeri 35 Palembang. *Scholastica Journal*

Jurnal Pendidikan Sekolah Dasar Dan Pendidikan Dasar (Kajian Teori Dan Hasil Penelitian), *2*(1). https://doi.org/10.31851/sj.v2i1.7564

Muniroh, H., & Amberansyah, A. (2024). Meningkatkan Keterampilan Berpikir Kritis dan Hasil Belajar IPA Materi Ekosistem Menggunakan Model PBL DICONTOH (Problem Based Learning, Discovery Learning, Contextual Teaching and Learning, dan Number Head Together) pada Siswa Kelas V SDN Kuin Selatan 1. *Jurnal Pendidikan, Sains Dan Teknologi*, *3*(4), 805–813. https://doi.org/10.47233/jpst.v3i4.2162

National Science Education Standards. (1996). National Academies Press. https://doi.org/10.17226/4962

Nofiana, M., & Julianto, T. (2018). Upaya Peningkatan Literasi Sains Siswa Melalui Pembelajaran Berbasis Keunggulan Lokal. *Biosfer : Jurnal Tadris Biologi*, *9*(1), 24. https://doi.org/10.24042/biosf.v9i1.2876

OECD. (2017). *PISA 2015 Assessment and Analytical Framework*. OECD. https://doi.org/10.1787/9789264281820-en

OECD. (2019). *Education at a Glance 2019*.

PISA. (2018). *Results Combined Executive Summaries Volume I, II & III* (2018th ed.). https://www.oecd.org/en/data/datasets/pisa-2018-database.html

Pratama, R., Mashudi Alamsyah, Martua Ferry Siburian, Giry Marhento, Jupriadi, J., George Louwis Jonathan, & Wirda Susanti. (2024). Analisis Kemampuan Literasi Sains Peserta Didik pada Mata Pelajaran IPA. *Jurnal Pendidikan MIPA*, *14*(2), 576–581. https://doi.org/10.37630/jpm.v14i2.1619

Putra, D. P. (2024). Analisis Keterampilan Berbahasa dan Literasi Ilmiah Siswa Sekolah Dasar Melalui Discovery Learning dan Media ICT. *Jurnal Pelita: Jurnal Pembelajaran IPA Terpadu*, *4*(1), 70–79. https://doi.org/10.54065/pelita.4.1.2024.444

Putro Utomo, E. N. (2018). Pengembangan Modul Berbasis Inquiry Lesson Untuk Meningkatkan Literasi Sains Dimensi Proses Dan Hasil Belajar Kompetensi Keterampilan Pada Materi Sistem Pencernaan Kelas XI. *Biosfer : Jurnal Tadris Biologi*, *9*(1), 45. https://doi.org/10.24042/biosf.v9i1.2878

Ramdhan, M. (2021). *Metode penelitian*. Cipta Media Nusantara.

Rosa, F. O. (2015). Pengembangan Modul Pembelajaran Ipa Smp Pada Materi Tekanan Berbasis Keterampilan Proses Sains. *Jurnal Pendidikan Fisika*, *3*(1). https://doi.org/10.24127/jpf.v3i1.21

Situmorang, R. P. (2016). Integrasi literasi sains peserta didik dalam pembelajaran sains. *Satya Widya*. https://ejournal.uksw.edu/satyawidya/article/view/630

Subroto, D. E., Supriandi, Wirawan, R., & Rukmana, A. Y. (2023). Implementasi Teknologi dalam Pembelajaran di Era Digital: Tantangan dan Peluang bagi Dunia Pendidikan di Indonesia. *Jurnal Pendidikan West Science*, *1*(07), 473–480. https://doi.org/10.58812/jpdws.v1i07.542

Sugiyono. (2022). *Metode Penelitian Kuantitatif*. Alfabeta.

Sumanik, N. B., Hasanah, K., & Siregar, L. F. (2024). Rancang Bangun Instrumen Soal Literasi Sains Berbasis Quizizz Pada Pokok Bahasan Larutan Elektrolit Dan Non Elektrolit. *Lensa (Lentera Sains): Jurnal Pendidikan IPA*, *14*(1), 58–68. https://doi.org/10.24929/lensa.v14i1.497

Suparya, I. K., I Wayan Suastra, & Putu Arnyana, I. B. (2022). Rendahnya Literasi Sains: Faktor Penyebab Dan Alternatif Solusinya. *Jurnal Ilmiah Pendidikan Citra Bakti*, *9*(1), 153–166. https://doi.org/10.38048/jipcb.v9i1.580

Suryanti, Ibrahim, M., & Lede, N. S. (2018). Process skills approach to develop primary students' scientific literacy: A case study with low achieving students on the water cycle. *IOP Conference Series: Materials Science and Engineering*, *296*, 012030. https://doi.org/10.1088/1757-899X/296/1/012030

Suryanti, S., Widodo, W., & Budijastuti, W. (2020). Guided Discovery Problem-Posing: An Attempt

to Improve Science Process Skills in Elementary School. *International Journal of Instruction*, *13*(3), 75–88. https://doi.org/10.29333/iji.2020.1336a

Tarihoran, E. (2019). Guru Dalam Pengajaran Abad 21. *SAPA - Jurnal Kateketik Dan Pastoral*, *4*(1), 46–58. https://doi.org/10.53544/sapa.v4i1.68

Wasis, Rahayu, Y. S., Sunarti, T., & Indana, S. (2020). *HOTS dan Literasi Sains (Konsep, Pembelajaran, dan Penilaiannya)*. Kun Fayakun Anggota IKAPI. https://statik.unesa.ac.id/profileunesa_konten_statik/uploads/literasi/file/f7a3de3e-0e5b-4ded-ba8a-1f6ffa59df2e.pdf

Wati, A. R. Z., & Trihantoyo, S. (2020). Strategi Pengelolaan Kelas Unggulan Dalam Meningkatkan Prestasi Belajar Siswa. *Jurnal Dinamika Manajemen Pendidikan*, *5*(1), 46. https://doi.org/10.26740/jdmp.v5n1.p46-57

Zukmadini, A. Y., Karyadi, B., & Rochman, S. (2021). Peningkatan Kompetensi Guru Melalui Workshop Model Integrasi Terpadu Literasi Sains Dan Pendidikan Karakter Dalam Pembelajaran IPA. *Publikasi Pendidikan*, *11*(2), 107. https://doi.org/10.26858/publikan.v11i2.18378