BIO-INOVED
Jurnal Biologi-Inovasi Pendidikan
Volume 6, Issue 3, October 2024 page. 397-403

P-ISSN : 2684-9062 | E-ISSN : 2714-9803
https://ppjp.ulm.ac.id/journal/index.php/bino
DOI: 10.20527/bino.v6i3.20312

The analysis of last year junior high school students' scientific literacy in biology topics

Rezky Nefianthi [1] *, Muhammad Novaldy Nur Dwinand Wahab [2]

[1] Study Program of Biology Education, Universitas PGRI Kalimantan, Banjarmasin, South Kalimantan, Indonesia
[2] Master Program of Science Education, Postgraduate Program, Universitas Negeri Surabaya, Surabaya, East Java, Indonesia

** Corresponding Author Email: kikiwahab@gmail.com*

Article Information

Keyword:
Biology learning; Learning process; Learning quality; Scientific literacy; Student profile

Kata Kunci:
Pembelajaran biologi; Proses pembelajaran; Kualitas pembelajaran; Literasi sains; Profil peserta didik

History:
Received : 23/08/2024
Revised : 19/10/2024
Accepted : 25/10/2024
Published : 30/10/2024

Abstract

The urgency of this study lies in the importance of science literacy assessment to reflect the quality of the learning process, especially in biology topics that require laboratory skills related to science literacy. This study used a quantitative descriptive analysis approach to analyze and compare the level of science literacy of junior high school students in biology topics. The assessment tool in this study was developed based on PISA indicators to measure students' science literacy. Data collection was conducted using purposive sampling technique to obtain samples from two different junior high schools. Based on the results of the study of 134 students from two classes in each school, it was found that 113 students still had below average science literacy skills, while only 21 students were above average. Students with above-average scores were at levels 5 and 6, while students with below-average scores were at levels 2, 3, and 4. This study shows that there needs to be special attention from teachers to focus more on developing students' science literacy. The scientific implication in the future is to improve the quality of the learning process to develop students' science literacy, especially on the topic of biology.

Abstrak. *Urgensi penelitian ini terletak pada pentingnya penilaian literasi sains untuk mencerminkan kualitas proses pembelajaran, khususnya pada topik biologi yang membutuhkan keterampilan laboratorium terkait literasi sains. Penelitian ini menggunakan pendekatan analisis deskriptif kuantitatif untuk menganalisis dan membandingkan tingkat literasi sains siswa SMP dalam topik biologi. Alat penilaian dalam penelitian ini dikembangkan berdasarkan indikator PISA untuk mengukur literasi sains siswa. Pengumpulan data dilakukan dengan teknik purposive sampling untuk memperoleh sampel dari dua SMP yang berbeda. Berdasarkan hasil penelitian terhadap 134 siswa dari dua kelas di setiap sekolah, ditemukan bahwa 113 siswa masih memiliki keterampilan literasi sains di bawah rata-rata, sementara hanya 21 siswa yang berada di atas rata-rata. Siswa dengan nilai di atas rata-rata berada pada level 5 dan 6, sedangkan siswa dengan nilai di bawah rata-rata berada pada level 2, 3, dan 4. Penelitian ini menunjukkan bahwa perlu adanya perhatian khusus dari guru untuk lebih fokus pada pengembangan literasi sains siswa. Implikasi ilmiah di masa mendatang adalah peningkatan kualitas proses pembelajaran guna mengembangkan literasi sains siswa, khususnya pada topik biologi.*

A. Introduction

Scientific literacy is the ability to recognize questions, find new information, explain scientific phenomena and make fact-based conclusions, comprehend the nature of science, be aware of how science and technology affect the natural, intellectual, and cultural environments, and be willing to get involved. They are concerned with matters pertaining to science (KEMDIKBUD, 2017; OECD, 2019; Toharudin et al., 2011).

One of the keys to meeting the many difficulties of the twenty-first century is scientific knowledge. Understanding the fundamentals of science and technology will be very beneficial in resolving issues in life. That does not imply, however, that everyone must be an expert in science. Understanding and becoming proficient in the fundamentals of science enables people to participate in decision-making (Kelana & Pratama, 2019; Wasis et al., 2020). Biological sciences, can be usefull as a topic to observe the students' scientific literacy, and it also listed by PISA in their content knowledge topics (OECD, 2019).

All nations are now concerned about primary school pupils' proficiency in scientific literacy. The science curricula of Singapore, Canada, Hong Kong, China, and Finland demonstrate how the combination of literacy and science curriculum is thought to be able to develop scientific literacy abilities (Sinyanyuri et al., 2022). Given that Indonesian students' scientific literacy is still comparatively low, the country has to focus more on the development of scientific literacy abilities.

Students' lack of experience with training in questions that take the shape of discourse and learning processes (literacy-based question) is one of the factors contributing to their inadequate scientific literacy, especially in biology class. Mostly they only learn about content knowledge, without applicating their knowledge in real situation like inquiry activity or laboratory activity. This lack of development in literacy occurs for the participants as well (Luzyawati et al., 2023). Indonesia's scientific literacy was placed 132nd out of 147 participating nations in the 2021 PISA findings of worldwide science learning assessments, according to the Organization for Economic Cooperation and Development (OECD, 2022). More over half of the students that make up the sample still fall into the low-literacy group, having completed level 2 or less in science.

When comparing Indonesian students' scientific literacy to that of other nearby nations in Southeast Asia, our level is still lower. Indonesian students' scientific literacy progress is still below average, indicating that they still struggle with concepts, procedures, and attitudes toward ordinary scientific occurrences. Numerous recent researcs that look at the characteristics of students' scientific literacy in a number of Indonesian cities provide evidence for this case.

According to research on junior high school students' science literacy in climate change content, the average score is still quite poor, with only 31.58 from the 73 students who participated in the study (Nuryanti et al., 2023). She went on to say that there are a number of reasons why this might happen, including the fact that there are still very few educational resources that concentrate on helping students enhance their scientific literacy abilities, and then they are also still infrequently trained with evaluation instrument tests that help them refine their science literacy skills.

In the other recent research from Nasor, that tried to figure out the profile of student scientific literacy on context, competencies, and knowledge, according to his findings from 102 students that became a sample, only 19 of it that can showed their scientific literacy above the average, and the rest of it are still in low category (Nasor et al., 2023). In his findings, he also revealed that it is still uncommon for students to be trained utilizing learning tools and test instruments that focus on improving scientific literacy, and then the content contained in learning textbooks also does not help students grow their abilities very much.

Ashari's subsequent research, which focused on examining the scientific literacy abilities of junior high school pupils, confirmed earlier findings. In more depth, he shows that scientific literacy abilities, as measured by PISA's three metrics, remain low and below average. Students are still not accustomed to unsustainable science learning, and the emphasis on building students' scientific literacy abilities is the main reason of it (Ashari et al., 2023).

The researcher believes that similar research is required to determine the conditions for the development of scientific literacy in the researcher's home location, citing a number of recent studies that have been previously mentioned. In this study, students from one of the schools in the researcher's city and one of the schools in the closest district will be compared for their scientific literacy skills. The researcher intends to carry out this research, because interested to find out how much students' scientific literacy has developed during science learning in junior high school.

B. Material and method

The purpose of this study is to gather data regarding the scientific literacy level of the students. The findings of this study will be compared to the degree of scientific literacy growth in each school and may be applied to future research projects aimed at enhancing the scientific literacy abilities of junior high school students. This research was a quantitative descriptive analysis to analyze and make a comparison of the level of junior high school students' scientific literacy. This

approach purpose also to support the improvement of scientific literacy among students by enhancing the quality of science education (Nuryanti et al., 2023; Saraswati et al., 2021).

This study used a purposive sample strategy to collect the data for this research, which is a sampling technique with certain concerns (Sugiyono, 2013). This study's samples consisted of 134 junior high school students from two distinct schools, each with two classes. This study employs scientific literacy questions to assess students' scientific literacy abilities. The questions are developed based on PISA scientific literacy indicators (OECD, 2022).

The twenty questions that are utilized are divided into three discussion biology topics that have been tailored to fit the PISA scientific literacy framework and the academic science curriculum. Biology topics that were used namely ecosystem, health issues, and sustainability that related to biosphere. Additionally, the questions have been modified to align with the PISA scope, which includes personal, local/national, and global (OECD, 2022). Student scores and levels in scientific literacy are determined by 1) assigning a different level of value or score to each item on the scientific literacy test. 2) After adapting the value score from PISA, calculate the achievement score for every level using the Formula 1 by Wahab et al. (2023).

$$\text{Score} = \sum \frac{\text{Bi x bi}}{\text{St}} \text{ x } 100\% \text{ .....Formula 1}$$

Description:
Bi = the number of items answered correctly
bi = the value of each item (adapted from PISA)
S = theoretical score

The following range of scores and levels of scientific literacy abilities shown in the Table 1 by converting the PISA scores and the research results obtained.

Table 1 Scientific literacy level and category

Score range	Scientific literacy level	Category
93-100	6	Very good
73-92	5	Good
55-72	4	Enough
40-54	3	Deficient
14-39	2	Low
7-13	1a	Very Low
1-6	1b	Extreamly Low

After calculating the score to categorize students' scientific literacy levels, the following step is to evaluate each student's answer sheet. Subsequently, the scientific literacy skills attained by students are determined using Table 1, which lists various abilities for each level. For a more thorough study, the author will consult PISA's definitions of the skills linked with each level to discover the limitations of students' ability (Wahab et al., 2023).

C. Results and discussion

This research were used a 20 questions of scientific literacy based test to obtained the data about students scientific literacy. The questions that were used, are already been validated from 5 expert in science learning. The questions were made using a scientific literacy indicator from PISA (OECD, 2022). The indicators referred to are 1) explaining phenomena scientifically, 2) evaluating and designing scientific investigation, and 3) interpreting data and evidence scientifically. The data from this study's scientific literacy exam indicates that pupils' scientific literacy skills are not developing as they should be in both schools. The condition of student scientific literacy skill still in low category. It can be seen on the Figure 1.

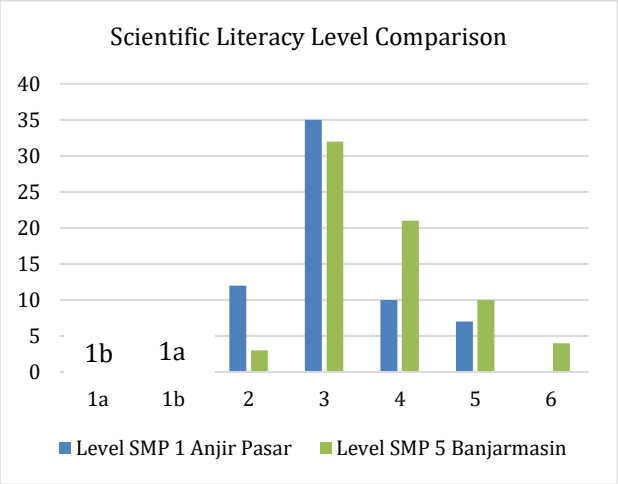

Figure 1 The comparison about students scientific literacy

Out of the 134 last year students that participated in this research, only 21 exhibited strong scientific literacy, which was to be expected, specifically at levels 5 and 6. While the rest of students are still in below expected level, especially in level 2 and level 3. In the SMP 1 Anjir Pasar, there are 64 students in total with the details 12 students are in low category, 35 students in deficient category, 10 students in enough category, and 7 students in good category. Meanwhile, in SMP 5 Banjarmasin there are 70 students in total with the details 3 students are in low category, 32 students are in deficient category, 21 students in enough category, 10 students in good category, and then 4 students in very good category.

From the research data that already obtained, can also be grouped into the highest, lowest and average values as in the Figure 2.

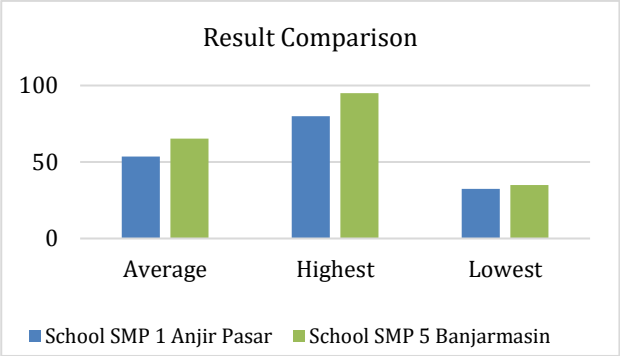

Figure 2 Result comparison in general

It is possible to said that there aren't many disparities between the two schools' student scientific literacy conditions based on the data displayed in the above figure. The result obtained for the average score in SMP 1 Anjir Pasar is 53,59. Then, 80 is the highest score, and 32.5 is the lowest. In the meantime, the average score attained in SMP 5 Banjarmasin is 65,18. Then, 95 is the highest score, and 35 is the lowest. We can learn more about students' scientific literacy levels by grouping their results. PISA already explains students' scientific literacy abilities, specific to each level. It can be used to assess the limits of students' ability at each level. It can be seen in Table 2.

Table 2 Description about each level of scientific literacy

Level	Description
1b	At this level, students can utilize their everyday or basic scientific knowledge to identify common features or straightforward phenomena
1a	Students are able to identify or recognize explanations for basic scientific phenomena by applying their everyday knowledge or basic procedural content
2	Students can identify and explain scientifically, understand facts, and recognize problems being presented in a straightforward design by using common material and fundamental procedural skills
3	Students can recognize or provide pertinent explanations for events in less familiar or more complex contexts by applying their very extensive content knowledge
4	Students can create explanations for less familiar occurrences and phenomena by drawing on their complex content knowledge
5	Students can explain complex and unknown situations, processes, and phenomena that include additional causal links using abstract scientific ideas or concepts
6	Students can employ content, procedural, and epistemic knowledge to give explanatory hypotheses of unusual scientific phenomena, events, and processes or to make predictions. They can also rely on associated scientific ideas and concepts from the physical, life, and earth sciences

(Source: OECD, 2019)

After grouping students with their scientific literacy level, we can describe their ability on each level. In this research data there's still 15 students were categorized level 2 or in low category. In this level, the students had an ability to identify and explain scientifically, understand facts, and recognize problems being presented in a straightforward design by using common material and fundamental procedural skills (OECD, 2019).

This finding is in line with the data that obtained, where the students at this level can explain and also understand the phenomena in a simple question. For example, when they were asked to explain about analyzing the foodchain in ecosystem. For answers to problems involving more complicated phenomena, students at this level still require assistance (Wahab et al., 2023).

Meanwhile, in the level 3 or deficient category there are 67 students. In this level the students had an ability to recognize or provide pertinent explanations for events in less familiar or more complex contexts by applying their very extensive content knowledge (OECD, 2019). This are in line with the data that researcher obtained. For example, when they were asked to answer the question to encourage actions to prevent extinction in an ecosystem. Students in this level still require a stronger conceptual understanding of scientific information to influence low-science applications which means their procedural knowledge and epistemic knowledge (Shohib et al., 2021).

Then, there's also 31 students that categorized level 4 or as enough category. In this level students can create explanations for less familiar occurrences and phenomena by drawing on their complex content knowledge (OECD, 2019). For example, when they were asked to interpreting data on environmental pollution and its relevance to health issues and ecological degradation. However, even at this level, students still struggled to draw conclusions from their explanations about everyday situations or occurrences that they were still unfamiliar with and that had causal consequences and also due to their low epistemic knowledge (Rahmawati et al., 2023).

After that, in level 5 there's 17 students who categorized as good category. In this level the students can explain complex and unknown situations, processes, and phenomena that include additional causal links using abstract scientific ideas or concepts (OECD, 2019). For example, in this research are when they were asked about to interpreting the data that related to the health issues. In order to keep their levels, high-level students must also practice often. In the event that it isn't, they could receive lesser levels in the future (Peni et al., 2022).

Table 3 Recapitulation on each scientific literacy indicator

Scientific literacy indicators	Questions number	Achievement percentage
Explaining phenomena scientifically	1, 4, 7, 10, 13, 16, 18	64,18%
Evaluating and designing scientific investigations	2, 5, 8, 11, 14, 19	43,28%
Interpreting data and evidence scientifically	3, 6, 9, 12, 15, 17, 20	51,49%

Last but not least, there's 4 students that categorized as very good category or level 6. In this level students can employ content, procedural, and epistemic knowledge to give explanatory hypotheses of unusual scientific phenomena, events, and processes or to make predictions (OECD, 2019). For example, in this research when they were asked evaluating scientific data obtained from sustainability development projects that related to biosphere context. Actually, in this situation students are expected to be at levels 5 and 6. However, due to a variety of causes, student scientific literacy has not grown significantly.

For more specific analysis, the researcher also calculated each scientific literacy indicator percentage achievement from the student test. It can be seen in Table 3. It can be assessed the various problems that may occur and result in the growth of students' scientific literacy in biology topics. As we can see in the table above, the most indicator that students had a high percentage of achievement in their answer was the first indicator about explaining phenomena scientifically. Then, the second one is the third indicator about interpreting data and evidence scientifically. Last but not least, the lowest percentage of achievement that students answer was evaluating and designing scientific investigations indicator. These findings are in line with recent research from (Ashari et al., 2023; Mujahidin et al., 2023; Saraswati et al., 2021).

Students' inadequate capacity to do tasks beyond memorization and recognition of scientific information accounts for their low degree of scientific literacy. They frequently require assistance in applying scientific theory to actual circumstances (Nasor et al., 2023). Given that students' proficiency in answering scientific literacy questions is low, attention must be paid to exposing them to scientific literacy questions. Scientific literacy comprises two scientific knowledge-related insights in addition to a number of skills, such as inquiry, critical thinking, problem-solving, and decision-making (Ashari et al., 2023). These things can cause students low skills in explaining phenomena scientifically indicator.

The fact that teacher classroom instruction was still centered on memory and theory contributed to students' poor critical thinking, inductive/deductive reasoning, and critical analysis skills. Students should have a deeper sense of purpose in their studies (Aprilia et al., 2023; Sutrisna, 2021). As a result, it is vital to have a learning process that demands students to pay attention to an issue in depth so that they may analyze existing knowledge and identify which variables should be utilized or altered (Hasasiyah et al., 2020; Ibda, 2018). These things can cause students low skills at evaluating and designing scientific investigations due to their learning process didn't involve them in investigation process like inquiry and laboratory activity.

Literate people should have access to a variety of learning tools that promote scientific literacy. Meanwhile, in this research both schools are only using one learning sources that used as a textbook which known as Kemendikbud Textbook. This situation is less effective to develop the student scientific literacy, because they need a lot of learning sources that can facilitated them in developing their scientific literacy, even more this textbook wasn't optimal to facilitated it (Saraswati et al., 2021). Indonesian textbook are still less content to facilitated student scientific literacy. Because our textbook had a lot of about science content in terms of quantity, but still needs to be improved in several aspect (Dhitareka et al., 2022). These things can cause students low skills in indicator interpreting data and evidence scientifically, due to lack of quality in our science textbook that doesn't provide a content or science facts to train the students.

Afterward during the interview with several students and also with the teachers, the researcher realized that in both schools are still lack of training to answer the question which based on scientific literacy indicators. These are also in accordance with current study, which showed that lack of training utilizing scientific literacy-based questions is the primary factor that influenced poor Indonesian student scientific literacy (Ashari et al., 2023; Nasor et al., 2023; Saraswati et al., 2021; Wahab et al., 2023). For these circumstances, we need to do something to improve student scientific literacy.

The learning process especially in biology topics, should be taught not only explaining the content of teaching materials. The learning process should be well prepared using a strategy that can facilitated students in developing their skills like scientific literacy, higher order thinking skills, and also creative thinking skills. The biology learning process can be held by using a lot of strategy such as inquiry, or another investigation or laboratory activity that required students to be more active and not only using their memorize skills. This could be an alternative to improve the quality of biology learning process, that can improve students' scientific literacy. Another strategy to improve students' scientific literacy in biology topics is developing a new learning device that developed using scientific literacy-based content, so it can be facilitated students to train their scientific

literacy skills (Heliawati et al., 2022; Putra et al., 2023; Uslan et al., 2024). The other one solution that can be done by doing developing a new model that focused to facilitated students to train and develop their scientific literacy during learning process (Simamora et al., 2022). These are a few solutions that can be applicated in learning process at school as an effort to improve students' scientific literacy. From this research findings, it can be seen that even the last year students still have a low category scientific literacy, where it indicates the development of scientific literacy during their time in junior high school are still not going well.

D. Conclusion

Based on this research data and findings, it can be concluded that the last year students' scientific literacy level in biological topics are still categorized low. It can be seen from 134 samples obtained from two classes in each school, the researcher discovered 113 students still have under-average scientific literacy skills and only 21 students were above the average. The above-average students are the students who had grades at levels 5 and 6, while the under-average students are the students who had grades at levels 2, 3, and 4. More attention from teachers are needed to solve this problem. There are a few actions that can be taken to improve student scientific literacy such as developing a new learning device that developed using scientific literacy-based and biological content and indicators, and also creating a new learning model that focused on facilitating the students to develop their scientific literacy abilities during the learning process.

E. Acknowledgement

Special thanks to the school and the teachers of SMP 1 Anjir Pasar and SMP 5 Banjarmasin that allow researcher to be able doing research in their classroom. There are several other related parties that cannot be mentioned one by one. Last but not least, thanks for the students that already participated in this research, wishing all of them a very bright future as our next generation.

F. References

Aprilia, C., Anggereini, E., Nazarudin, N., & Ahda, Y. (2023). Development of web-based learning media (Glideapps) to improve digital literacy and science literacy about materials human digestive systems. *Jurnal Penelitian Pendidikan IPA*, *9*(3), 1112–1117. DOI: https://doi.org/10.29303/jppipa.v9i3.2618

Ashari, S. E., Rachmadiarti, F., & Herdyastuti, N. (2023). Analysis of the science literacy profile of students at state junior high school. *IJORER : International Journal of Recent Educational Research*, *4*(6), 889–898. DOI: https://doi.org/10.46245/ijorer.v4i6.340

Dhitareka, P. H., Hidayat, A., & Siahaan, P. (2022). Comparison of nature of science profile in Indonesia, Malaysia, and Singapore secondary science textbooks: Case of electricity lesson. *Jurnal Penelitian Pendidikan IPA*, *8*(5), 2299–2306. DOI: https://doi.org/10.29303/jppipa.v8i5.1878

Hasasiyah, S. H., Hutomo, B. A., Subali, B., & Marwoto, P. (2020). Analisis kemampuan literasi sains siswa SMP pada materi sirkulasi darah. *Jurnal Penelitian Pendidikan IPA*, *6*(1), 5–9. DOI: https://doi.org/10.29303/jppipa.v6i1.193

Heliawati, L., Lidiawati, L., Adriansyah, P. N. A., & Herlina, E. (2022). Ethnochemistry-based Adobe Flash learning media using indigenous knowledge to improve students' scientific literacy. *Jurnal Pendidikan IPA Indonesia*, *11*(2), 271–281. DOI: https://doi.org/10.15294/jpii.v11i2.34859

Ibda, H. (2018). Penguatan literasi baru pada guru madrasah ibtidaiyah dalam menjawab tantangan era industri 4.0. *Journal of Research and Thought on Islamic Education (JRTIE)*, *1*(1), 1–21. DOI: https://doi.org/10.24260/jrtie.v1i1.1064

Kelana, J. B., & Pratama, D. F. (2019). *Bahan ajar IPA berbasis literasi sains*. Bandung: Lekkas.

KEMDIKBUD. (2017). *Materi penunjang literasi sains: Gerakan literasi sains*. Kementrian Pendidikan dan Kebudayaan.

Luzyawati, L., Hamidah, I., Faudzan, A., & Wiyati, E. (2023). Lesson study to improve students' scientific literacy abilities on respiratory system material. *Jurnal Penelitian Pendidikan IPA*, *9*(8), 6626–6633. DOI: https://doi.org/10.29303/jppipa.v9i8.3806

Mujahidin, G. R., Rahman, G. G. A., Wilujeng, I., & Nugroho, S. D. (2023). Profil literasi sains aspek kompetensi peserta didik melalui pembelajaran berbasis Budaya Lokal Reyog Ponorogo. *Jurnal Penelitian Pendidikan IPA*, *9*(2), 965–970. DOI: https://doi.org/10.29303/jppipa.v9i2.2753

Nasor, A., Lutfi, A. L., & Prahani, B. K. (2023). Science literacy profile of junior high school students on context, competencies, and knowledge. *IJORER : International Journal of Recent Educational Research*, *4*(6), 847–861. DOI: https://doi.org/10.46245/ijorer.v4i6.436

Nuryanti, T., Pursitasari, I. D., & Rubini, B. (2023). Science literacy profile of junior high school students on climate change material. *Jurnal Penelitian Pendidikan IPA*, *9*(10), 8390–8395. DOI: https://doi.org/10.29303/jppipa.v9i10.5218

OECD. (2019). *PISA 2018 results in focus: What 15year-olds know and what they can do with what they know*. Columbia University.

OECD. (2022). *PISA 2021 results in focus: What 15year-olds know and what they can do with what they know*. Columbia University.

Peni, N., Priska, M., & Wao, Y. P. (2022). Students scientific literacy profile of mathematics education study program in chemistry subjects. *Jurnal Penelitian Pendidikan IPA*, *8*(6), 3050–3054. DOI: https://doi.org/10.29303/jppipa.v8i6.2295

Putra, I. M. T. P., Sudiatmika, A. A. I. A. R., & Suardana, I. N. (2023). Effectiveness of E-LKPD IPA through socioscientific inquiry based learning (SSIBL) model to improve students' scientific literacy skills. *Jurnal Penelitian Pendidikan IPA*, *9*(8), 6337–6344. DOI: https://doi.org/10.29303/jppipa.v9i8.3957

Rahmawati. P, A., Febrian, A., Wilujeng, I., Suyanta, S., & Rejeki, S. (2023). Profile of students' scientific literacy through science learning based on the Pacu Jalur Kuantan Singingi. *Jurnal Penelitian Pendidikan IPA*, *9*(4), 1868–1872. DOI: https://doi.org/10.29303/jppipa.v9i4.3492

Saraswati, Y., Indana, S., & Sudibyo, E. (2021). Science literacy profile of junior high school students based on knowledge, competence, cognitive, and context aspects. *IJORER : International Journal of Recent Educational Research*, *2*(3), 329–341. DOI: https://doi.org/10.46245/ijorer.v2i3.118

Shohib, M., Rahayu, Y. S., Wasis, W., & Hariyono, E. (2021). Scientific literacy ability of junior high school students on static electricity and electricity in living things. *IJORER : International Journal of Recent Educational Research*, *2*(6), 700–708. DOI: https://doi.org/10.46245/ijorer.v2i6.170

Simamora, A. B., Sanjaya, I. G. M., & Widodo, W. (2022). Validity of BRADeR learning model development: An innovative learning model to improve science literacy skills for junior high school students. *Journal of Curriculum and Teaching*, *11*(8), 311–316. DOI: https://doi.org/10.5430/jct.v11n8p311

Sinyanyuri, S., Utomo, E., Sumantri, M. S., & Iasha, V. (2022). Literasi sains dan asesmen kompetensi minimum (AKM): Integrasi bahasa dalam pendidikan sains. *Jurnal Basicedu*, *6*(1), 1331–1340. DOI:https://doi.org/10.31004/basicedu.v6i1.2286

Sugiyono. (2013). *Metode penelitian kuantitatif, kualitatif, dan R&D*. Bandung: PT. Alfabeta.

Sutrisna, N. (2021). Analisis Kemampuan Literasi Sains Peserta Didik SMA di Kota Sungai Penuh. *Jurnal Inovasi Penelitianitian*, *1*(12), 2683-2694. DOI: https://doi.org/10.47492/jip.v1i12.530

Toharudin, U., Hendrawati, S., & Rustaman, A. (2011). *Membangun literasi sains peserta didik.* Bandung: Humaniora.

Uslan, U., Abdullah, N., Imami, M. K. W., & Aiman, U. (2024). The effectiveness of the local knowledge-based module (LKBM) to improve students' scientific literacy and thinking skills. *Jurnal Pendidikan IPA Indonesia*, *13*(1), 147–161. DOI: https://doi.org/10.15294/jpii.v13i1.47561

Wahab, M. N. N. D., Wasis, W., & Yuliani, Y. (2023). Profile of junior high school students' scientific literacy. *IJORER : International Journal of Recent Educational Research*, *4*(2), 176–187. DOI: https://doi.org/10.46245/ijorer.v4i2.292

Wasis, W., Rahayu, S. Y., Sunarti, T., & Indana, S. (2020). *HOTS dan literasi sains: konsep, pembelajaran, dan penilaiannya*. Surabaya: Kun Fayakun Crop.