Psychology, Evaluation, and Technology in Educational Research
7 (1), 2024, 94-103

Available Online: http://petier.org/index.php/PETIER

Transforming science literacy: Assessing the ability of chemistry teacher candidates through the viewpoint of Islamic values

Tutik Sri Wahyuni [a] *, Ifah Silfianah [b]

Universitas Islam Negeri Sayyid Ali Rahmatullah Tulungagung. Tulungagung, 66221, Indonesia
[a] tswahyuni@uinsatu.ac.id; [b] ifah.silfianah@gmail.com
* Corresponding Author.

Received: 26 July 2024; Revised: 29 July 2024; Accepted: 21 September 2024

Abstract: Science literacy assessment is important to familiarize students with literacy questions based on aspects of science knowledge and its interaction with the environment, technology, and society. Students' low science literacy is often caused by teachers' low science literacy. This study aims to analyze (1) the science literacy skills of chemistry education students in basic chemistry courses; and (2) the science literacy skills of chemistry education students based on competency aspects which are divided into three achievement indicators. This research is a descriptive study with a quantitative approach, with subjects 21 semester 6 students of the chemistry education study program at UIN Sayyid Ali Rahmatullah Tulungagung. The instrument used was a scientific literacy test in the form of an essay test with 22 questions which have been validated by 2 chemistry education lecturers, and the test results with a test reliability of 0.629, as well as a difficulty level of 1 easy question, 19 medium, and 2 difficult. The results showed that (1) students' science literacy skills were in the "sufficient" category with an average score of 43.9. (2) Analysis based on competency aspects shows the ability to explain phenomena scientifically and identify scientific issues is in the sufficient category, but the use of scientific evidence is low. The findings are expected to provide input to improve learning and practice of science literacy in preparing students as future educators.

Keywords: Scientific Literacy, Prospective Chemistry Teachers, Islamic Values

How to Cite: Wahyuni, T. S., & Silfianah, I. (2024). Transforming science literacy: assessing the ability of chemistry teacher candidates through the viewpoint of Islamic values. *Psychology, Evaluation, and Technology in Educational Research*, *7*(1), 94-103. https://doi.org/10.33292/petier.v7i1.233

INTRODUCTION

The challenges of the 21st century require innovative solutions based on scientific thinking and discoveries. Enhancing the quality of educated human resources to conduct research and innovation is crucial to meet the advancements in science and technology, economy, society, and environment globally. Rapid scientific and technological developments and intense competition demand individuals to quickly master various sciences and technologies. Without this mastery, individuals may fall behind or lose in different fields of competition. Scientific knowledge and technology can be learned through the use and mastery of literacy. with scientific literacy skills, a person has an awareness of how to carry out an action based on science and technology, intellectual, and cultural environment, as well as having the will to get involved in issues related to science, thereby acting as a reflective citizen (PISA 2006; Utami et al, 2016).

This is an open access article under the CC–BY-SA license.

10.33292/petier.v7i1.233

Literacy skills are one of the competencies that must be achieved in national curriculum learning. Generally, literacy is considered the ability of an individual to use potential and skills in processing and understanding information when reading and writing. However, literacy skills are not only related to reading and writing; students must also be able to use scientific processes, scientific concepts, and scientific situations to answer questions and make decisions about phenomena. As Oktariani and Ekadiansyah (2020) state, literacy is not just about reading and writing but also encompasses technological, political, critical thinking, and environmental awareness. According to Ramdhayani (2023), modern literacy includes the ability to interpret images, technological literacy, and various efforts to acquire knowledge. (Pekkolay, 2022) views literacy as a skill that emerges from the natural development process of individuals and is used intentionally, actively, and meaningfully. Thus, literacy encompasses reading, writing, arithmetic, using technology, critical thinking, and understanding the surrounding environment. Literacy skills are acquired from the individual's knowledge and skill development process. In this context, students are required to use the knowledge gained from school learning to solve problems they face.

Mastery of literacy is essential in supporting one's competencies. The OECD (Organization for Economic Co-operation and Development) states that efforts are needed to equip society with knowledge and skills to reach their full potential, contribute to improving inter-citizen relationships, and possess better skills for a better life (Schleizer, 2018). Zuriyani (2017) also notes that scientific literacy skills are increasingly important in the workplace. More jobs require high-level skills, necessitating individuals who can learn, reason, think creatively, make decisions, and solve problems. This highlights the importance of literacy in various human activities.

According to the World Economic Forum, here are 16 skills needed in the 21st century, consisting of six basic literacies (reading-writing literacy, numeracy, science, digital, financial, and cultural citizenship), four competencies (critical thinking/problem solving, creativity, communication, and collaboration), and six characters (curiosity, initiative, perseverance, adaptability, leadership, and social and cultural awareness) (World Economic Forum, 2015). Literacy is a focal issue in Indonesia due to its low literacy rate. This is evident from the PISA (Programme for International Student Assessment) results conducted by the OECD. Since 2000, Indonesia has participated in this program, which occurs every three years. According to PISA 2022 results reported by the Ministry of Education, Culture, Research, and Technology (Ministry of Education Culture & Research and Technology, 2023). Indonesia's literacy ranking has improved compared to PISA 2018, with reading and mathematics literacy rising by five positions and science literacy by six positions. However, the overall average score remains below the OECD average, at 369 out of 478. Despite the rise in ranking, the score has decreased, indicating a need for continuous efforts to improve literacy skills.

Scientific literacy is a crucial basic literacy. The ability to apply scientific concepts in life, describe scientific events, and explain them based on scientific evidence is known as scientific literacy (Bybee et al., 2009). PISA defines scientific literacy as: "The ability to engage with science-related issues, and with the ideas of science, as a reflective citizen. A scientifically literate person is willing to engage in reasoned discourse about science and technology which requires the competencies to explain phenomena scientifically, evaluate and design scientific enquiry, and interpret data and evidence scientifically" (OECD, 2017). PISA believes that every individual should think scientifically about the evidence they encounter in real-life challenges. Thus, scientific literacy is the ability to use scientific knowledge and procedures and explain

Copyright © 2024, Psychology, Evaluation, and Technology in Educational Research, ISSN 2622-5506

scientific phenomena based on scientific evidence regarding real-life issues locally, regionally, and globally.

Chemistry is a branch of science that requires scientific literacy skills to study and understand conceptually. According to Ambarwati et al. (2023), scientific literacy in chemistry is defined as the ability to effectively and efficiently understand and apply chemical concepts in daily life. The rapid development of science and technology demands awareness from everyone to engage with it, making the discourse on literacy models based on Islamic and Indonesian cultural values essential. This can be understood as the ability to engage with scientific issues and ideas as a reflection of being a cultured and religious citizen.

In basic chemistry courses, key topics include electrolyte and non-electrolyte solutions, acids-bases and neutralization, chemical equilibrium, precipitation reactions, and redox and electrochemical reactions. These chemistry topics can be integrated with Islamic values found in the Qur'an. For example, the verse in Q.S. Al-Kahfi 83-98 discusses the story of Zulkarnain building a corrosion-resistant iron wall, related to the concept of redox reactions in electrolytic cells. Apart from that, QS. Az-Zariyat verse 49 which means "And We created everything in pairs so that you remember the greatness of Allah." In chemistry, we know proton and electron pairs, electrolyte and non-electrolyte solutions, acids and bases, and reduction and oxidation. Allah SWT has arranged all of this in such a way that they complement each other.

The integration of science and the Qur'an is crucial for accelerating scientific development. The interconnection of Islamic and scientific integration is expected to enhance student's understanding of both scientific and religious knowledge, avoiding a dichotomous view where science and religion are seen as separate. The integration-interconnection paradigm across disciplines can complement each other's strengths and weaknesses (Siswanto, 2015). Integrating science and Islamic values enhances attitudes, religious values, and students' character. Incorporating Islamic values in chemistry literacy questions can also develop students' critical thinking skills, as seen in solving problems of Islamic science competitions (Kompetisi Sains Madrasah atau KSM) like the chemistry olympiad for students.

Assessing scientific literacy is necessary to familiarize students with literacy questions developed based on scientific knowledge, inquiry into the nature of science, science as a way of thinking, and the interaction between science, environment, technology, and society (Rusilowati, 2018). Students' low scientific literacy skills are likely due to teachers' equally low scientific literacy skills (Putra & Rusilowati, 2021). Research by (Muhariyansah et al., 2021) shows that the scientific literacy skills of chemistry education students are predominantly in the nominal and functional categories, with percentages of 33.2% and 24.2%, respectively, while the conceptual and multidimensional categories account for 13.7% and 4.4%. Meanwhile, 24.5% of students did not respond to the given test. This study aims to analyze (1) the scientific literacy skills of chemistry education students in basic chemistry courses, (2) the scientific literacy skills of chemistry education students based on competency aspects divided into three indicators of achievement: explaining phenomena scientifically, evaluating and designing scientific investigations, and interpreting data and evidence scientifically. This research is expected to provide valuable insights into the learning process in lectures and help students practice solving scientific literacy problems as preparation for becoming literate educators.

METHODS

This research is a descriptive study with a quantitative approach. The study subjects involved 21 sixth-semester students from the Chemistry Education Program, Faculty of Education and Teacher Training, UIN Sayyid Ali Rahmatullah Tulungagung. The research was conducted in

Copyright © 2024, Psychology, Evaluation, and Technology in Educational Research, ISSN 2622-5506

May-June 2024. The research instrument used was a test of scientific literacy skills in integrated Islamic values on chemical solution materials, consisting of 22 essay questions. The scientific literacy skills instrument was developed based on the PISA (2018) science framework, covering three competencies: identifying scientific issues or questions, explaining phenomena scientifically, and using scientific evidence. The instrument used was a scientific literacy test in the form of an essay test with 22 questions which have been validated by 2 chemistry education lecturers. Content validity by evaluation experts and met criteria for material, construction, and language validity. Furthermore, reliability testing of the test instrument yielded a Cronbach's Alpha coefficient of 0.629, indicating high reliability, as well as a difficulty level of 1 easy question, 19 medium, and 2 difficult. Details of the scientific literacy skills measurement indicators based on the competencies used in this study are presented in Table 1.

Table 1. Details of the scientific literacy skills measurement indicators

Indicators	Number of Questions
Identify scientific issues or questions	7
Explaining phenomena scientifically	9
Using scientific evidence	6

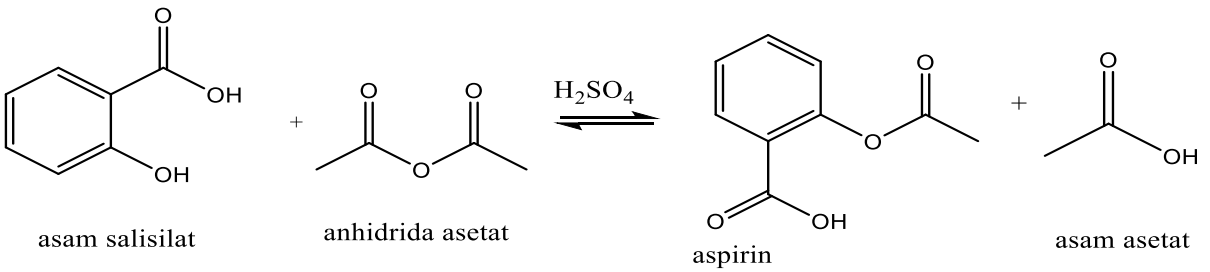
The test instrument for measuring science literacy skills integrated with Islamic values in detail contains 5 phenomena in basic chemistry material, as follows: First, Recommendations for Medical Treatment in Islam and the Synthesis of Aspirin Using Salicylic Acid and Acetic Anhydride, Linked to Acid-Base Reactions, Reaction Rates, and Solution Stoichiometry. The following is an example of scientific literacy text included in the questions.

Please read the following information!

Gambar 1. Aspirin (www.klikdokter.com)

Fundamentally, seeking medical treatment is highly recommended in Islam. This is due to several reasons, primarily for the preservation of life and health. One of the objectives of Islamic law is to protect life and health. As stated by the Prophet Muhammad (peace be upon him): "*Verily, Allah has sent down the disease and the cure, and for every disease, He has made a cure. So seek* medical *treatment, but do not use anything unlawful.*" (Narrated by Abu Dawud).

In the 5th century BCE, Hippocrates discovered an analgesic (pain reliever) derived from the extract of willow bark (*Salix alba*), known as salicin. However, salicin had dangerous side effects on the digestive system. Consequently, in 1859, the compound aspirin was successfully synthesized as a substitute for salicin. Aspirin is synthesized from salicylic acid and acetic anhydride according to the following reaction.



asam salisilat anhidrida asetat aspirin asam asetat

Second, The utilization of nitrogen during the era of the Muslim scientist Jabir Ibn Hayyan included its use in the production of ammonia. Jabir Ibn Hayyan reacted nitric acid with hydrochloric acid (aqua regia) to dissolve gold. Allah has provided an abundant source of nitrogen in the atmosphere in the form of N_2. N_2 gas reacts with hydrogen gas to form

Copyright © 2024, Psychology, Evaluation, and Technology in Educational Research, ISSN 2622-5506

ammonia, a process known as the Haber process. This phenomenon is subsequently linked to the chemical equilibrium reaction.

Third, The subject of solubility and precipitation reactions is elucidated through scientific literacy readings on the phenomenon of using miswak (*Salvadora Persi*ca), which has been known for centuries to maintain oral and dental hygiene. The Prophet Muhammad (SAW) stated, "*Miswak cleanses the mouth and pleases the Lord*" (HR Bukhari and An Nasa'i).

Miswak is rich in fluoride, silica, and other natural minerals, making it highly beneficial for daily use. However, the use of miswak has been largely replaced by toothbrushes and toothpaste containing fluoride ions. The process by which fluoride ions prevent dental decay is determined by the chemical reactions occurring within the tooth layers. The enamel layer of the teeth contains the mineral hydroxyapatite, $Ca_5(PO_4)_3OH$. The solubility product constants (K_{sp}) for hydroxyapatite an fluorapatit, $Ca_5(PO_4)_3F$, are 6.8 x 10^{-37} and 1 x 10^{-60}, respectively.

Fourth, The use of vinegar as a culinary ingredient is exemplified by the saying of Prophet Muhammad (SAW), "*The best of condiments is vinegar, the best of condiments is vinegar*" (HR Muslim No. 2052). This teaches the appreciation of all available food and the respect for those who prepare it. This topic is associated with acid-base chemistry, buffer solutions, and salt hydrolysis.

The giving of a dowry from the groom to the bride as a requirement for marriage in Islam is discussed regarding a companion of the Prophet who intended to marry but had no wealth. The Prophet Muhammad (SAW) instructed him to find a dowry even if it was just an iron ring. This topic is linked to the electroplating of an iron ring with gold, employing the concepts of redox reactions and electrolysis.

Data collection techniques utilized tests and interviews. The tests were conducted offline to gather quantitative data on students' scientific literacy skills, while interviews were conducted with post-test data processing. Ten students were randomly selected for interviews to explore their thought processes in solving integrated Islamic values scientific literacy questions, which were then used as supplementary data to describe the test results. Analysis of scientific literacy skills data involved calculating scores achieved by chemistry education students and categorizing them according to interpretations presented in Table 2.

Table 2. Science Literacy Criteria

Rate	Category
81-100	Excellent
61-80	Good
41-60	Sufficient
21-40	Poor
0-20	Very Poor

Adapted from Riduwan (2012)

RESULTS AND DISCUSSION

Data on the science literacy skills of prospective chemistry teachers on solution chemistry materials integrated with Islamic values based on the categories achieved by each student can be read in Table 3.

From the Table 3, it can be seen that most students have science literacy skills in the "Sufficient" category with an average of 64.1. The average data on the results of students' science literacy skills based on indicators of achieving scientific competence consisting of the ability to identify scientific issues or questions, explain phenomena scientifically, and use scientific evidence are presented in Table 4.

Copyright © 2024, Psychology, Evaluation, and Technology in Educational Research, ISSN 2622-5506

Table 3. Classification of Science Literacy Score Results

No.	Range Score	Category	Frequency	Value
1.	81-100	Excellent	0	
2.	61-80	Good	1	
3.	41-60	Sufficient	11	
4.	21-40	Poor	9	
5.	0-20	Very Poor	0	
Number of students			21	
Maximum				64,1
Minimum				27,7
Average		Sufficient		43,9
Standard deviation				9,18

Table 4. Average Science Literacy Ability of Students for Each Indicator

Indicators	Average	Category
Identify scientific issues or questions	51,4	Sufficient
Explaining phenomena scientifically	46,8	Sufficient
Using scientific evidence	31,1	Poor

Achievement in literacy skills within competency aspects reflects an individual's ability to draw interpretations from a phenomenon or event connected to studied theories (Laksono, 2018). Data from Table 3 indicates that the average scientific literacy abilities of students in identifying scientific issues or questions and explaining phenomena scientifically fall into the "Sufficient" category, whereas their use of scientific evidence falls into the "Poor" category. The students' achievement in scientific literacy in terms of competency aspects has not shown satisfactory results, thus indicating a need for improvement. This study's findings are consistent with those of Rini et al. (2021), showing that scientific literacy skills, particularly in competency aspects among PGSD FKIP UMT students, are categorized as "Sufficient". The difference lies in this study where the lowest proficiency in scientific literacy competency aspects was in using scientific evidence, whereas in other research it was in scientific phenomena indicators based on Rini's et al. (2021). These results also align with the conclusions drawn by Permatasari, et.al (2019), indicating an overall achievement in scientific literacy competency at 30.26%, categorized as "very poor". These findings suggest that students' conceptual understanding and reasoning affect their ability to explain phenomena and establish logical connections between conclusions and scientific evidence.

Similar research analyzing scientific literacy skills among chemistry education students was conducted by Muhariyansah et al. (2021). The difference lies in the measurement of scientific literacy based on four categorized levels: (1) Nominal Scientific Literacy, (2) Functional Scientific Literacy, (3) Conceptual Scientific Literacy, and (4) Multidimensional Scientific Literacy. Data analysis shows that the majority of chemistry education students' scientific literacy falls into the nominal and functional categories, with percentages of 33.2% and 24.2%, respectively. The conceptual and multidimensional categories accounted for 13.7% and 4.4%, while 24.5% of students did not respond to the test (Muhariyansah et al., 2021). This data indicates that the majority of students' scientific literacy skills are categorized as nominal, indicating their ability to recognize scientific concepts without full comprehension. Furthermore, students' scientific literacy skills are dominated by the functional category, suggesting their capability to define basic scientific concepts and provide correct explanations, although their understanding of these concepts remains limited or inadequate.

Copyright © 2024, Psychology, Evaluation, and Technology in Educational Research, ISSN 2622-5506

Competency aspects, also known as scientific processes, are components of scientific literacy that involve an individual's process in answering scientific questions or solving scientific problems (Rini et al., 2021). These competencies relate to students' scientific literacy skills, based on their use of logic, critical and creative analysis towards scientific phenomena.

Indicator one, which is identifying scientific issues or questions, entails recognizing and understanding the given scientific questions or information, identifying keywords, and variables present in a phenomenon. Jufri (2017) elucidates that scientific questions require answers based on empirical evidence.

Indicator two involves explaining phenomena scientifically. In this context, individuals utilize scientific knowledge to describe and elucidate occurring events, providing relevant explanations of phenomena and predicting appropriate outcomes. The PISA 2018 framework further expounds that this indicator encompasses competencies in describing or interpreting phenomena and predicting possible changes. PISA assessments not only ensure students can reproduce knowledge but also evaluate their ability to extrapolate from what they learn and apply that knowledge both within and outside of school. This approach reflects the reality that modern economies reward individuals not just for what they know but for what they can do with that knowledge.

Findings from this research also revealed through interviews that some students struggle to explain concepts of scientific phenomena in their own words for communication to others. For instance, students encountered difficulties explaining the scientific phenomenon of how the concept of redox reactions occurs during the electroplating process of gold metal on iron rings. They faced challenges explaining which electrode the iron ring and gold metal are placed on and how electron flow occurs in the electrolytic cell.

In an educational context, scientific literacy aids students in understanding how the natural world functions and how human activities can influence it. Students with strong scientific literacy can comprehend complex environmental, health, and technological issues. They are also capable of making informed decisions based on scientific evidence, crucial in a world increasingly complex and filled with diverse information. For example, in this study, concerning dental damage related to solubility and precipitation reactions. Scientific literacy enables students to understand the causes of dental damage due to irregular brushing with fluoride toothpaste and its consequences, as well as evaluating applicable solutions. They can compare the solubility values of fluorapatite compounds in water, which are lower compared to hydroxyapatite, and explain why brushing teeth before bedtime is important in preventing cavities due to H^+ ions from food fermentation reacting with enamel containing OH^- ions.

Indicator three, which is using scientific evidence, expects individuals to interpret scientific findings as evidence to draw conclusions, identify evidence, and communicate the rationale behind conclusions (Jufri, 2017). Achievement in literacy skills related to using scientific evidence remains relatively low. For example, this is illustrated by students' ability to determine the amount of gold deposition on an iron ring in the context of the electroplating phenomenon for marriage dowries. In essence, this indicator demands the ability to use data and scientific evidence, interpret the meaning of such evidence, and communicate it in one's own words. PISA (2018) also explains that this competency requires the use of mathematical formulas to analyze or summarize data, and the ability to use a method to transform data into different representations. Interview results with students also indicated their difficulties in using mathematical formulas to calculate the mass of gold coating on iron rings and evaluating their opinions, as well as expressing the logical relationship between evidence and conclusions in their responses. state that chemical literacy functions to select and distinguish truths from

Copyright © 2024, Psychology, Evaluation, and Technology in Educational Research, ISSN 2622-5506

acquired scientific information, enabling conclusions to be drawn and communicated to the public (Sari et al., 2022). Therefore, the ability to identify assumptions, evidence, and reasons behind drawing conclusions in problem-solving needs to be cultivated through context-based scientific literacy questions. The low results in students' scientific literacy are partly due to their unfamiliarity with scientific literacy questions. Report the results of study to find the factors causing the low scientific literacy abilities of Indonesian students which were put forward by researchers in relation to the results of PISA Indonesia, including (a) selection of textbooks, (b) misconceptions, (c) non-contextual learning, (d) low reading ability, and (e) the learning environment and climate are not conducive. Another reason is that chemistry learning that is less oriented towards scientific processes may also contribute to the low level of scientific literacy (Fuadi et al., 2020). Utami (2016) suggest that the learning process using a scientific approach can enhance students' scientific literacy. Furthermore, they explain that using a scientific approach provides opportunities for students to connect concepts they have previously acquired with concepts they are currently learning and the relationships between different subjects.

In addition, the integration of scientific literacy discourse with Islamic values is also related to how students can appreciate nature by utilizing the science and technology they have mastered, thereby assisting them in facing modern-day challenges. Science encompasses not only understanding basic scientific concepts but also involves the ability to apply that knowledge in everyday situations. The benefits of successful science learning will be more apparent if the learning can be applied to real-life situations. By integrating scientific literacy through the cultivation of Islamic values, it is hoped to develop a deep spiritual insight and rational understanding of Islam in the context of life. Moreover, students can develop their abilities to appreciate, justify, and interpret Allah's creation using scientific knowledge.

Science teaches humans how to manage nature, perform various processes, and produce things for their livelihoods. Meanwhile, religion teaches humans about value systems, emphasizing piety towards Allah SWT and kindness towards others. Integrating Islamic values and science (chemistry) can enhance a comprehensive understanding of concepts and make learning meaningful. Islamic values learned can be integrated into life to shape and develop noble character. Furthermore, integrating Islamic values into science can deepen religious understanding and bring individuals closer to Allah SWT. These learned Islamic values can be integrated into life to cultivate and develop virtuous character. Thus, enhancing integrated scientific literacy with Islamic values is key to helping students overcome difficulties in understanding and applying chemical concepts effectively.

CONCLUSION

The science literacy skills of chemistry education students are in the "Sufficient" category with an average score of 43.9. Students' science literacy skills in the competency aspect with indicators of identifying scientific issues or questions and explaining phenomena scientifically are in the sufficient category, while the indicator of using scientific evidence is in the low category. This data emphasizes the importance of improving science literacy integrated with Islamic values, especially in competency, so that students can understand and apply chemical concepts effectively in everyday life.

REFERENCES

Ambarwati, A. H., Aini, H., Putri, N. S., & Fadillah, N. K. (2023). Analisis literasi kimia: Pentingnya pemahaman konsep kimia di sekolah menengah. *Jurnal Arjuna: Publikasi*

Copyright © 2024, Psychology, Evaluation, and Technology in Educational Research, ISSN 2622-5506

Ilmu Pendidikan, Bahasa Dan Matematika, *2*(1), 165–174. https://doi.org/10.61132/arjuna.v2i1.474

Bybee, R., McCrae, B., & Laurie, R. (2009). PISA 2006: An assessment of scientific literacy. *Journal of Research in Science Teaching*, *46*(8), 865–883. https://doi.org/10.1002/tea.20333

Fuadi, H., Robbia, A. Z., Jamaluddin, J., & Jufri, A. W. (2020). Analisis faktor penyebab rendahnya kemampuan literasi sains peserta didik. *Jurnal Ilmiah Profesi Pendidikan*, *5*(2), 108–116. https://doi.org/10.29303/jipp.v5i2.122

Jufri, A. W. (2017). *Belajar dan pembelajaran sains*. Pustaka Reka Cipta.

Ministry of Education Culture, & Research and Technology. (2023). *Literasi membaca, peringkat Indonesia di PISA 2022*.

Muhariyansah, J., Rahmawati, A., Fibonacci, A., & Naqsyahbandi, F. (2021). Exploring scientific literacy of chemistry education pre-service teachers through socio-scientific issues approach. *JTK (Jurnal Tadris Kimiya)*, *6*(2), 243–253. https://doi.org/10.15575/jtk.v6i2.15145

OECD. (2017). *PISA for development assessment and analytical framework* (Vol. 1, Issue 1). OECD Publishing.

Oktariani, O., & Ekadiansyah, E. (2020). Peran literasi dalam pengembangan kemampuan berpikir kritis. *Jurnal Penelitian Pendidikan, Psikologi Dan Kesehatan (J-P3K)*, *1*(1), 23–33. https://doi.org/10.51849/j-p3k.v1i1.11

Pekkolay, S. (2022). The importance of literacy. *Scholars Journal of Arts, Humanities and Social Sciences*, *10*(1), 6–8. https://doi.org/10.36347/sjahss.2022.v10i01.002

Putra, A. K., & Rusilowati, A. (2021). Analisis profil literasi sains calon guru fisika pada materi optika geometri. *UPEJ Unnes Physics Education Journal*, *10*(1). https://doi.org/10.15294/upej.v10i1.46647

Ramdhayani, E. (2023). Pentingnya literasi dalam menumbuhkan nilai nilai karakter di era digital. *Jurnal Kependidikan*, *47*(1), 100950. https://e-journallppmunsa.ac.id/index.php/kependidikan/article/view/1128

Rini, C. P., Dwi Hartantri, S., & Amaliyah, A. (2021). Analisis kemampuan literasi sains pada aspek kompetensi mahasiswa PGSD FKIP Universitas Muhammadiyah Tangerang. *Jurnal Pendidikan Dasar Nusantara*, *6*(2), 166–179. https://doi.org/10.29407/jpdn.v6i2.15320

Rusilowati, A. (2018). Asesmen literasi sains: Analisis Karakteristik instrumen dan kemampuan siswa menggunakan teori tes modern Rasch model. *Prosiding Seminar Nasional Fisika Universitas Riau Ke-3*, 2–15.

Sari, R. K., Melati, H. A., Erlina, E., Enawaty, E., & Hadi, L. (2022). Profil kemampuan literasi kimia mahasiswa pendidikan kimia Universitas Tanjungpura. *Edu Sains: Jurnal Pendidikan Sains & Matematika*, *10*(1), 25–34. https://doi.org/10.23971/eds.v10i1.2917

Schleizer, A. (2018). PISA 2018 Insight and Interpretations. *OECD Publishing*, *5*(XVII), 236.

Siswanto. (2015). Perspektif Amin Abdullah tentang Integrasi-Interkoneksi dalam Kajian Islam. *Teosofi: Jurnal Tasawuf Dan Pemikiran Islam*, *3*(2), 376. https://doi.org/10.15642/teosofi.2013.3.2.376-409

Utami, B., Saputro, S., Ashadi, A., & Masykuri, M. (2016). Scientific literacy in science lesson. *International Conference on Teacher Training and Education*, *1*(1), 125–133. https://jurnal.fkip.uns.ac.id/index.php/ictte/article/view/7561

Copyright © 2024, Psychology, Evaluation, and Technology in Educational Research, ISSN 2622-5506

World Economic Forum. (2015). *New vision for education - Unlocking the potential of technology*. https://widgets.weforum.org/nve-2015/index.html

Zuriyani, E. (2017). Literasi sains dan pendidikan. *Jurnal Sains Dan Pendidikan*, *13*, 13.

Copyright © 2024, Psychology, Evaluation, and Technology in Educational Research, ISSN 2622-5506