Jurnal Pijar MIPA
https://jurnalfkip.unram.ac.id/index.php/JPM

ISSN 1907-1744 (Print)
ISSN 2460-1500 (Online)

Profile of Science Literacy Skills of Junior High School Students in Surabaya City

Siti Nurul Hidayati, Siti Nurul Hidayati*

Department of Science Education, Universitas Negeri Suarabaya, Surabaya, Indonesia
*e-mail: sitihidayati@unesa.ac.id

Received: December 30, 2024. Accepted: January 29, 2025. Published: January 30, 2025

Abstract: Science literacy is critical for every student to master because it can train students' ability to think critically, solve problems, and understand scientific phenomena in everyday life. This study aims to describe the initial science literacy skills of students in Surabaya junior high schools. This research design is a survey design with data analysis techniques used descriptive quantitative, namely by analyzing the average percentage of 3 indicators of science literacy competencies, including 1) explaining phenomena scientifically, 2) evaluating and designing scientific investigations, and 3) interpreting data and evidence scientifically. The research instrument consisted of 9 science literacy test questions adopted from the 2015 PISA science literacy test. The subjects of this research were the 8th-grade students of Labschool UNESA 1 Surabaya Junior High School, consisting of 99 students, 44 male and 55 female students. The results showed that the indicators of evaluating and designing scientific investigations and interpreting data and evidence scientifically obtained a moderate category with an average of 42% and 41%. The Indicator of explaining phenomena scientifically still requires additional training because it is included in the low category with an average of 40%. This is due to students' inability to analyze information, conclude, and link theories with tangible phenomena. Based on the study results, it can be concluded that grade VIII students in Surabaya Junior High Schools have moderate science literacy skills with an overall average percentage of 41%.

Keywords: Critical Thinking; Problem Solving; Science Literacy; Scientific Phenomena.

Introduction

Science literacy is critical for every student to master because it involves understanding the basic concepts of science [1], the ability to interpret data [2], the ability to problem-solve [3], and critical thinking [4]. Science literacy has rapidly evolved beyond the ability to read and digest scientific information; it also includes the capacity to understand and implement scientific concepts in everyday life [5]. Science literacy skills can help students solve problems as a basis for making decisions based on scientific considerations [6]. In addition, science literacy skills can also enable students to follow and understand social and environmental issues that occur in everyday life more deeply [7]. However, students' science literacy skills are still relatively low and require more attention [8].

The data obtained by PISA (Program for International Student Assessment) shows junior high school students have low science literacy skills. In 2018, Indonesia's PISA score was ranked 70th out of 78 countries, with an average of 396. In 2022, the ranking rose to 56 out of 81 countries, but the score dropped to 383 [9]. Students' lack of understanding shows that students' ability to understand and apply science concepts is still not optimal. Several previous studies have revealed that students' science literacy skills are still below the expected standards, so appropriate efforts are needed to improve them [11]. The results of research conducted at SMP Muhammadiyah 2 Taman show that students' science literacy skills are in the low category, with an average percentage of 37% [12]. The research at SMP Negeri 35 Palembang revealed that the learning had not improved students' science literacy skills [13]. A more interactive and engaging learning model is considered to help students understand scientific concepts concretely [14]. In addition, presenting material that relates to real phenomena in the surrounding environment can help students connect theory with everyday life [15]. The application of this ability is essential in life. Thus, students are more skilled in systematically observing, analyzing, and explaining scientific phenomena, which is the essence of science literacy [16].

Based on the explanation above, there have been many studies on the four aspects of students' science literacy and the factors that cause it. However, studies rarely focus on students' science literacy skills at the junior high school level because this ability is more commonly associated with higher education levels. Therefore, the researcher is interested in conducting a study entitled "Profile of science literacy skills of junior high school students in Surabaya" to determine the category of students' science literacy as well as the achievement of each indicator of science literacy competence of grade VIII junior high school students in Surabaya. It is hoped that teachers can utilize this information as a reference to assess and improve the quality of science learning in schools.

Research Methods

This research design uses a survey design. The science literacy instrument was adopted from the valid

How to Cite:
S. N. Hidayati and S. N. Hidayati, "Profile of Science Literacy Skills of Junior High School Students in Surabaya City", *J. Pijar.MIPA*, vol. 20, no. 1, pp. 162–167, Jan. 2025. https://doi.org/10.29303/jpm.v20i1.8318

PISA questions in 2015, which consisted of 9 multiple-choice questions. The instrument has been adapted to 3 aspects of science literacy competence, namely on indicators: 1) explain phenomena scientifically, 2) evaluate and design scientific investigations, and 3) interpret data and evidence scientifically. Each competency aspect indicator consists of 3 items. The subjects of this study were students of class VIII SMP Labschool UNESA 1 Surabaya with a total of 99 students, consisting of 44 male students and 55 female students.

The data analysis technique used is quantitative descriptive analysis. It analyzes all students' answers on each aspect of science literacy competence and then presents them as percentages according to the category [17]. The results of the study were processed using the following formula:

$$P = \frac{F}{N} \times 100\% \quad \text{.....(1)}$$

[17]

Description:
P = percentage of answers
F = Number of correct student answers
N = Total Number of students
The data obtained were then interpreted into the percentage of science literacy categories shown in Table 1.

Table 1. Categories of Science Literacy Skills

Percentage (%)	Category
X > 80	Very High
60 < X ≤ 80	High
40 < X ≤ 60	Medium
20 < X ≤ 40	Low
0 < X ≤ 20	Very Low

[17]

Results and Discussion

The answers that the students have collected are then analyzed using descriptive quantitative methods to understand their science literacy skills. The results of the analysis are presented in Table 2.

Table 2. Average score of science literacy indicators

Sub Variables	1)	2)	3)
Mean	1.21	1.25	1.23
Median	1	1	1
Mode	1	1	1
Standard Deviation	0.77	0.86	0.80

Table 2 presents a recapitulation of the student science literacy test achievement scores. The lowest mean data was identified in the Indicator of explaining phenomena scientifically at 1.21 and the highest in evaluating and designing scientific investigations at 1.25. Based on the standard deviation, the Indicator with the lowest level of variation in the data range explains phenomena scientifically at 0.77, and the highest data range is evaluating and designing scientific investigations at 0.86. This shows that students' understanding of the Indicator of explaining phenomena scientifically is more uniform than their ability to assess and design investigations. A further picture of the distribution of students' science literacy skills can be seen in Figure 1, which presents the percentage of students by category of science literacy level.

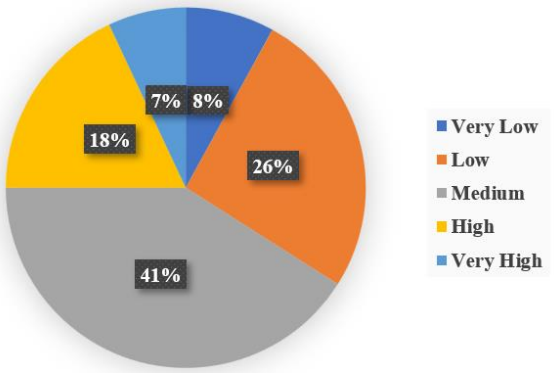

Figure 1. Percentage of Students' Science Literacy Ability Results

Based on Figure 1, it can be seen that seven students obtained an average percentage of 7%, which was included in the very high category, 18 students received an average percentage of 18% in the high category, 41 students obtained an average percentage of 41% in the medium category, 26 students obtained an average percentage of 26% in the low category, and seven students obtained an average percentage of 8% in the very low category.

The study's results indicate that there are still obstacles to understanding science concepts, both in terms of learning methods [18], access to learning resources, and individual factors such as motivation and interest in science [19]. The low percentage of students in the very high category is also a concern because good science literacy is essential for mastering science at a higher level. To further understand the factors that influence students' science literacy results, the categorization of students' science literacy based on gender can be shown in Table 3.

Table 3. Students' Science Literacy Results by Gender

Gender		Category
Male	Female	
2	5	Very Low
9	17	Low
22	19	Medium
6	12	High
3	4	Very High

Based on Table 3, it can be seen that in the male gender, as many as two students are in the very low category, nine students in the low category, 22 students in the medium category, six students in the high category, and three students in the very high category. In the female gender, five students were in the very low category, 17 in the low category, 19 in the medium category, 12 in the high category, and 4 in the very high category.

The difference in science literacy based on gender in Table 3 shows that female students are more in the high and very high categories. In contrast, male students dominate in the medium and low categories. This is influenced by learning methods, interest, and learning environment [20]. To understand the aspects that need to be improved, it is necessary to analyze the average achievement of each competency indicator based on the criteria for interpreting science literacy scores, as shown in Figure 2.

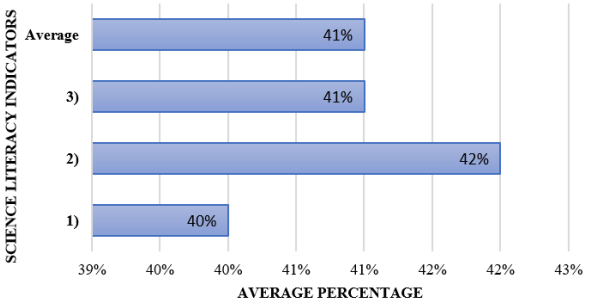

Figure 2. Average percentage of each Indicator Based on Science Literacy Score Criteria

Figure 2 shows that Indicator 1) is included in the low category with an average percentage of 40%, and there are two indicators included in the medium category, namely Indicator 2) and Indicator 3) with an average percentage of 42% and 41%. All indicators of students' science literacy competency fall into the moderate category, averaging 41%. The analysis results show that some elements of competence from the science literacy indicators are sufficiently developed but still require strengthening. The low level of one of the indicators can hinder the development of overall competence because science literacy requires a balance between concept understanding [21], application, and critical thinking skills [22].

Science literacy refers to an individual's ability to utilize knowledge about science, technology, and social issues with a critical thinking approach [23]. The emphasis on science as a form of knowledge is reflected in presenting, discussing, and asking questions to review information related to interrelated facts, concepts, principles, events, laws, and theories [24]. Students' success in learning can be measured by their ability to apply the knowledge gained in everyday life through science literacy [25]. However, the level of science literacy of students in Indonesia is still relatively low. Students' science literacy skills are still low because science learning is often not linked to everyday life [26], less interactive teaching methods [27], and the a lack of learning facilities and resources that support deeper exploration of science [28]. In addition, the lack of student motivation to connect science concepts with everyday life is also a factor that contributes to low science literacy [29].

The results of research conducted at SMP Labschool UNESA 1 Surabaya indicate that the ability to explain phenomena scientifically is in the low category. The low competence of students in this aspect is caused by the lack of learning experiences that train students to understand and describe a phenomenon using scientific concepts [30]. Following previous research that has been conducted, interviews with teachers show that in the learning process, students receive more material passively without being allowed to connect concepts that have been learned with real phenomena [31]. So, students struggle to explain the cause-and-effect relationship in a scientific event [32]. In addition, teachers rarely ask questions that encourage students to think critically and relate science concepts to everyday life [33]. Learning focuses more on memorizing theories than deeply understanding an event. The lack of ability to explain a phenomenon based on scientific concepts results in students tending to repeat information without understanding the underlying principles. Learning evaluation should test the extent to which students can remember theories and encourage students to apply and relate various scientific concepts in explaining phenomena. Students with good science literacy skills can understand an event, tell it to the appropriate theory, and explain it logically and systematically [34]. Therefore, science learning must be designed to provide experiences that help students develop skills in explaining phenomena based on the science principles they have learned.

Based on the study results, the ability to evaluate and design scientific investigations is included in the moderate category. Students' abilities in this Indicator have begun to develop, but students still have difficulty determining the proper method to analyze data critically [35]. Further guidance is needed to create more complex research questions to connect the investigation results with the underlying scientific theory [36]. The ability to evaluate and design scientific investigations is essential for students to assess experimental results better. Despite efforts to encourage students to think critically and analytically, students need more experience in distinguishing between valid and invalid evidence. Improving these skills will help strengthen students' understanding of science concepts and motivate students to be more independent in solving scientific problems systematically [37].

The results also indicated that the ability to interpret data and evidence scientifically was in the medium category. Some students can recognize patterns in data and connect them with basic scientific concepts, but still have difficulty drawing more complex conclusions based on existing evidence [38]. Students need to develop critical thinking skills to interpret data by linking it to concepts learned [39], as described in cognitive learning theory. The level of cognitive aspects students possess also plays a role in processing and analyzing data obtained from various sources [40]. Therefore, improving the ability to interpret data and evidence scientifically is essential so that students can process information more deeply, use science literacy skills to analyze and evaluate data, develop stronger arguments, and understand scientific phenomena more comprehensively [41].

Science literacy plays a vital role in the learning process. Several steps can be taken to strengthen science literacy, including improving teachers' understanding of science literacy, applying it throughout the learning process, and using more student-centered learning strategies. One strategy that can be applied is using experiment-based learning methods, which allow students to build their understanding through direct experience [42]. Experiment-based learning methods can help students independently plan, implement, and evaluate learning outcomes. During science learning, practicum activities are one of the effective ways to train science literacy skills [43]. In addition, effective learning must provide a stimulus that can encourage students' active involvement in the learning process [44]. Students' active participation can be increased by applying innovative and diverse learning methods supported by engaging media and adequate facilities. Some learning methods that can be used include discovery learning, inquiry, jigsaw, teams game tournament (TGT), cooperative learning, and problem-based learning

(PBL). All of these methods contribute to improving students' science literacy skills [45].

Based on the explanation above, this research has the opportunity to significantly impact educators in understanding students' science literacy skills. With a better understanding, teachers can apply more appropriate learning methods in developing science literacy. However, some teachers teach without considering the needs of students. Therefore, teachers need to design more practical and effective learning, support good communication, and manage time optimally when delivering material [46].

Conclusion

Based on the research results, it can be concluded that the science literacy skills of students in Surabaya Junior High Schools are in the moderate category, with an average overall percentage of 41%. Of the three indicators in the science literacy competency aspect, the lowest average percentage score is in the Indicator of explaining phenomena scientifically, which is 40%, while the indicators of evaluating and designing scientific investigations and interpreting data and evidence scientifically are in the moderate category with an average percentage of 42%. This condition indicates that students' science literacy skills need to be improved. Interest, interactive, innovative learning strategies and adequate media and learning support facilities are required to improve science literacy skills.

Author's Contributions

Siti Nurul Hidayati: conducted observations at UNESA Labschool 1 Surabaya Junior High School to obtain information related to the obstacles faced by students in science literacy. Based on this information, the author conducted research on students' science literacy profile, collected data through the 2015 PISA-based science literacy test, and analyzed the data using quantitative descriptive techniques. Siti Nurul Hidayati: helped in providing direction, guidance, and evaluating the research and article writing process. In addition, the author also plays a role in the preparation, revision, and completion of the manuscript until it is ready for publication.

Acknowledgement

The author would like to thank the UNESA Labschool 1 Surabaya Junior High School for giving permission and support in conducting this research. Gratitude is also extended to the students who have participated in this research. In addition, appreciation is given to the supervisor and colleagues who have provided constructive input in the process of preparing this article.

References

[1] A. Rusilowati, N. Hidayah, and M. Masturi, "Analisis profil kemampuan literasi sains siswa SMP/MTs di Kabupaten Pati," *Phenomenon: Jurnal Pendidikan MIPA*, vol. 9, no. 1, pp. 36–47, 2019. doi: 10.21580/phen.2019.9.1.3601.

[2] S. N. Pratiwi, C. Cari, and N. S. Aminah, "Pembelajaran IPA abad 21 dengan literasi sains siswa," *Jurnal Materi dan Pembelajaran Fisika*, vol. 9, no. 1, pp. 34–42, 2019.

[3] M. Mellyzar, S. R. Zahara, and S. Alvina, "Literasi sains dalam pembelajaran sains siswa SMP," *Pendekar: Jurnal Pendidikan Berkarakter*, vol. 5, no. 2, pp. 119–124, 2022. doi: 10.31764/pendekar.v5i2.10097.

[4] A. Latip and A. Faisal, "Upaya peningkatan literasi sains siswa melalui media pembelajaran IPA berbasis komputer," *Jurnal Pendidikan UNIGA*, vol. 15, no. 1, pp. 444–452, 2021. doi: 10.52434/jp.v15i1.1179.

[5] I. Irsan, "Implemensi literasi sains dalam pembelajaran IPA di sekolah dasar," *Jurnal Basicedu*, vol. 5, no. 6, pp. 5631–5639, 2021. doi: 10.31004/basicedu.v5i6.1682.

[6] N. Dewantari, Nuryunita, and S. Singgih, "Penerapan literasi sains dalam pembelajaran IPA," *Indonesian Journal of Natural Science Education (IJNSE)*, vol. 3, no. 2, pp. 366–371, 2020. doi: 10.31002/nse.v3i2.1085.

[7] V. E. Sari, S. D. Pamelasari, and R. D. Hardianti, "Penerapan model PBL-STEM melalui kegiatan field trip untuk meningkatkan literasi sains siswa abad 21," *Proceeding Seminar Nasional IPA*, 2023.

[8] S. H. A. Utami, P. Marwoto, and W. Sumarni, "Analisis kemampuan literasi sains pada siswa sekolah dasar ditinjau dari aspek konten, proses, dan konteks sains," *Jurnal Pendidikan Sains Indonesia (Indonesian Journal of Science Education)*, vol. 10, no. 2, pp. 380–390, 2022. doi: 10.24815/jpsi.v10i2.23802.

[9] OECD, "Program for international student assessment (PISA) results from PISA 2022," 2023. [Online]. Available: https://www.oecd.org/pisa/PISA-2022-Indonesia.pdf.

[10] 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.

[11] M. H. Rahman, S. Latif, and M. M. Saban, "Implementasi model discovery learning untuk meningkatkan kemampuan literasi sains siswa kelas XI MAN 2 Halmahera Utara," *Jurnal Pendidikan Fisika*, vol. 10, no. 2, pp. 259–270, 2022. doi: 10.24127/jpf.v10i2.5660.

[12] Z. E. Pratiwi, S. N. Hidayati, and E. V. Aulia, "Analisis profil literasi sains siswa kelas VIII di Sidoarjo berdasarkan indikator PISA 2015," *Nusantara: Jurnal Pendidikan Indonesia*, vol. 4, no. 4, pp. 1131–1140, 2024. doi: 10.14421/njpi.2024.v4i4-17.

[13] 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.

[14] R. N. Rosyadi, S. Wardani, and M. Doyin, "Studi literatur: Pemanfaatan buku pop up untuk meningkatkan literasi sains dan motivasi siswa," *Didaktika: Jurnal Kependidikan*, vol. 13, no. 3, pp. 3365–3378, 2024.

[15] A. Luthfiyyah and R. P. Puspitawati, "Kelayakan E-LKPD berbasis saintifik pada materi pertumbuhan dan perkembangan tumbuhan kelas XII untuk melatih literasi sains peserta didik," *Berkala Ilmiah Pendidikan Biologi (BioEdu)*, vol. 13, no. 3, pp. 533–542, 2024.

[16] D. G. Kirana, M. Budiyanto, and A. R. Purnomo, "Meningkatkan kemampuan literasi sains siswa melalui pembelajaran IPA berbasis socio-scientific issues pada materi pencemaran lingkungan," *Pensa: E-Jurnal Pendidikan Sains*, vol. 10, no. 2, pp. 260–265, 2022.

[17] M. Mellyzar, S. R. Zahara, and S. Alvina, "Literasi sains dalam pembelajaran sains siswa SMP," *Pendekar: Jurnal Pendidikan Berkarakter*, vol. 5, no. 2, pp. 119–124, 2022. doi: 10.31764/pendekar.v5i2.10097.

[18] S. D. Indahwati et al., "Integration of independent learning and physics innovation in STEAM-based renewable energy education to improve critical thinking skills in the era of Society 5.0 for Sustainable Development Goals (SDGs) 2030," *E3S Web of Conferences*, vol. 450, 2023. doi: 10.1051/e3sconf/202345001010.

[19] S. Safrizal, Yulia, D. A. Anastasha, Husnani, and S. Rahmi, "Gambaran kemampuan literasi sains siswa sekolah dasar di Kota Padang (studi kasus siswa di sekolah akreditasi A)," *El-Ibtidaiy: Journal of Primary Education*, vol. 4, no. 4, pp. 55–64, 2021. doi: 10.24014/ejpe.v4i1.12362.

[20] M. Najib, A. Syawaluddin, and S. Raihan, "Pengembangan multimedia pembelajaran interaktif sistem tata surya berbasis literasi sains untuk siswa SD," *Jurnal Inovasi Pedagogik dan Teknologi*, vol. 1, no. 1, pp. 1–13, 2023.

[21] J. B. Kelana and D. F. Pratama, *Bahan Ajar IPA Berbasis Literasi Sains*. Bandung: Lekkas, 2019.

[22] A. S. Marwah and F. N. Pertiwi, "Literasi sains siswa dalam berinovasi pada pembelajaran IPA berbasis produk," *Jurnal Tadris IPA Indonesia*, vol. 4, no. 1, pp. 114–126, 2024. doi: 10.21154/jtii.v4i1.3064.

[23] A. T. Hidayat and S. N. Hidayati, "Peningkatan literasi sains siswa berbantuan LKPD berorientasi socio scientific issues (SSI)," *Jurnal Ilmiah Pendidikan IPA*, vol. 6, no. 1, pp. 57–63, 2024. doi: 10.29100/.v6i1.4378.

[24] R. Febriana, *Kompetensi Guru*. Jakarta: Bumi Aksara, 2021.

[25] S. N. Pratiwi, C. Cari, and N. S. Aminah, "Pembelajaran IPA abad 21 dengan literasi sains siswa," *Jurnal Materi dan Pembelajaran Fisika*, vol. 9, no. 1, pp. 34–42, 2019.

[26] M. Yasir, "Tingkat literasi sains siswa terhadap etnosains keris Madura dalam pembelajaran IPA," *Membangun Dinamika Matematika dan Ilmu*, vol. 91, 2024.

[27] I. W. Merta, I. P. Artayasa, K. Kusmiyati, N. Lestari, and D. Setiadi, "Profil literasi sains dan model pembelajaran dapat meningkatkan kemampuan literasi sains," *Jurnal Pijar MIPA*, vol. 15, no. 3, pp. 223–228, 2020. doi: 10.29303/jpm.v15i3.1889.

[28] S. Abror, *Implementasi Metode Inkuiri dalam Mengembangkan Keterampilan Berpikir Kritis Peserta Didik pada Mata Pelajaran Sejarah Kebudayaan Islam di MA Pembangunan UIN Jakarta*, Skripsi, Jakarta: FITK UIN Syarif Hidayatullah, 2020.

[29] F. Rinaldo, *Analisis Kemampuan Literasi Sains Siswa di SMPN se-Kecamatan Jambi Luar Kota pada Aspek Kompetensi*, Disertasi, Fakultas Keguruan dan Ilmu Pendidikan, 2019.

[30] Q. R. Azaly, "Pengembangan media pembelajaran berbasis Microsoft Office Sway pada materi perubahan lingkungan untuk melatihkan kemampuan literasi sains siswa kelas X SMA," *Berkala Ilmiah Pendidikan Biologi (BioEdu)*, vol. 11, no. 1, pp. 218–227, 2022. doi: 10.26740/bioedu.v11n1.p218-227.

[31] K. Limiansih, N. Sulistyani, and M. M. Melissa, "Persepsi guru SMP terhadap literasi sains dan implikasinya pada pembelajaran sains di sekolah," *Jurnal Pendidikan MIPA*, vol. 14, no. 3, pp. 786–796, 2024. doi: 10.37630/jpm.v14i3.1858.

[32] F. Aulia, *Pengaruh Lembar Kerja Peserta Didik (LKPD) Berbasis Problem-Based Learning terhadap Kemampuan Literasi Sains (Kuasi Eksperimen di SMA Negeri 5 Depok)*, Skripsi, Jakarta: FITK UIN Syarif Hidayatullah, 2021.

[33] A. Atiaturrahmaniah, I. B. P. Arnyana, and I. W. Suastra, "Peran model science, technology, engineering, arts, and math (STEAM) dalam meningkatkan berpikir kritis dan literasi sains siswa sekolah dasar," *JPGI (Jurnal Penelitian Guru Indonesia)*, vol. 7, no. 4, pp. 368–375, 2022.

[34] D. A. Damayanti, *Analisis Kemampuan Literasi Sains Siswa Kelas XI Melalui Pendekatan Life Cycle Thinking Project dalam Pembelajaran Kimia pada Materi Asam Basa*, Disertasi, Universitas Negeri Jakarta, 2016.

[35] W. W. Murti and T. Sunarti, "Pengembangan instrumen tes literasi sains berbasis kearifan lokal di Trenggalek," *ORBITA: Jurnal Pendidikan dan Ilmu Fisika*, vol. 7, no. 1, pp. 33–43, 2021. doi: 10.31764/orbita.v7i1.4386.

[36] E. Saptaningrum et al., "Profil penguasaan literasi sains berdasarkan kerangka PISA (Programme for International Student Assessment) pada siswa SMP Negeri se-Kota Semarang tahun 2022," *Jurnal Penelitian Pembelajaran Fisika*, vol. 14, no. 2, pp. 240–250, 2023. doi: 10.26877/jp2f.v14i2.15482.

[37] S. A. T. Dianti, S. D. Pamelasari, and R. D. Hardianti, "Penerapan pembelajaran berbasis proyek dengan pendekatan STEM terhadap peningkatan kemampuan literasi sains siswa," *Proceeding Seminar Nasional IPA*, 2023.

[38] E. F. Wardani, "Analisis kemampuan literasi sains, sikap ilmiah dan merancang mini riset mahasiswa PGSD STKIP Muhammadiyah Bangka Belitung pada mata kuliah praktikum IPA," *Primary Education Journal Silampari (PEJS)*, vol. 1, no. 1, pp. 13–23, 2019.

[39] N. Wulandari, "Analisis kemampuan literasi sains pada aspek pengetahuan dan kompetensi sains siswa SMP pada materi kalor," *Edusains*, vol. 8, no. 1, pp. 66–73, 2016. doi: 10.15408/es.v8i1.1762.

[40] H. Hanifah and A. Retnoningsih, "Penerapan metode science literacy circles untuk meningkatkan kemampuan literasi sains dan sikap peduli lingkungan

pada materi perubahan lingkungan," *Indonesian Journal of Conservation*, vol. 8, no. 2, 2019.

[41] 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.

[42] M. S. Sujudi, T. Idris, S. Suryanti, and P. H. Handayani, "Profil kemampuan literasi sains siswa SMP Islam As-Shofa Kota Pekanbaru berdasarkan PISA," *Journal of Natural Science and Integration*, vol. 3, no. 1, pp. 58–69, 2020. doi: 10.24014/jnsi.v3i1.9023.

[43] R. D. Sapitri, S. Hadisaputra, and E. Junaidi, "Pengaruh penerapan praktikum berbasis kearifan lokal terhadap keterampilan literasi sains dan hasil belajar," *Jurnal Pijar MIPA*, vol. 15, no. 2, pp. 122–129, 2020. doi: 10.29303/jpm.v15i2.1342.

[44] K. Saadah, "Peran model brain-based learning pada pembelajaran sistem saraf dalam meningkatkan literasi sains siswa," *Phenomenon: Jurnal Pendidikan MIPA*, vol. 9, no. 2, pp. 132–149, 2020. doi: 10.21580/phen.2019.9.2.3967.

[45] N. De Vega et al., *Metode & Model Pembelajaran Inovatif: Teori & Penerapan Ragam Metode & Model Pembelajaran Inovatif Era Digital*. PT. Sonpedia Publishing Indonesia, 2024.

[46] A. K. Finka, "Pengaruh pendekatan saintifik terhadap kemampuan literasi sains peserta didik kelas VIII pada materi ajar sistem ekskresi manusia," Disertasi, UIN Raden Intan Lampung, 2024.