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IMPROVING STUDENTS' SCIENCE LITERACY COMPETENCIES ON EARTH AND ITS SATELLITES THROUGH STRUCTURED INQUIRY LEARNING

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Abstract

This research aims to describe the improvement of students' science literacy competencies through structured inquiry learning on Earth and its satellites material. The subjects used in this study were students in the VII-C grade at Sidoarjo Junior High School. This research used a pre-experimental with one group pre-test-post-test design. This research used science literacy test sheets to collect data by pre-test (before treatment) and post-test (after treatment). The data obtained were analyzed to decide whether or not there was a student's science literacy improvement after being given learning with the structured inquiry model. The analysis results of the improvement of students' science literacy competencies with a gain score of 0.68 in the medium category, the results of the pre-test and post-test scores different significant with sig. (2-tailed) of 0.000, the achievement of science literacy competency indicators had increased with a medium category in indicator 1 and a high category in indicators 2 and 3.

Kata Kunci: *science literacy, structured inquiry.*

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INTRODUCTION

21st-century education has several important aspects that students need to master, including literacy skills (Nurhasanah et al., 2020). There are six basic literacies needed by students, including science literacy (Nudiati, 2020). Science literacy is a literacy competency that can be trained through science learning. Indonesian Ministry of Education and Culture has implemented science literacy in Indonesian education starting from the KTSP in 2006, the 2013 Curriculum, to the Merdeka Curriculum (Yusmar & Fadilah, 2023)

PISA has described science literacy as the competence in applying scientific knowledge, determining problems, and concluding a view of logical information to comprehend and give a judgement related to nature also the effects on nature by humans (OECD, 2016). DeBoer (1991) argues that science literacy was introduced by Paul deHart Hurd, a science education expert from Stanford University in 1985 who defined science literacy as an act of scientific understanding and its implementation in social life and society. Students who are scientifically knowledgeable individuals must be ready to reason and discuss scientific knowledge and technological advances.

Science literacy is not specifically trained in science learning but rather becomes an ability gained through the scientific process or inquiry experienced by students during learning in the form of aspects of science literacy competencies with indicators of capacity to explain phenomena scientifically, evaluate and design scientific investigations, and interpret data and evidence scientifically (OECD, 2019).

Indonesian science literacy is at a low level, as reflected in the achievement of the PISA score by the OECD. Education disruptions due to COVID-19 caused Indonesia's average PISA score in math, reading, and science to drop compared to the previous year. The 2022 PISA scores show that Indonesian students' competencies have not reached the OECD average with a score in the math aspect of 366 points out of an average of 472 points, the reading aspect of 359 points out of an average of 476 points, and the science aspect of 383 points out of an average of 485 points (OECD, 2022).

Low student science literacy give an impact on science learning because students have less ability to implement their knowledge in real life, are difficult to finish problems, are slow to decide something, less responsive in finish problem related to the surrounding environment (Yusmar & Fadilah, 2023). It is important for students to have science literacy competencies such as scientific information and thinking to improve their ability to decide

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something by considering the interests of the audience, to have a useful job in the future (Pratiwi et al., 2019).

Regarding the low Indonesian science literacy competence, the main influencing factors are low reading ability and decontextualized learning, lack of interest in reading, teacher-centered learning processes, and student activeness are not seen yet in scientific learning (Akbar et al., 2023). The reason why students difficult to finish science issues is because students are used to memorizing information more than whats has been learning, which results in students having difficulty understanding and applying their knowledge in daily activities (Ramli et al., 2021). Indonesian education needs efforts to overcome students' low science literacy through independent learning programs with the right learning model and training process skills (inquiry).

Students' science literacy is also reflected in the results of pre-research in Sidoarjo's secondary school which shows science literacy data medium on indicators explaining phenomena scientifically at 51,7%, medium on evaluating and designing scientific investigations at 44,2%, low on interpreting data and evidence of 35,8%. The teacher also stated that students are still unable to make questions based on facts, have not been able to formulate hypotheses and design investigations and find it difficult to draw a conclusion based on observations. These results are caused by learning with a model that is still teacher-centered and causes minimal of active student roles during learning, and minimal practice in the laboratory, especially in the material of the earth and its satellites. Teachers are also less innovative in choosing learning models, especially for students in grade 7th who are considered to be in the transition stage from elementary school stage to high school stage.

The results of pre-research and analysis of the educational conditions carried out show that efforts are needed to improve students' science literacy and achieve the two main elements of science education in the Curriculum through the implementation of an appropriate learning model, focusing on student activity in discover or construct concepts or knowledge, namely through inquiry. Inquiry defined as process in the form of observation or experimentation to find information and solve problems (Gunawan et al., 2019). Piaget defines inquiry as a model which is requires student conduct experiments by observing objects, determining questions from a problem, and answering questions by linking between each thing found and comparing with the results found by other students (Mulyasa, 2007).

Inquiry learning is suitable for implementation in science learning in the Curriculum, which has two main elements that students need to understand concepts and have process competence (inquiry). The Merdeka Curriculum has a goal in the learning process, namely, training students' inquiry process competencies to identify, decide problem formulations, and be able to solve problems through real action in scientific approach learning (Kemendikbudristek, 2022). It is expected of students to critical thinking after going through inquiry activities to process information, connect between information, analyze, evaluate, conclude, and implement the knowledge they have in certain conditions (Kemendikbudristek, 2022). This ability is in line with the indicators of science literacy competence, inquiry activities in science learning can be integrated with science literacy.

This is also supported by a statement about the Primary and Secondary Education Process Standards that students have to active to discover knowledge or concepts through the educational process. This is still inversely proportional to the reality that shows the majority of the learning in the class is still too focused on the teacher or teacher-centered which causes the active role of students to be less visible, tending to listen and memorize the knowledge conveyed by the teacher (Munira et al., 2018)

Banchi & Bell (2008) suggest that the inquiry learning model is divided into four levels categorized based on the treatment given to students during learning, namely: (1) confirmation inquiry where the teacher shows problems, procedures, and results; (2) structured inquiry where the teacher shows problem and procedure, students look for results; (3) guided inquiry where the teacher shows problems, students decide procedures to find results; and (4) open inquiry where students decide problems, procedures, and look for results.

The level of inquiry learning that is suitable to be applied in junior high school is structured inquiry because based on the results of observation, characteristics grade 7 students are not yet able to carry out high-level inquiry processes, and still need guidance in determining the formulation of problems or questions and investigation procedures. The structured inquiry model is given to students who still lack experience in inquiry-based learning, especially in the transition stage from the basic phase to the intermediate phase, and still need guidance from the teacher (Ni'mah & Widodo, 2022).

The structured inquiry model is learning with an inquiry process with questions or problems and steps given by the teacher, students provide explanations accompanied by supporting evidence that has been obtained. Learning based on the structured inquiry model focuses on concrete observation of scientific objects and collecting data through inquiry (Colburn, 2000). The structured inquiry learning model has four phases which include the phases of identifying questions, conducting experiments, analyzing data, and drawing conclusions (Faulconer, 2016). All inquiry activities are also indirectly related to the indicators of science literacy competencies.

Structured inquiry learning is an effort to optimize the student's active role so that the science education objectives in the Curriculum can be achieved both in the aspects of understanding concepts and process skills (inquiry) related to students' science literacy. Science learning with the structured inquiry model is expected to improve scientific literacy. The supported research by Ali (2019) which shows the results that students' science literacy competencies increased after receiving structured inquiry learning. Similar research by Magfira (2022) also states that the structured inquiry learning model affects on improving students' science literacy competencies. Other similar research results support Wang (2022) who states

that the structured inquiry learning model is positively and significantly correlated with science literacy skills.

The science learning material used in this study is the material of the earth and its satellites considering the suitability of the material as science literacy content related to life, including scientific knowledge that is important and has long-term benefits (OECD, 2019). The material is taught with a structured inquiry model that contains science literacy knowledge content about the earth, moon, and sun to form students' science literacy through a scientific activity or inquiry stage.

This study aims to improve students' science literacy competencies in learning about the material of the earth and its satellites through structured inquiry learning and at the same time prove some relevant previous research results.

METHOD

This research uses pre-experimental, namely one group pre-test-post-test design. The initial stage is giving a pre test, followed by giving treatment of implementing a structured inquiry learning with the material of the earth and its satellites, and closed by giving a post test. This research was directed in the JHS in Sidoarjo with the research sample being grade VII-C with 30 students. The sample was selected by purposive sampling with consideration of the material, class with heterogeneous student abilities on the teacher's advice, and the school's willingness.

The test methods used in this research, with pre-test and post-tests to collect data with the instrument of science literacy test question sheets. The science literacy test question sheet used was adopted from Cahyani (2023) which consists of 16 multiple choice questions that contain 3 indicators of science literacy competence. The results of science literacy test data of pre-test and post-test scores will be analyzed through several tests, namely a test of normality, a test of paired sample t-test, and a test of normalized gain (N-Gain) to decide the resulting science literacy improvement. An increase in results indicates that the treatment given is effective, and vice versa. Calculation of the percentage of post-test scores to decide the achievement of science literacy competency indicators.

The normality test aims to decide whether the distribution of science literacy test data obtained is normal or not using the Shapiro-Wilk test assisted by SPSS program. The data is normal if the significance value >0.05, it is not normal if it is < 0.05 (Putra et al., 2019). Normally distributed data will continue to be analyzed through a paired sample t-test to decide if pretest and posttest different significant with the SPSS program. The pretest and posttest are different significant if the significance value is more than 0.05 and not significant different if it is less than 0.05 (Nuryadi et al., 2017). The normalized gain test aims to measure the increase in science literacy competence of treatment with the N-gain equation 1.

$$g = \frac{S_{postt} - S_{pre}}{S_{max} - S_{pre}} \quad (1)$$

The gain (g) obtained was calculated as the average to decide the overall science literacy improvement of the sample. The results of the gain were used to decide the category of improvement in students' science literacy competencies analyzed based Table 1.

Table 1 Categories of Science Literacy Competency Improvement

N-Gain value (g)	Categories
g < 0.3	Low
0.3 ≤ g ≤ 0.7	Medium
g > 0.7	High

(Hake, 1999)

The gain obtained was calculated as a percentage to decide the interpretation of how effective structured inquiry learning makes students' science literacy competencies improved based Table 2 with the equation 2.

N-Gain (%) = gain (g) × 100% (2)

Table 2 Interpretation of the Effectiveness of Structured Inquiry Learning

N-Gain (%)	Interpretation
< 40	Not Effective
40 – 55	Less Effective
56 – 75	Quite Effective
> 76	Effective

(Hake, 1999)

The accomplishment of science literacy competence indicator ability is dissected through the pre test and post test of each indicator which can be determined using the equation 3.

$$P(\%) = \frac{score\ obtained\ for\ each\ indicator}{maximum\ score\ for\ each\ indicator} x100\% \quad (3)$$

The results of the percentage of achievement of each indicator can be interpreted through the criteria in Table 3.

Table 3 Criteria for Accomplishment of Science Literacy Indicators

Value Range	Criteria
<60%	Very Low
60-69%	Low
70-79%	Medium
80-89%	High
90-100%	Very High

(Slavin, 2018)

RESULTS AND DISCUSSION

The students' science literacy improvement measured through science literacy tests (pretest and posttest). The research was conducted for two meetings for the provision of treatment by giving pretests and posttests outside the lesson hours of treatment with multiple choice questions totaling 16 questions with science literacy competency indicators.

Learning is carried out with the help of observation-based Student Worksheets with structured inquiry model

steps which contain several stages to improve students' science literacy competencies, namely identifying questions through illustrations of scientific phenomena by reading and understanding to decide observation questions afterward, conducting investigation with groups and writing down the data obtained, analyzing data and answering questions given according to the results of observations, and drawing conclusions according to the investigations results and group discussions accompanied by presentations of observation results.

The results of students' pre and posttest on structured inquiry learning implementation to improving science literacy competencies through the N-Gain test are displayed in Table 4.

Table 4 Normalized Gain Test Results

Gain score (g)	Category	Student Count	Student Percentage (%)
$g < 0.3$	Low	0	0
$0.3 \leq g \leq 0.7$	Medium	15	50
$g > 0.7$	High	15	50

The gain results that have been categorized based on the students' science literacy competencies increase are also displayed in a pie chart in Figure 1.

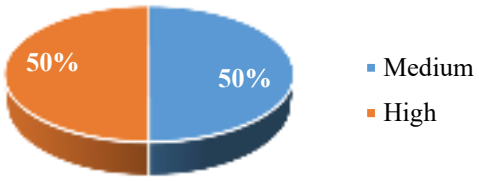

Figure 1 Chart of Student Science Literacy Improvement

Figure 1 presents the increase in students' science literacy competencies at the medium and high categories with an equal number of percentages of 50%. The category of science literacy improvement is decided by gain average, interpretation of the structured inquiry learning effective or not to improving students' science literacy is decided by average percentage of gain displayed in Table 5.

Table 5 Science Literacy Improvement Category and Effectiveness Interpretation of Structured Inquiry Results

Average		*N-Gain* (%)	Interpretation
N-Gain (g)	Category		
0.68	Medium	68	Quite Effective

Table 5 describes the gain average of 30 students with a score of 0.68 that means students' science literacy has improved and categorized as moderate. The overall gain percentage reached 68% which indicates quite effective of the structured inquiry to improving students' science literacy competencies is quite effective.

Pretest and post test scores will then be tested for normality through the Saphiro-Wilk test with the SPSS program to decide whether it has a normal or abnormal distribution. The normality test results are displayed in Table 6.

Table 6 Saphiro-Wilk Normality Test Results

	Statistic	df	Sig. (0.05)
Pre test	0.980	30	0.816
Post test	0.945	30	0.122

The normality test results in Table 6 indicate that the data have a normal distribution with significance value of 0.816 (pretest) and 0.122 (posttest).

Paired t-test using SPSS is due to decide the pretest and posttest different significant or not which the result are displayed in Table 7.

Table 7 Paired t-test Results

Std. Error Mean	Mean	t	df	Sig. (2-tailed)
1.460	-32.933	-22.561	29	0.000

Table 7 shows the paired t-test has a result of 0.000 which means the pretest and posttest different significant. The t-table value can be known based on the degree of freedom (df) which is 29 resulting a value of 1.460 with 5% significance level. Based on these results, the value is $0.000 < 0.05$ and the t-count > t-table value is $22.56 > 1.46$.

The results of increasing science literacy competencies are supported by the research of Ali (2019) which describes the results of structured inquiry learning that can improve students' science literacy competencies. Magfira (2022) also explained the results of structured inquiry learning effective on students' science literacy competencies. Similar research by Wang (2022) also explained that the structured inquiry learning model was positively and significant correlated with students' science literacy competencies. Some of these previous research results support the results obtained from this study.

The increase of percentage of accomplishment of each indicator displayed in Figure 2.

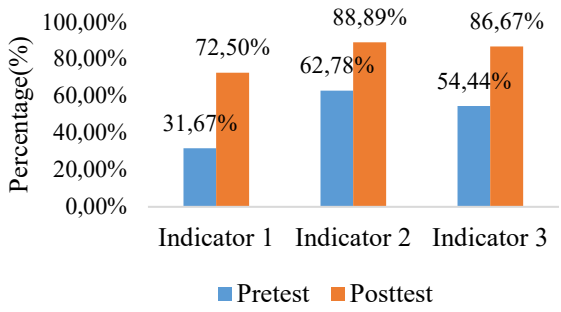

Figure 2 Percentage of Achievement of Science Literacy Competency Indicators based on Pretest-Posttest

Figure 2 shows that students' science literacy test scores (pretest posttest) on each indicator have increased.

The first indicator is explaining phenomena scientifically which resulted in a high increase from 31.67% (pretest) to 72.50% (posttest). This increase shows that after learning with the structured inquiry model, students become more capable of explaining phenomena scientifically by implementing scientific knowledge that is understood to solve science literacy test questions (Rini et al., 2021). The very low pretest results indicate that so far science teachers have not practiced students in explaining phenomena scientifically through learning. Changes in the ability to explain phenomena scientifically can be seen after learning about the earth and its satellites using the structured inquiry model. Students' post test results are still in the medium category despite a fairly high increase. This illustrates that students' abilities are not yet optimal in explaining phenomena scientifically. The concept of knowledge held in students' memories will affect students' competence when explaining phenomena scientifically (Sumarni et al., 2021).

The second indicator is designing and evaluating scientific inquiry which resulted in a lower increase than the first indicator of 26.11% from 62.78% (pretest) to 88.89% (posttest). The increase shows that after learning with the structured inquiry model on the material of the earth and its satellites, students become slightly more capable of designing and evaluating scientific investigations. The fairly low increase is due to the pretest results of students in the low category but with a big enough percentage which shows that students are accustomed to working on problems related to the ability to decide observation questions and identify materials and observation procedures appropriately. This is because science teachers have trained students by applying observations in science learning, although on different materials. Observation-based learning such as structured inquiry requires students' capability to utilize knowledge to solve a problem from a situation provided by the teacher by collecting data through observation activities in learning (Magfira et al., 2022).

The third indicator is interpreting data and evidence scientifically which resulted in a lower increase than the first indicator but higher than the second indicator by 32.23% from 54.44% (pretest) to 86.67% (posttest). The increase shows that after learning with structured inquiry model on the material of the earth and its satellites, students become a little more capable of interpreting data and evidence scientifically. Low pre test scores mean that students are still unable to interpret data and evidence scientifically such as interpreting graphs or tables presented in questions with material concepts (Hidayah et al., 2019). Improvements in students' competence to interpret data and understand the data or evidence used in making statements and conclusions are seen after students follow the learning (OECD, 2019).

The emergence of student's science literacy increase after getting treatment in the form of implementing a structured inquiry model on the material of the earth and its satellites for two meetings cannot be separated from the influence of other factors. Factors that can influence are observation-based learning with a structured inquiry model at each meeting that makes students actively involved directly and trains student collaboration with their group members, the relevance of the learning model and material chosen with the questions given to students as a science literacy test, good relationships between students and teacher that can make a good learning situation. The application of inquiry strategies has an effect in increasing student learning motivation and concept understanding, because inquiry learning focuses on students play an active role in shaping each students' concept understanding to increase the curiosity and understanding of each student (Lusidawaty et al., 2020). Supported by the opinion Wijiastuti (2021) explains that inquiry learning with several stages that contain concept-oriented science processes, problem solving, and critical thinking that can encourage the achievement of science literacy. Teachers who can condition learning will produce good relationships with students so that the inquiry process becomes more effectively (Kang, 2022).

CONCLUSION

The conclusion that can be drawn based on data analysis and results of research is that there is improvement in students' science literacy competencies after being given learning with structured inquiry model on the material of the earth and its satellites. The normalized gain test results score of 0.68 shows that students' science literacy has increased with medium improvement criteria from pre test to post test results. The paired sample t-test value of 0.000 showed a significant different between the pre test and post test scores. The analysis of the accomplishment of the 3 science literacy competence indicator results also showed an increase in the post test with one indicator increasing with moderate criteria and two indicators increasing with high criteria.

Suggestions that can be given based on the research are the selection and readiness of media tools and materials need to be considered so that they can attract students' attention and are not boring, the reading material on the LKS is more adapted for 7th grade students with language that is easier to understand.

REFERENCES

Akbar, A., Zain, Z., & Nugroho, A. (2023). Pendampingan Literasi Sains Dalam Implementasi Kurikulum Merdeka Yayasan Uswatun Hasanah Bontang. *Jurnal Pengabdian Masyarakat*, *1*(2), 44–51. https://doi.org/10.59562/abdimas.v1i2.1017

Ali, T. G. P. (2019). Implementasi Pembelajaran Inkuiri Terstruktur. *Jurnal Ilmiah Pro Guru*, *5*(4).

Banchi, H., & Bell, R. (2008). The Many Levels of Inquiry. *Journal Science and Children, 46*(2), 26–29.

Cahyani, K. N. (2023). Penerapan Model Inkuiri Terbimbing untuk Meningkatkan Literasi Sains pada Materi Bumi dan Satelitnya. *Skripsi.* Universitas Negeri Surabaya.

Colburn, A. (2000). An Inquiry Primer. *Science Scope*, *23*(6), 42–44.

DeBoer, E. G. (1991). *A History of Ideas in Science Education*. Columbia: Teacher College Press.

Faulconer, E. K. (2016). Investigating the Influence of the

Level of Inquiry on Student Engagement. *Journal of Education and Human Development*, *5*(3), 13–19. https://doi.org/10.15640/jehd.v5n3a2

Gunawan, Harjono, A., Hermansyah, & Herayanti, L. (2019). Guided Inquiry Model Through Virtual Laboratory to Enhance Students' Science Process Skills on Heat Concept. *Cakrawala Pendidikan*, *38*(2), 259–268. https://doi.org/10.21831/cp.v38i2.23345

Hake, R. R. (1999). Analyzing change/gain scores. *Dept. of Physics Indiana University, 16*(7), 1073-1080.

Hidayah, N., Rusilowati, A., & Masturi, M. (2019). Analisis Profil Kemampuan Literasi Sains Siswa SMP/MTs di Kabupaten Pati. *Phenomenon: Jurnal Pendidikan MIPA*, *9*(1), 36–47. https://doi.org/10.21580/phen.2019.9.1.3601

Kang, J. (2022). Interrelationship Between Inquiry-Based Learning and Instructional Quality in Predicting Science Literacy. *Research in Science Education*, *52*(1), 339–355. https://doi.org/10.1007/s11165-020-09946-6

Kemendikbudristek. (2022). Capaian Pembelajaran Mata Pelajaran Ilmu Pengetahuan Alam (IPA) Fase D. *Pusat Kurikulum Dan Pembelajaran, Badan Standar, Kurikulum, Dan Asesmen Pendidikan, Kementerian Pendidikan, Kebudayaan, Riset, Dan Teknologi*, *3*, 103–111.

Lusidawaty, V., Fitria, Y., Miaz, Y., & Zikri, A. (2020). Pembelajaran IPA dengan Strategi Pembelajaran Inkuiri untuk Meningkatkan Keterampilan Proses Sains dan Motivasi Belajar Siswa di Sekolah Dasar. *Jurnal Basicedu*, *4*(1), 168–174.

Magfira, N. K., Muhiddin, N. H., & Ramlawati. (2022). Pengaruh Model Pembelajaran Inkuiri Terstruktur Terhadap Peningkatan Kompetensi Literasi Sains Kelas VIII SMP Negeri 01 Bajeng. *Prosiding Seminar Nasional Pendidikan IPA III*, 94–104.

Mulyasa. (2007). *Menjadi Guru Profesional Menciptakan Pembelajaran Kreatif dan Menyenangkan*. Bandung: PT Remaja Rosdakarya.

Munira, J., Yusrizal, & Safitri, R. (2018). Efektivitas Model Pembelajaran Problem Solving untuk Meningkatkan Pemahaman Konsep Peserta Didik di SMA Negeri 11 Banda Aceh. *Jurnal Pendidikan Sains Indonesia*, *6*(1), 40–45. https://doi.org/10.24815/jpsi.v6i1.10716

Ni'mah, M., & Widodo, W. (2022). Penerapan Model Pembelajaran Inkuiri Terstruktur Berbantuan Virtual-Laboratory PhET untuk Meningkatkan Pemahaman Konsep Listrik Dinamis. *Pensa E-Jurnal : Pendidikan Sains*, *10*(2), 296–304.

Nudiati, D. (2020). Literasi Sebagai Kecakapan Hidup Abad 21 Pada Mahasiswa. *Indonesian Journal of Learning Education and Counseling*, *3*(1), 34–40. https://doi.org/10.31960/ijolec.v3i1.561

Nurhasanah, N., Jumadi, J., Herliandry, L. D., Zahra, M., & Suban, M. E. (2020). Perkembangan Penelitian Literasi Sains Dalam Pembelajaran Fisika Di Indonesia. *Edusains*, *12*(1), 38–46. https://doi.org/10.15408/es.v12i1.14148

Nuryadi, Astuti, T. D., Utami, E. S., & Budiantara, M. (2017). *Buku Ajar Dasar-dasar Statistik Penelitian.* Yogyakarta: Sibuku Media.

OECD. (2016). Excellence and Equity in Education, PISA. *PISA 2015 Results (Volume I)*. Paris: OECD Publishing.

OECD. (2019). Chapter 4. PISA 2018 Science Framework. *PISA 2018 Assessment And Analytical Framework*. Paris: OECD Publishing.

OECD. (2022). Comparing countries' and economies' performance. *PISA 2022 Results.* Paris: OECD Publishing.

Pratiwi, S. N., Cari, C., & Aminah, N. S. (2019). Pembelajaran IPA abad 21 dengan literasi sains siswa. *Jurnal Materi Dan Pembelajaran*, *9*, 34–42.

Putra, A. L., Kasdi, A., & Subroto, W. T. (2019). Pengaruh Media Google Earth Terhadap Hasil Belajar Berdasarkan Keaktifan Siswa Kelas IV Tema Indahnya Negeriku Di Sekolah Dasar. *Jurnal Review Pendidikan Dasar : Jurnal Kajian Pendidikan Dan Hasil Penelitian*, *5*(3), 1034–1042. https://doi.org/10.26740/jrpd.v5n3.p1034-1042

Ramli, M., Saridewi, N., & Rifki, A. (2021). Analysing Traditional Islamic Boarding School Students' Scientific Literacy Using Pisa Framework. *Jurnal Penelitian Pendidikan IPA*, *6*(1), 31. https://doi.org/10.26740/jppipa.v6n1.p31-39

Rini, C. P., Hartantri, S. D., & Amaliyah, A. (2021). Analisis Kemampuan Literasi Sains Pada Aspek Kompetensi. *Jurnal Pendidikan Dasar Nusantara*, *6*, 166–179.

Slavin, R. E. (2018). *Educational Psychology : Theory and Practice* (12th ed.). London: Pearson Education.

Sumarni, R., Soesilawati, S. A., & Sanjaya, Y. (2021). Science Literacy and Students' Mastery of Concept After Learning The Excretion System uses Scientific Literacy-Based Practicum Guidelines. *Assimilation: Indonesian Journal of Biology Educaton*, *4*(1), 32–36.

Wang, H. H., Hong, Z. R., She, H. C., Smith, T. J., Fielding, J., & Lin, H. shyang. (2022). The role of structured inquiry, open inquiry, and epistemological beliefs in developing secondary students' scientific and mathematical literacies. *International Journal of STEM Education*, *9*(1). https://doi.org/10.1186/s40594-022-00329-z

Wijiastuti, A. (2021). Hubungan Antara Literasi Sains dan Keterampilan Proses Sains dengan Hasil Belajar pada Materi Metabolisme (Uji Korelasional di Kelas XII SMA Negeri 6 Tasikmalaya Tahun Ajaran 2020/2021). *Skripsi.* Universitas Siliwangi.

Yusmar, F., & Fadilah, R. E. (2023). Analisis Rendahnya Literasi Sains Peserta Didik Indonesia: Hasil Pisa Dan Faktor Penyebab. *LENSA (Lentera Sains): Jurnal Pendidikan IPA*, *13*(1), 11–19. https://doi.org/10.24929/lensa.v13i1.283